Minzu University of China
Infinity publishing

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

Beijing, China 2019

上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

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

Part 4: Participants’ reports in English

2019年2月11-12日，中国北京
February 11-12, 2019. Beijing, PRC

ISBN 978-5-905695-93-3

Materials of the International Conference
“Scientific research of the SCO countries: synergy and integration”. Part 4 - Reports in English

(February 11-12, 2019. Beijing, PRC)

ISBN 978-5-905695-93-3

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

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

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

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

ISBN 978-5-905695-93-3

CONTENT

PEDAGOGICAL SCIENCES

PHILOLOGY

PSYCHOLOGICAL SCIENCES

ARCHITECTURE

MEDICAL SCIENCES

BIOLOGICAL SCIENCES

CHEMICAL SCIENCES

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”

经济中的税收浪潮
TAX WAVES IN THE ECONOMY

Kazmin Anton Gennadievich
Candidate of Economic Sciences, Associate Professor
Voronezh State Agrarian University named after Emperor Peter I

注解。 文章提出了经济中存在超长波的观点。 这些浪潮与税收周期有关。特别是，我们谈论的是直接和间接税收周期的存在。 这些波只能以非常大的时间间隔进行跟踪。 作为税收制度研究的一部分，英国设法建立了700年的临时和间接税收临时系列。

关键词：周期，波浪，直接税，间接税，经济法

Annotation*. The article put forward the idea of the existence of extra-long waves in the economy. These waves are related to tax cycles. In particular, we are talking about the existence of cycles of direct and indirect taxation. These waves can be traced only at very large time intervals. As part of the study of the tax system, Britain managed to build a temporary series of direct and indirect taxation for 700 years.*

Keywords*: cycles, waves, direct taxation, indirect taxation, economic laws*

The selection of the cyclical nature of economic activity was carried out in ancient times. Since Ancient Egypt, Ancient Greece, Ancient Rome and the Persian kingdom, steps have been taken to identify patterns in the development of society. First of all, attention was drawn to the cyclical nature of the seasons and the yields of agricultural crops, the change of weather patterns, volcanic, solar and lunar activity and other phenomena and processes surrounding a person. This knowledge contributed to the formation of the surrounding space and the development of society. Since they made life much easier, by means of the possibility of predicting future events and phenomena and reducing the negative consequences of adverse factors.

With the development of society, a system of scientifically based assessments has been developed describing the long-term driving force of social and economic development [4, p. four]. Allowed to identify the cyclical nature of economic activity, socio-cultural dynamics and the metaphysics of the processes. In turn, the development of knowledge and the accumulation of statistical information allowed to build a number of hypotheses that determined the logical sequence of

changing technical and technological structures, the justification of the system of formation cycles and the specifics of capitalist conjuncture cycles [4], as well as other repeated correlation, synchronous and interrelated phenomena.

Thus, in the process of progressive development, it was possible to identify the most significant characteristics of the cycles, which are:

First, they show the development of reproduction, at different periods of time, as the interrelation of the productive forces and production relations.

Secondly, taking into account the transitive transition of individual laws at different stages of the economic cycle, a hypothesis has been put forward about the regulatory role of the tax system on the absolute majority of economic laws.

Thirdly, the alternation of periods of recovery and recession due to the cyclical dynamics of macroeconomic activity.

Fourthly, the dynamic indicators of cyclical fluctuations, very definitely, indicate the problems of risk assessment and accuracy of forecasts for the short, medium and long term periods.

All the above, allows us to formulate the priority of the interests of society over the interests of individual social groups. Historical experience within the framework of socio-cultural dynamics indicates a unique chronology of events and phenomena that entail completely definite results of the development of society. During periods when interests of certain groups prevailed over the interests of the whole (at the end of the slave-owning system, feudalism), the reproduction process was almost completely stopped, the resource base was significantly limited (necessary to meet the growing needs of individual social groups). . The resulting dis-proportions were associated with a reduction in social wealth, due to the exhaustion of material, labor, intellectual and other resources.

This character of relations contradicts the natural character of the evolution of social labor. In particular, the gradual transition from simple production to intellectual labor, as more productive, able to provide qualitative improvement of the means of production and labor.

This transition will inevitably be accompanied by the elimination of contradictions in the form of overhead (the acquisition of luxury goods, yachts, aircraft). In other words, the socio-economic processes in the innovation economy tend to technological and social proportionality, which contributes to the rapid growth in the production of means of production compared with the production of consumer goods [9].

Because the productive forces are the relationship between material and labor resources, circulating and non-circulating funds and their individual components. Economic relations are proportions between consumption, accumulation and reserves, investments and income distribution, etc. Acting with the help of taxes on external and internal factors of the productive forces and economic relations, it is possible to achieve compliance with the law of compliance of economic relations

with the level and nature of the development of productive forces.

The functionality of this law is easily confirmed by making a historical excursion and analyzing the relationship between productive forces and economic relations over five thousand years of written history of mankind. At each stage, their harmonious combination will not be possible without a control system, which serves the tax system.

Violation of the universal law of proportional development of the economy was expressed:

First, by reducing social wealth, through the redistribution of material, intellectual and other material resources in the interests of a small group of individuals, which undermined the foundation for the future development of the economy and necessitated the restructuring of institutions.

Secondly, the growth of social labor productivity was significantly limited, by creating restrictions for intellectual labor that could facilitate the production of more productive means of production, reducing the proportion of the population (epidemics, wars), reducing individual labor productivity by discouraging labor.

Therefore, the existence of these contradictions in the nature of social production, the basic economic law, needs to be leveled, since obstacles to social labor productivity are forming, as part of special socio-economic interactions, in the form of various overhead costs. Otherwise, an unresolved host of contradictions leads to a disintegration of the system and a change in the determinants of social development.

With the progress of automated production, which imposes extremely high demands on mobility, qualification and interest of the workforce in the results of labor, it is necessary to abandon non-economic coercion - based on the capitalistically organized capital market and labor force [4].

Relatively most of the time, the economy develops dynamically with a predominance of uniform distribution of resources, but during periods of crisis a sudden transition from one position to another occurs. At this point, the total cost of the economy for reproduction is significantly higher than the usual period of the cycle. In this regard, the most promising is the direction that allows predicting crisis moments, and, consequently, periods of the greatest exertion of forces, which will allow improving the system for managing the development of the economy.

In fact, we are dealing with an exponential distribution on the time scale covering almost 7,600 years of human history. At the moment, there are three major periods of time. The first period was a slave system with a duration of almost 6000 years, which occupies about 77% of the time scale (from 1.0 to 0.25 along the 0X axis). The second period was the feudal system, which lasted for about 1200 years and occupied approximately 15% of the time scale (from 0.25 to 0.063 along the 0X axis). The third period of capitalism, which lasts nearly 400 years and it is 8% (from 0.063 to 0.032 along the 0X axis). Those. schematic distribution, also referred to as the Kapitsa exponential curve (Figure 10) [6].

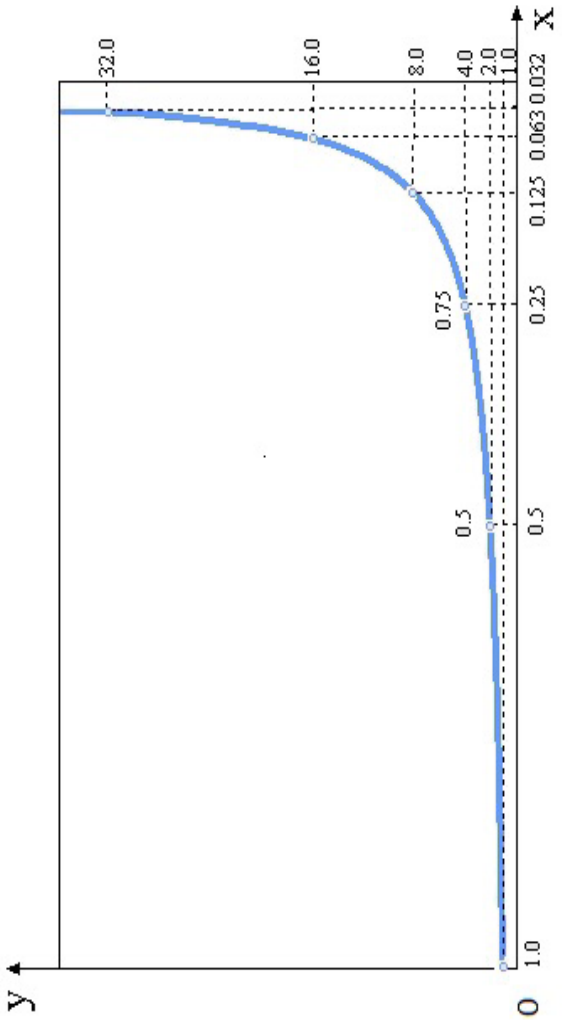


***Figure 1** - Kapitsa's Exponential Curve*

In this particular case, it shows that the development of modern society has reached its peak, therefore, we are on the verge of transition to a new economic model. This transition will be accompanied by a certain economic chaos, which is also described mathematically [7]. In particular, this is evidenced by the theory of chaos, according to which any complex system (including economic) is unpredictable, but at the same time, at the moments of transition from one state to another, it becomes possible to predict the behavior of the system, this is especially pronounced in the graphs attractors or fractals (self-similarity). Those. in fact, we can understand the direction of motion of the new nascent system from the current most unstable [1] bifurcation point to a new point located much more to the right on the time axis.

Historical data and a lot of research in the field of socio-economic processes revealed various periods of fluctuations, called cycles. The cyclical economy of the process is a fact that has been repeatedly proven [7, 8, 10]. In the framework of these studies, various periodicities were identified. In our opinion, mega-, macro-, micro- and meso-cycles should be distinguished. Due to the influence of external and internal factors (which, for frequent, are of a random nature), the cycles of the economic system are subject to a pulse effect. The influence of factors can manifest itself at the stage of rise or fall. In part, this affects the cycle time (Table 1).

Table 1 - *Classification of economic cycles*

Уровень	**Цикл**	**Периодичность**	**Factors**
1	**2**	**3**	**4**
Mega-	Tax	100-300 лет	Political, economic, social
Macro-	Kitchina	2-4 года	Fluctuations in world gold reserves
	Juggler	7-11 лет	Fluctuations in monetary circulation
	Marx's	8-11 лет	Fluctuations in the renewal of fixed capital
	Kuznec	15-25 лет	Fluctuations in construction
	Kondratiev	40-60 лет	Fluctuations in economic conditions
Micro-	The life of the economic entity	From 1 year or more	External and internal based on the stage of development of the organization
Meso-	Product life	From 1 year or more	Community needs
	Market	From 1 year or more	Geographical, social, economic, political
	Person (worker)	1 - 40 years	Education, health, material well-being

In our opinion, in modern interpretation of cyclical processes, 4 levels should be distinguished. At the same time, the last three levels are most well studied, while the mega-level has not actually been subjected to research, due to insufficient materials. For cycles of a given level have a frequency from 100 to 1000 years, although it is possible that there are also hypo-levels with cycles of more than 1000 years, as well as even higher levels and extra long cycles, the frequency of which may be tens of thousands, hundreds of thousands and millions of years. . But for the identification of such cycles, we still do not have enough data.

Most of the presented cycles are well studied [7]. Moreover, the interrelations between different cycles and the levels of their synergy and correlation have been studied [1]. The order of their alternation and articulation is described [5]. Also, in the literature [11, 12], the sequence of phases and consequences for countries and peoples, the nature of events and phenomena preceding a particular phase, cycle, or occurring within the specified phases are widely described. But little attention is paid to the role and importance of the tax system in the same cycle. Especially in interaction with other cyclic processes and the synergistic effect, which inevitably forms when a resonance occurs. This is due to the small amount of information and the relative complexity of its systematization, due to the large amount of data and a long period of grouping. So tax cycles refer to megacycles. Since their duration is more than 100 years. We have established (by grouping data, in some cases for 700 years) the presence of two branches. The first line is a cycle of indirect taxation lasting up to 300 years. The second line is a cycle of direct taxation in the dominant plane that lasts about 100-150 years.

Thus, it is advisable to note that throughout the entire written history of mankind, in the process of changing socio-economic formations, from the primitive communal system to socialism, we observe events and phenomena from time to time. It is also established that the position of the tax system is deterministic and very specific in different periods of time. The ongoing changes are consistently accompanied by an increase in overheads, which leads to the destruction of the links between productive forces and production relations. In everyday life, this is reflected in the growth of taxes and the tax burden on the most vulnerable segments of the population, which are at the same time the main consumers of material goods produced in the country.

The general conclusion is that the increase in costs in the last phases of the life cycle curve leads to the fact that at some point in time the total volume of overhead costs become burdensome for the economy so much that economic growth stops. “Then there should be a radical change in the mode of production, which allows to overcome the most significant economic pathologies, the derivatives of which are socially excessive non-productive costs. Such a situation developed at the time of the death of the Roman Empire, and later - at the beginning of the death of feudal monarchies, at the time of the completion of the Russian Empire ”[3, p. 67].

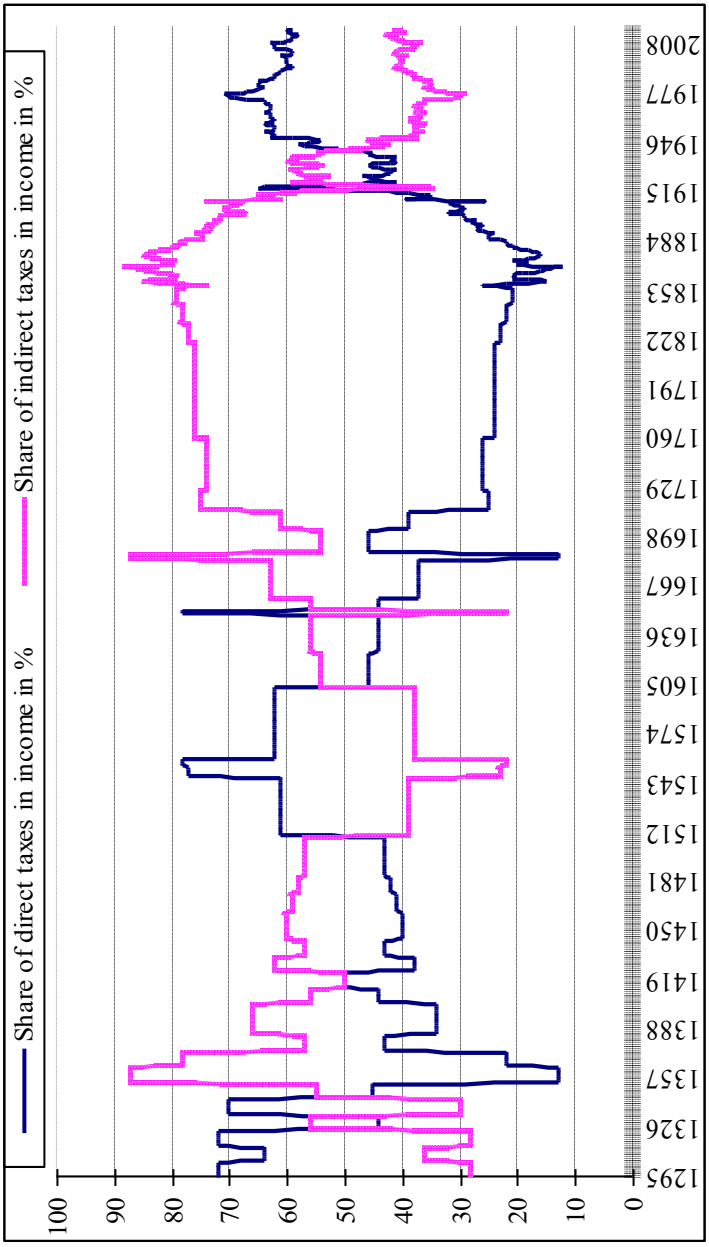


***Figure 2** - Waves of direct and indirect taxation of Britain for 700 years*

Thus, at the current moment in time, the world capitalist system is at the next point of bifurcation, since there is an imbalance between the growth in labor productivity and a decrease in the solvent demand of the population. The main reasons are the increase in non-productive costs, the increase in tax burden (to cover these costs), the improvement of technology, the rationalization of production (general robotization), the reduction in the capacity of commodity markets due to the fall in the purchasing power of the population (due to the increase in non-productive costs and tax increases). Attempting to delay the collapse of the system due to over-lending, only temporarily pushed aside the moment of isolation and exacerbated the imbalances.

References

1. Arrigi J. Long Twentieth Century: Money, power and the origins of our time / Trans. from English A. Smirnova and N. Edelman. - Moscow: Territory of the Future Publishing House, 2006. (Series "University Library of Alexander Pogorelsky"). - 472 p.

2. Wentzel, E.S. Theory of Probability. - 10th ed. - Moscow: "Academy", 2005. - 576 p.

3. Zagaytov I.B. Actual problems of fundamental and applied economics: monograph. - Part 3. Economic laws. - Voronezh: Voronezh State Agrarian University, 2013. - 347 p.

4. Zagaytov I.B. Laws and regularities of reproduction cyclicity: monograph. - Voronezh: Voronezh State Agrarian University, 2011. - 163 p.

5. 3ang V. B. Synergetic economics: time and changes in non-linear economic theory. - Moscow: Mir, 1999. - 335 p.

6. Kapitsa S.P. The general theory of human growth. How did the world of man grow and where does it go? Kapitsa - Moscow: 2009. - 120 p.

7. N. Kondratyev Large conjuncture cycles and the theory of foresight. - Moscow: CJSC "Publishing House" Economics ", 2002. - 767 p.

8. Laszlo E. Century of bifurcation: comprehension of a changing world // Path. - 1995. - № 1. - p. 3-129.

9. Lenin V.I. The development of capitalism in Russia. The process of formation of the domestic market for large industry. - Saint-Petersburg: A. Leifert Tipolithography, 1908. - 480 p.

10. Menshikov S.M. Long waves in the economy. When society changes skin. / CM. Menshikov, Klimenko L.A. - Moscow: International relations, 1989. - 272 p.

11. Feder E. Fractals: Trans. from English. - Moscow: Publishing house "Mir", 1991. - 256 p.

12. Fursov A. De conspiratione / A. Fursov, S. Goryainov, V. Karpenko, A. Rudakov, E. Ponamaryova - Moscow: KMK, 2012. - 528 p.

面向数字经济的风险产生因素问题
TOWARDS THE PROBLEM OF RISK-GENERATING FACTORS OF DIGITAL ECONOMY

Shmireva Alexandra Ivanovna
Doctor of Economic Sciences, Professor
Baranov Pavel Petrovich
Doctor of Economic Sciences, Professor, Head of Department
Shaposhnikov Alexander Arsenyevich
Doctor of Economic Sciences, Professor
Novosibirsk State University of Economics and Management

The development and operation of the digital economy is one of the inalienable, promising and significant attributes of a global scale. Studies show that all subjects of both the world and Russian economy are at different stages of their digital development: some essentially act as leaders, others use digital technologies, and others only begin to use them, or respond indifferently to this.

At the state level, e-government and budgeting are being introduced; at the level of commercial structures, processes are actively automated using robots and artificial intelligence; blockchain technologies, cloud technologies, cryptographic methods, etc. are developing.

The criteria for the expediency of introducing digital technologies are: performance and economic efficiency (for example, based on the effect of reducing the administrative costs of business).

But regardless of the level (public or private, commercial), all without exception, when using digital techn ologies, they face various risks.

Thus, the losses of Russian companies from cyber attacks in 2017 are estimated at more than 115 billion rubles. [one].

At the same time, the authors point to certain negative factors that do not contribute to their reduction, first of all, low user awareness; sometimes the lack of professional qualifications of employees and technical problems in the functioning of Internet communications.

Today, many companies are actively investing in methods of protecting, for example, personal data using digital formatting. Thus, in particular, Mastercard announced the use of blockchain technology to combat identity theft [2].

Most often in modern scientific publications the following key risks of introducing digital technologies are highlighted:

- loss of control in critical areas of government,
- unauthorized use of personal data,
- the possibility of violation of human rights in authorized management decisions,
- organizational risks.

However, according to the authors, the substantial risk-generating potential lies in the area of generating public information about operations with digital assets.

The dynamic development of the market and the expansion of the range of operations with digital assets clearly puts a number of serious problems in the plane of the accounting methodology and the formation of the accounting financial statements of modern companies. There is reason to believe that information on digital assets should be recognized as essential from the standpoint of accounting, regardless of the volume, cost of these objects and the intensity of operations carried out with their participation: the significance of the reported data on the "figure" is determined, first of all, by their risk-taking nature which should be taken into account in the conditions of intensive development of compliance audit.

Among the key problems of digital asset accounting methodology, it is advisable to single out two:

1. The problem of qualification of digital assets as objects of accounting and elements of financial statements. On the one hand, there is no doubt that the objects of the digital economy are classified as assets, since these objects are owned (or controlled) by companies and are used by the latter in order to obtain economic benefits. From another point of view, the question of attributing digital objects to any of the classical asset groups is not so straightforward: they have signs of intangible assets, financial investments, cash and even investments in non-current assets (when it comes to creating digital objects).

2. The problem of decapitalization of the studied objects, which determines the need to choose between depreciation policy and the policy of testing the fair value of digital assets. In turn, this primary choice inevitably poses a number of serious problems in the context of each of the approaches: in particular, if an organization takes a depreciation policy position, then naturally there are problems in determining the useful life of a digital asset and determining the most adequate method of calculating its depreciation. As for organizations that adopt a policy of testing fair value, they are clearly faced with the problem of justifying the revaluation methodology, based on data from the information space of the financial market [3].

The two described problems, which, of course, do not exhaust the entire problem area of the methodology of accounting for digital assets, have priority, be-

cause they require the formation of professional judgment of an accountant [4, 5]. This aspect is very important because its practical implementation can have a significant impact on the structure of the company's balance sheet and its financial results, and, consequently, on the views of users of financial statements about liquidity and solvency of the company's performance.

Thus, the expansion of the digital economy opens up a new window of opportunity for the development of scientific research at the intersection of the theory of finance, jurisprudence and the theory of accounting:

- the task of the theory of finance, from this point of view, is to study the economic and financial nature of digital assets, isolate and describe their immanent attributes, determine their place and role in dynamically developing economic relations;
- the task of jurisprudence is reduced to the legal qualification of the phenomenon of digital assets and the definition of legal restrictions due to their use of risks;
- the basic task of the theory of accounting is to integrate the provisions of the financial and legal sciences and their transformation into a methodology for making professional judgment on valuation, the procedure for recording and disclosing information on digital assets in financial accounting reports.

According to the authors, the solution of these problems can give a powerful impetus to the qualitative development of scientific research and create a new mainstream in these areas of scientific knowledge.

References

1. News // Cybersecurity Bulletin. - 2018. - №3. - p.6.

2. News // Cybersecurity Bulletin. - 2018. - №5. - p.11.

3. Alekseev, MA Informational space of the financial market: monograph. - Novosibirsk: NGUE, 2017. - 247 p.

4. Baranov, P. P. Methodology and methods of forming a professional judgment of materiality: [monograph]. - Kemerovo: Kuzbassvuzuzdat, 2011. - 257 p.

5. Tuyakova Z.S., Satalkina Ye.V. Classification of professional judgment as a modern accounting toolkit // OGU Bulletin. - 2010. - No. 1 (107). Pp. 90–97.

声誉排名系统发展的问题与趋势
PROBLEMS AND PROSPECTS OF DEVELOPMENT OF SYSTEM OF REPUTATIONAL RANKINGS

Pashkovskaya Irina Vladimirovna
Candidate of Economic Sciences, Associate Professor
Financial University under the Government of the Russian Federation

注解。 信息技术的发展使得可以使用声誉评级系统来预测个人的信誉，并在金融机构和客户之间建立新的关系形式。 文章分析了俄罗斯声誉评级的原因和趋势以及国外实践。 我们考虑了欧洲和中国声誉评级系统的特点，俄罗斯客户数字概况的一般和显着特征以及中国社会评级系统。

关键词：个人收视率，大数据，信用评分，声誉排名，在线平台，社会信用系统，评级系统，数字化转型，信息和通信技术

Annotation. *The Development of information technologies makes it possible to use reputation rating systems to predict the creditworthiness of individuals and to develop new forms of relationships between financial institutions and customers. The article analyzes the causes and trends of reputation ratings in Russia and foreign practice. The features of the European and Chinese reputation rating systems, General and distinctive features of the digital profile of clients in Russia and Chinese social rating systems are considered.*

Keywords: *personal ratings, big data, credit scoring, reputation rankings, online platforms, social credit system, rating systems, digital transformation, information and communications technologies*

Customer reputation is an important aspect of e-commerce and the digital economy of the 21st century. The financial sector, which uses the already established methods of assessing the creditworthiness of its customers, first appreciated the benefits of new technologies and began to introduce them not only to reduce their own risks, but also to improve marketing strategies to promote new products and services. Reliable information about customers can be obtained both from their own sources and from social networks, databases of various state institutions or private companies, etc. The implementation of the BigData system allows the use of significant amounts of information for analysis, which has an impact on the nature of financial management and the behavior of key economic entities.

At present, a “reputational revolution” is taking place, transforming the relations of financial institutions with their real and potential customers. Changes in relations between various economic actors are associated with the transition to the practice of monitoring information, creating information bases for analyzing, and developing principles for conducting such an analysis. Reputational mechanisms and technologies are increasingly being used by both commercial and government management structures.

Consumer lending has existed since Babylonian times, but a system for evaluating customer information based on the use of statistical information and the construction of mathematical models arose relatively recently. Various quantitative methods for evaluating credit information began to develop in the United States as early as the 19th century. Statistical methods for assessing creditworthiness have been widely developed in international practice since the 60s of the last century. However, the methods of scoring individual points as a customer rating system developed only by the end of the 20th century. The system of scoring individual points implies continuous monitoring and control over the rating process, and not just blacklisting of unscrupulous borrowers.

Currently, the scoring is built into the system of social and commercial life of modern society. Modern assessment methods take into account social organization, moral rules and the basis of behavior, as well as the possibility of their integration into a single system of relations. At the end of the 20th century, a certain revolution occurred in the systematization of financial indicators, the construction of ordered tables and structured efficiency systems, and the combination of economic performance indicators with management objectives at the micro and macro levels.

In Europe, such systems are widely used, including for promoting products and services of financial companies, for assessing the quality and accessibility of education, the effectiveness of individual educational programs, etc. The use of quantitative assessments helps to compare incomparable elements, obtain information on individual citizens, as well as systematize information on individual institutions.

The peculiarity of the modern credit scoring system is the possibility of using the results of the analysis carried out at the centralized level: agencies or government agencies. The use of a centralized system for collecting and analyzing information makes it possible to accumulate a larger amount of data on individual individuals or legal entities, assess their capabilities and needs, and organize and transmit information to other service users.

The emergence of trading platforms as a system of social relations requires an effective security system for conducting transactions, as well as reliable and accessible dispute resolution schemes. In this regard, rating systems for assessing the reputation of buyers and sellers of goods on trading floors are part of the trust

system and can be considered as the "digital social capital" of modern society. Modern trading systems have the right to analyze information about the participants in transactions and not allow users with low ratings to enter platforms.

The Internet has created a new form of economics, the economy of sharing, which is built on the basis of interpersonal relations, so large trading platforms not only use scoring systems to assess the reliability of participants, but also provide opportunities for feedback between potential participants in transactions. The presence of a user community, the provision of social media and technological innovations contribute to increasing the awareness of products and services and are part of the innovative marketing in the new digital world.

Currently, rating reputation systems are often complemented by gamification mechanisms, i.e. good performance, active participation and involvement over a long time are classified by level based on points, which guarantees the presence of certain rewards.

However, reputation systems can also be built in the reverse order. When negative actions generate "penalty points" for participants in the relationship system. Such systems can also be used by state institutions: quite often they are used to regulate the rules of the road, when different actors too often violate the established mandatory rules for all. Developed systems use, in addition to penalty rating schemes, the methods of consent and reward, which should be clearly defined by the rules of reputational scoring.

Different systems of both private scoring and state rating systems can complement each other. For example, the creation of an identifier for individuals for social welfare purposes helped to improve the scoring methods in consumer lending for banks and non-bank financial institutions in the United States.

In developed countries, sharing economics is based on the legal foundations of government. The quality of information provided on the basis of the platform is limited and controlled by the level of responsibility determined by freedom of speech, protection of private information and trade secrets, current legislation prescribing rules and standards for protection against defamation (protection of honor, dignity and business reputation).

A state may establish a certain mode of restriction when concerns arise about the consequences of applying a rating, or the general provisions and requirements for limiting the dissemination of information apply. In the US, the credit scoring procedure is subject to special regulation and is included in the laws governing the data protection system.

However, as international practice shows, the regulatory regulation of evaluation systems usually lags because the development of innovative technologies allows analyzing and using in the scoring system significant amounts of information that were not available for earlier evaluation systems. Co-consumption economics and social networks allow you to analyze customer information based on its "digital footprints".

"Digital footprints" is an opportunity to obtain information about a client from various Internet sources. Even without writing a text about yourself, downloading financial information or providing data about friends and acquaintances on social networks, the fact of accessing or registering on a certain web page leaves valuable information about the person. Digital footprint provides easily accessible proxies for determining the economic status of a person without complex requests for personal information and hard to reach data about his income.

Various information may be used to assess the customer's identity. As a simple example, each website can easily keep track of which devices a client uses to log in, whether a client comes to the site using a search engine or through paid advertising, what preferences a given client has, what search system he uses. In addition, information about a person can be compiled on the basis of when he makes a purchase. Digital traces allow you to evaluate a customer based on information about his name and email address (whether it contains numerical values), how much the information is changed and closed by the customer, whether the information contains conscious errors and distortions, and whether the customer enters the name and delivery address using the bottom register.

Information about the client banks can be obtained on the basis of the nature of his purchases and the system of payment used. If a customer buys cheap food through chain stores and uses payroll cards, the bank should keep track of transaction volumes for a certain period of time and the frequency of transactions. On the basis of the received information on the expenses of a client, one can more accurately determine its financial capabilities, rather than using the information on receipts and account balances. However, information on customer receipts and expenditures is closed, it cannot be obtained by inquiries on social networks, and is often inaccessible to the majority of participants in the sharing economy. However, if customers regularly visit the websites of certain online stores, then you can get an idea of their income level and preferences for certain categories of goods.

In addition, to study the problems of reputational ratings, the processes of validation and aggregation of information accumulated by separate information and analytical systems are of interest. Nowadays, specialized intermediaries for the exchange of information, gathered on the basis of analysis of various goals, have appeared. Such intermediaries collect reputational information from various information sources about clients so that the whole system can control and use such information in the future. This system is already used by the social network Facebook, which has created an internal analytical information processing system, evaluating its users and allowing only reliable clients to serve the network. Existing systems of evaluation in social networks, as a rule, establish the nature of customer relations and general rules of conduct within the network.

At present, the methodology of credit scoring and the predictive value of credit scores in conjunction with customer data on non-credit issues are widely used to develop the information infrastructure and aggregate customer data. Credit appraisal methods are already widely used in health care, dating services, when evaluating in the auto insurance system, as well as in the context of renting, hiring, and providing cellular services. In the general context of the accumulation and transfer of customer information, a unified information system is created that aggregates the reputational capital in the available forms of its consumption by participants in the sharing economy. Aggregated information will be useful for the development of trading platforms that currently use their own information systems assessing potential customers. However, it is necessary to unify the information obtained from various assessment systems and ensure its reliability and objectivity.

Currently, a single information system is only being created in both developed and developing countries. Current rating systems can be classified according to several factors:

1. The nature of the state's participation in the reputational system: public or private systems.

2. Functions and goals of the system being created: for a single goal or as part of solving a variety of tasks.

3. Reputational scoring models: using a set of indicators or based on the calculation of the final score.

4. The result of the assessment is final or indicative, can it be supplemented and revised.

5. The degree of openness and transparency of the system.

6. The system of monitoring and supervision of the reputational system: market regulation or government supervision regulation.

In addition, it is possible to conditionally classify this set of indicators for all systems by degree: low, medium and high levels, intermediate variants are possible or the combination of several factors. For example, the system was developed by an individual on a specific issue, and the information received goes into the state rating system, which compares and aggregates it with other sources of information on the object, therefore the degree of reliability of the final reputation system is quite high and the assessment is objective. It is possible to use intermediate models, in cases where the "compliance and clarification" method is used, final grades may be revised.

However, all Western models of reputational scoring are used only as a source of customer information, they are not yet built into the public administration system, as in China. The current European and American systems provide information assistance and are more marketing systems, but are not used in official systems for solving social development tasks.

The Chinese system of social lending, which is already widely discussed in

Western economic literature, is just beginning to take shape and should be completed by 2020. At present, there are three models of social lending: Chinese general blacklists, a pilot rating system for individual cities and a social credit scoring system. based on information from financial institutions.

The introduction of a social credit system is intended to solve the problems of not only reliable assessment of individual companies and individuals, but also to increase the general level of honesty and credibility of citizens' interest in the results of their assessment within a single national system.

The Chinese system of social lending, created for the development of credit policy in the narrow context of bank lending and increasing the availability of credit resources for the poorest segments of the population, has become a complex system of reputational assessment for all categories of users. The history of credit ratings in the long-term aspect shows that in the consumer market the nature of the behavior of the subjects changes depending on which indicators and requirements are laid down in the rating system. The loan has always been based on a certain level of trust and faith, the new rating system, which includes a larger set of social indicators, is a continuation and development of old scoring systems and increases the responsibility system in the digital economy. Debate questions about the effectiveness of individual assessment forms (centralized or private assessment systems, at the level of individual companies or regional and municipal structures) are relevant for both China and Western countries. These assessment systems will continue to develop at the level of the economy of the “smart city”, changing the approaches to the management system. Chinese valuation models are not counter-models for European and Russian valuation and management models in the digital economy.

Russia has already applied similar rating systems that imply the establishment of blacklists for unreliable passengers and citizens of other countries located on the territory of Russia without registration; suggest the allocation of social benefits to certain categories of citizens at the expense of the cities and municipalities; use of commercial customer rating systems based on a wide range of online resource indicators. Since 2019, a personal credit rating of citizens has been established in Russia, the Bank of Russia plans in 2019 to complete work on creating the legal framework for a client’s digital profile, which will include a wide range of information about individuals. The technologies that will be used in this system will allow for the rapid exchange of data between consumers and data providers using a single technological ID, and will allow you to manage the digital consents of citizens to exchange information. It is planned that the digital profile will not store information from other databases, but will provide access to them using a pass-through technology identifier and ensure that such data about a citizen or company is obtained on the basis of digital consent. The identifier will link all data about the citizen contained in various information systems.

The digital customer profile system created in Russia differs from the Chinese reputation ratings only by the set of indicators and the scale of information accumulated in the assessment bases. Therefore, the methods of regulating and managing reputation systems that are already used in foreign practice can be useful for Russia. In the future, Russia should tighten control and introduce licensing of private reputational assessment systems to ensure the protection of personal information of citizens and prevent its use for commercial purposes.

References

1. Gorbunova O.A., Ason T.A. Prospects for the development of new forms of payments in e-commerce // The Internet magazine "SCIENCE", Volume 9, No. 6 (2017) https://naukovedenie.ru/PDF/133EVN617.pdf

2. New tools to attract financing for the development of technology companies: the practice of use and development prospects in Russia // Report of the Center for Strategic Research, 2018 // https://www.csr.ru/wp-content/uploads/2018/05/Doklad-novye-dengi.pdf.

3. Pashkovskaya I.V. Crowdling operations: basic models and development prospects // Bulletin of Eurasian Science, 2018 No. 3, https://esj.today/PDF/91ECVN318.pdf (free access). The title from the screen. Yaz rus

4. Fintech: A Guide to the Latest Financial Technologies / Susan Chishti, Janos Barberis; Per. from ang. - Moscow: Alpina Publisher, 2017. - 343 p.

5. China's Social Credit System: An Evolving Practice / Rogier Creemers / 22 May 2018, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3175792

6. Committee on Payments and Market Infrastructures. Market Committee. Central bank digital currencies. Report submitted by Working Groups chaired by Klaus Lober (European Central Bank) and Aerdt Houben (Netherlands Bank), March 2018, p.5

7. Daithi Mac Sithigh and Mathias Siems. The Chinese Social Credit System: EUI Department of Law Research Paper No. 2019/01, Queen's University Belfast - School of Law and European University Institute (EUI), 27 Jan 2019, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3310085

8. Abigail Devereaux and Linan Peng / GMU. 18-35, George Mason University, Department of Economics, 13 Dec 2018, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3294776

9. International banking and financial market developments. BIS Quarterly Review. September 2017, pp. 59-61, https://www.bis.org/publ/qtrpdf/r_qt1709.htm

10. Toward a Reputation State of China / Xin Dai / Ocean University of China, 24 Jun 2018, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3193577

矿物原料作为俄罗斯远东地区和哈巴罗夫斯克地区相关产业的存在和发展的资源的作用

THE ROLE OF MINERAL RAW MATERIALS AS RESOURCES FOR EXISTED AND DEVELOPMENT OF RELATED INDUSTRIES IN RUSSIAN FAR EAST AND IN KHABAROVSK TERRITORY IN PARTICULAR

Zhukova Inna Victorovna
Candidate of Economic Sciences, Associate Professor
Far-East Institute of Management, branch of RANEPA
Khabarovsk, Russia

注解。 本文的目的是表明经济中的一体化进程可以通过领土和部门互动来实现。 以哈巴罗夫斯克地区的矿产资源综合体为例，通过开发消耗矿物的现有工业的相关原材料来考虑采矿业的整合能力。 采用旨在开发和引入低废物和非废物技术的创新方法不仅可以最大限度地减少负面后果，而且可以将生产和消费废物用作自然资源回收的来源。

关键词。 矿产原料，采矿业，投资项目，整合方式，底土使用。

Annotation*. The purpose of the article is to show that integration processes in the economy can be realized through territorial and sectoral interaction. On the example of the mineral resource complex of the Khabarovsk Territory, the integration capabilities of the mining industry are considered through the development of related and raw materials for existing industries that consume minerals. The introduction of innovative approaches aimed at the development and introduction of low-waste and non-waste technologies allows not only to minimize negative consequences, but also to use production and consumption waste as sources of natural resource recovery.*

Keywords*. Mineral raw materials, mining industry, investment project, integration approach, subsoil use.*

The slow and inefficient development of the mining industry is due to the weak territorial and sectoral organization of the industry, or rather, the actual absence of such an organization. Complex interaction in the region is possible through the integration process.

Let us consider the integration capabilities of the mining industry through the development of related industries and the raw material supply of already existing industries of the Khabarovsk Territory, other regions of the Far East and countries of the Asia-Pacific region. Under related industries we understand the industry, providing the activities of mining enterprises and using mineral raw materials. To the sectoral composition of the mineral resource complex (MRC), for example, heavy engineering. Related industries in this case will be - the production of metallurgical, mining, handling equipment; production of power units, steam boilers, nuclear reactors, turbines, generators; production of other metal-consuming and large-sized products

The possible development of industries related to the mining industry through integration processes will be considered on the example of the Khabarovsk Kai. Table 1 lists the deposits in the Khabarovsk Territory that form the mineral and raw material base of the region.

Table 1

*The main deposits forming the mineral resource base of the Khabarovsk Territory **

Field name	The main mineral	Concomitant mineral	Rank	Assimilation
Mnogovershinnoe	Gold	Silver	L	Being developed
Hakandzhinskoe	Gold	Silver	M	Being developed
Belaya Gora	Gold	Silver	M	Being developed
Albazinskoe	Gold		L	Being developed
Hotorchanskoe	Gold		M	Non-distributed fund
Usmun	Gold		S	Being developed
Ulahanskoe	Gold	Silver	S	Being developed
Vasilek	Gold		S	Being developed
Levoberezhnoe	Gold		S	Being developed
Zaletnoe	Gold		S	Being developed
Yuryevskoe	Gold	Silver	S	Being developed
Chachika	Gold		S	Non-distributed fund
Oemku	Gold		S	Non-distributed fund
Avlayakan	Gold	Silver	S	Scoutable
Kirankan	Gold	Silver	S	Scoutable
Tukchi	Gold	Silver	S	Being developed
Shumnui	Gold		S	Scoutable
Krasivoe	Gold		S	Being developed
Malyutka	Gold	Silver	S	Scoutable
Dyappe	Gold		S	Scoutable
Noni	Gold	Silver	S	Scoutable
Kondyer	Platinum (placer and ore)		L	Being developed
Ket-Kapsky ore district	Platinum (placer and ore)			Being developed
Pravourmiiskoe	Tin	Tungsten, copper	L	Being developed

Festivalnoe	Tin	Tungsten, copper	L	Being developed
Perevalnoe	Tin	Tungsten, copper	L	Being developed
Sobolinoe	Tin	Tungsten, copper	L	Non-distributed fund
Pridorozhnoe	Tin	Tungsten, copper	M	Non-distributed fund
Urozhaynoe (Galam)	Titanium, iron	Phosphorus, vanadium	PE	Undeveloped
Gayumskoe	Titanium, iron	Phosphorus	PE	Undeveloped
Maymakanskoe	Titanium, iron	Phosphorus, vanadium	PE	Undeveloped
Milkanskoe	Iron		PE	Undeveloped
Nimiyskoe	Phosphorus		PE	Undeveloped
Lagapskoe	Phosphorus		PE	Undeveloped
Goreloe	Phosphorus		PE	Undeveloped
Iskinskoe	Alunite		PE	Undeveloped
Nalednoe	Alunite		PE	Undeveloped
Seredochnoe	Zeolites		M	Non-distributed fund
Urgalskoe	Coal		L	Being developed
Marekanskoe	Brown coal		S	Being developed
Hurmulinskoe	Brown coal		S	Non-distributed fund

*Note: L is a large deposit, M is medium, S is small, PE is a preliminary estimated**

Based on materials from the Department of Subsoil Use in the Far Eastern Federal District, Ministry of Natural Resources of the Khabarovsk Territory (URL: http://knu.znate.ru/docs/index-524198.html), with author editing in the Belaya Gora and Albazinskoe deposits.

In Table 1, we see that the participation of mineral raw materials in the provision of existing and related industries is due to the presence of gold, platinum, tin and black and brown coal deposits in the province.

The integration process associated with the development of industries related to the mining industry, based on the analysis of the state, should be developed through integration and project approaches. However, such investment projects, despite their high potential, are not offered very much in the mineral resource complex [2]. An illustrative integration process in the economy is the development of sectoral and territorial interaction with respect to fuel and energy resources. Consider the possibilities of this process on the example of the Khabarovsk fuel and energy hub.

The Khabarovsk fuel and energy hub includes the city of Khabarovsk and the Khabarovsk lignite deposit. It is one of the most difficult fuel supply in the region. There are large deposits of coal (stone and brown) in the region, the region has predictable oil and gas resources and in the future it can switch to full self-sufficiency in fuel and energy carriers.

Khabarovsk was traditionally supplied with coal from the Raychikhinsky brown coal deposit, which is currently being mined and constantly reducing production volumes (1985 -12 million tons, 1991 - 4.5 million tons, 2015 - 3.6 million. t, 2018 - 4 million tons). Directly within the city there are two large coal deposits - Khabarovsk and Bazovskoye - with total reserves of 418,657 thousand tons.

The analysis of hydrological conditions, the lithological composition of rocks, the quality of coal revealed the possibility of mining the field by means of underground gasification of coal [7] (hereinafter referred to as UGC). It should be noted that similar studies were carried out earlier, in 1962-1963, when the technical and economic indicators of underground gasification of coal from the Khabarovsk deposit were calculated and conclusions were made about the feasibility of building the Podzemgaz station to supply fuel to the existing CHP-1 [4]. At the same time, due to the underground gasification of these coals, it is possible to obtain more than 38 trillion. cc meters of gas, which is more than 10 times the explored reserves of natural gas in the region. The UGC technology is a promising direction for the revitalization of mothballed mines, mines produced and cuts through the involvement of the flanks and deep horizons. When planning the development of coal deposits as an alternative, it is always necessary to consider the underground gasification of coal, which in some cases can have a more significant effect.

Let us give a brief description of the feasibility study (FS) of underground coal gasification at the Khabarovsk brown coal field. Let us compare the main indicators of the Yerkovets coal mine in the Amur Region and the Khabarovsk Podzemgaz feasibility study presented in Table 2. The technical and economic comparison made more than 30 years ago revealed that labor productivity at the station is comparable to that on the coal mine, the cost is much lower and less capital costs per 1 ton of fuel equivalent It should be noted that this trend persisted even 30 years later in 2019.

Table 2

Comparison of the main technical and economic indicators of the UGC station and the coal mine *

	Name of indicators (in prices of 1987)	**Khabarovsk station "Podzemgaz" (project)**	**Yerkovets open-pit mine "Dal'VOSTNII proyekt ugol'"**
1	Enterprise capacity: a) million m^3 of gas per year Q^P_H =7. 54 МДж/$м^3$ b) in thousand tons of fuel equivalent	2000 514,2	- 2000
	c) natural fuel, thousand tons	1028,4	4500
2	Number of employees, a) including workers	409 345	1345 1145
3	Labor productivity of a worker, tons of fuel equivalent per month Labor productivity of a worker, tons of fuel equivalent per month	125	176,8
4	The cost of 1 tonnes of fuel equivalent	13,88	19,76
5	Capital investments, total, million rubles: a) including construction and assembly work b) per 1 tonne of fuel equivalent	49,2 36,4 95,7	289,3 189,0 144,6
6	Construction period, months	29	60

* Source: materials of the author

We see that the commissioning of the Podzemgaz station on the basis of the UGC technology allowed at the end of the last century, and now it allows us to have an energy production facility with high environmental and economic indicators. It should be noted that one of the CHP plants in Khabarovsk (namely, CHP-1) was designed to use the UGC technology, but the reforms that started in the country in the early 1990s, the collapse of the USSR prevented the implementation of this project, and the lack of preferences from the state with such innovative investments do not allow subsoil users to be distracted by such projects.

In 1975 The American company Texas Utilities Inc. bought a patent in the USSR for underground coal gasification and mastered UGC using Soviet technology [6]. Work on the UGC is currently underway in the United States, China, the European Union, DPRK, Australia, Thailand, Uzbekistan, Kyrgyzstan, and India. As far back as 2010, 6 industrial Podzemgaz stations operated in the PRC, and there were 4 stations in construction [6].

For the period 1985-2015. The issues of a feasibility study for the construction of Podzemgaz stations of a new technical and economic level in the Far Eastern region have been considered more than once. Feasibility studies of Vakhrushevskaya (Sakhalin Oblast), Khabarovsk (Khabarovsk Territory), Artyomovska-

ya, Chernyshevskaya and Banivurovsky (Primorsky Krai) Podzemgaz stations were completed, the main technical and economic indicators of which exceed the level of the existing stations. It was planned to build enterprises in areas with acute energy shortages and lack of local oil and gas resources. At the Far Eastern State Technical University (currently part of the Far Eastern Federal University in Vladivostok), the plant's technological scheme is developed and patented with the possibility of more efficient operation [3, 5]. However, even today such a capacious and effective project remains unfulfilled.

Simultaneously with the production of energy carriers, the use of UGC technologies makes it possible to process ballast impurities with the production of a commodity chemical product. Far Eastern Federal University has developed a technology for processing coal tar into polymer composite materials (PCM) [3, 5]. Today in Russia, no university prepares engineers and designers for composite materials. The exception - when training at the Moscow Aviation Institute - give skills to work with composite materials.

It should be noted that the Far East and Siberia are not provided with such PCM at all, although due to the increased aggressiveness of the environment and groundwater, these areas are in dire need of protective waterproofing and anti-corrosive PCM. In addition, these are effective market segments associated with the introduction of new building technologies, for example, repairing the coating of runways of polymer-solution aerodromes, the formation of polymeric self-leveling floors, seamless roofing, etc. The need for construction, operational, industrial enterprises, the Far Eastern Sea and Amur River Shipping Company, the fishing fleet and others exceeds tens of thousands of tons of PCM per year.

However, the region's integration capabilities in the area of energy resources are mainly potentially predictive in nature due to poor geological and geophysical knowledge of their distribution areas, reduced exploration and design and exploration work, and the lack of funds for developing proven fields and prepared projects. And the use of coal raw materials in the energy complex in connection with the withdrawal of common lands for ash and slag waste from coal combustion, dusting of ash dumps, pollution of soil and water by heavy and radioactive metals, is considered to entail a number of negative consequences [1]. However, today this problem has been solved. As a result of many years of research at the Far Eastern Scientific Research Institute of Mineral Resources, positive results have been obtained in extracting valuable components from ash and slag waste and their complete utilization. Tests were carried out on waste thermal power plants of the cities of Khabarovsk, Vladivostok, Raychikhinsk. A schematic diagram of the integrated processing of ash and slag wastes is presented, shown in Figure 3, which provides for the separation of the coal fraction with the subsequent separation of the magnetic and heavy fractions [1].

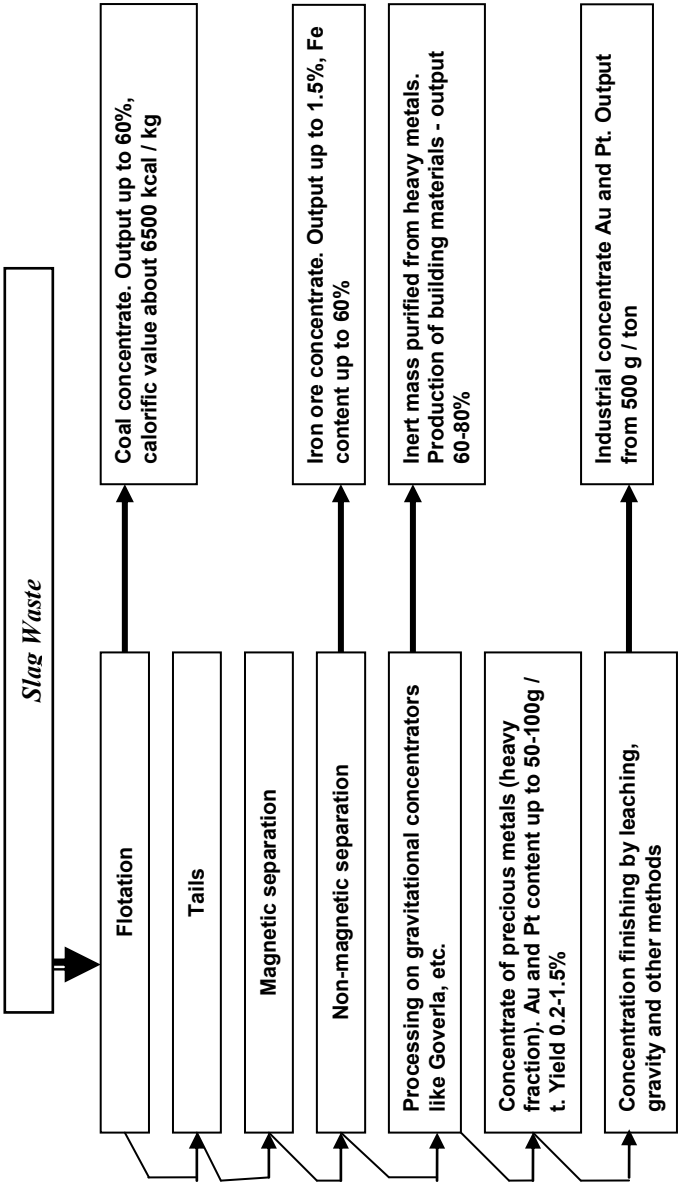


Fig.3. *Scheme of complex processing of ash and slag waste of thermal power plants (based on materials of the Far Eastern Institute of Mineral Resources, Khabarovsk)*

Ash and slag waste is a technogenic mineral raw material that does not become exhausted, but accumulates over time. This increases the prospects for the use of such waste in operation. Such use will allow the use of ash and slag waste in the construction industry, as well as reduce the negative impact on the environment. Extraction of useful components and full utilization of ash and slag waste through the use of their useful properties and the production of building materials will also free up the area occupied by the dumps.

Thus, it is necessary to introduce continuous processing of ash and slag waste by operating CHP, both from environmental, geological and economic points of view.

Summing up the study, we can draw the following conclusion. The existing branch structure does not fully meet the strategic interests of the region. Therefore, in order to make the most complete use of the economic and resource potential available in the region, in addition to diversifying the economy, the development of new highly efficient enterprises and industries is necessary. It is necessary to form an effective system of subsoil use based on the integrated development and use of the entire set of subsoil resources, the use of low-waste resource-saving technologies, greening production and ensuring the competitiveness of the products of the mineral-raw materials complex on the world market. At the same time, it is necessary to take into account the specifics of the Far East and the laws of complex production, the revision of traditional approaches and the understanding of many economic categories, principles, methods, and assessments.

References

1. Bakulin, Yu.I. Gold and platinum in ash and slag waste of CHP in Khabarovsk // Yu.I. Bakulin, A.A. Cherepanov. - Moscow: Ores and metals. - № 3.- 2002. P. 60-67.

2. Zhukova, I.V. Investment Management in Mining // Management issues. - №2. - 2016. P. 111-117.

3. Kondyrev B.I., Belov A.V. Development of integrated downhole coal mining technologies based on the method of underground gasification. - [Electronic resource] / Access Mode: http://bazar2000.ru/?view=page&id=1851. (Date of appeal: 02/09/2019).

4. Kreinin E.V. Technical and economic prospects of underground coal gasification. // Mining information and analytical bulletin (scientific and technical journal). -2009. - №5. P.347-352.

5. The method of underground gasification. / Kondyrev B.I., Zvonarev M.I., Belov A.V. - Patents for the invention of RUS 2318117. August 21, 2006; RUS 2316649. 08.21.2006.

6. Fatkulin A.A., Belov A.V. Underground gasification of coal as a promising geotechnology for the development of the coal industry. / A.A. Fatkulin, A.V. Belov, I.V. Grebenyuk, M.V. Larionov. // Mining information and analytical bulletin (scientific and technical journal). -2014. - №54-2. p.3-8.

数字化对石油和天然气行业的影响以及石油和天然气公司的市场价值
THE IMPACT OF DIGITALIZATION ON THE OIL AND GAS INDUSTRY AND THE MARKET VALUE OF OIL AND GAS COMPANIES

Shvetsova Irina Nikolaevna
Candidate of Economic Sciences, Associate Professor
Head of the Department
Syktyvkar State University named after Pitirim Sorokin
Kleus Violetta Olegovna
Master student
Syktyvkar State University named after Pitirim Sorokin

Oil and gas companies are making significant efforts to improve operational efficiency and optimize oil and gas production. At the same time, the versatile production information becomes the main basic resource for managing the operation of modern production systems, and the level of information technology used to a significant extent determines the possible value of the competitiveness of the oilfield, oil pipeline or refinery and other industries.

Since 2011, the term of the fourth industrial revolution was introduced into professional life, which refers to the transition to a fully automated "digital" production, which has "intelligent" real-time control systems that are in constant interaction with the external environment and go beyond the boundaries of one enterprises, with the further prospect of combining enterprises into a global industrial network of production, things and services [1, p. 365].

The result of the “digital” revolution is a ubiquitous transition to a “digital” economy, the practical principles of which are contained in a concept called Industry 4.0 [2].

Thus, the modern "digital" society emerged as a result of the extensive development of mobile services, the Internet and "digital" television broadcasting, which, in turn, was the result of advances in semiconductors, telecommunications, displays and other types of information technology.

The previous industrial revolution (Industry 3.0) was based on automating only individual production processes, while Industry 4.0 is already based on end-to-end “digitalization” of all existing physical assets of an enterprise and their integration into a single “digital” ecosystem.

At the same time, the concept of Industry 4.0 provides for “digitization” and integration of all the life cycle processes of the products produced: from the development process to the processes of their logistics and service. In accordance with the concept of Industry 4.0, each product produced must have its own “digital” image, that is, all information about it - drawings and production technology, rules of operation, maintenance and disposal - must be “digitized” and available for reading by devices and people. .

It should be noted that the data on all the processes, production stages, parts, assemblies and products obtained at the production should be available to authorized users in real time within a single “digital” network.

In particular, Industry 4.0 implies mandatory data exchange between all participants that are involved in the production chain: enterprise specialists, equipment, ERP systems, robots, products, etc. [3, p. eight].

To do this, such production systems combine hardware, process equipment and logistics systems. At the same time, a very important point is the continuous exchange of production information between all relevant elements of the cyber-physical system, through the Internet of Things technology [2].

In addition, it should be noted that very large arrays of various oil and gas data (BigOilData - BOD) are usually involved in providing “digital” oil and gas technologies. Thus, 2.5 exabytes (1018 bytes) of new data are generated daily in the world. The share of oil and gas data in them reaches 10%. Moreover, 4/5 of this information (seismic, geophysical, field, financial, reporting, etc.) is often in an unstructured form.

As a result, the most effective technology for processing and storing information has become “Cloud” service - this is a model of online storage, in which extensive production data is stored on numerous servers distributed over the network that are provided for use by customers. This data is stored and processed in the so-called “cloud”, which is one large virtual server. Physically, such servers can even be located on different continents.

Such an interaction environment provides an instant exchange of the collected production information between authorized production participants, which has a direct impact on the quality of making professional decisions, and therefore guarantees no downtime and a significant reduction in the number of accidents.

In particular, virtual cloud technology has become the mainstream for oil and gas companies: it is used mainly to reduce existing costs in the IT infrastructure, but now it has also become an important incentive to more quickly unlock potential values that can provide broader “digital " solutions. As a result, in oil and gas companies that promptly possess accurate data, the quality and speed of making production decisions is improved by 24% annually.

Today, large oil companies around the world are switching to using "digital" technology: Shell and Total use robots, Chevron and Shell use drones, Statoil use 3D visualization, Chevron using video analytics detects leaks on oil pipelines a project related to the application of industrial Internet of Things on offshore production platforms.

In addition, almost all the players in the global oil and gas industry are already using artificial intelligence and the possibilities of virtual and augmented reality in industrial oil technologies. In 2018, BP joined the Enterprise Ethereum Alliance, whose activities (including the distribution of smart contracts in corporations). Even a technology such as blockchain has not been ignored in the oil industry [3, p. 9].

Various oil companies have their own names for special projects that can be categorized as "smart / intelligent" production:

1. Smart Wells (Schlumberger);
2. Smart Operations (Petoro);
3. Integrated Operations (Statoil, OLF);
4. eOperations (North Hydro);
5. Real Time Operations (Halliburton);
6. eDrift (OD);
7. Integrated Asset Operation Model (IAOM), ADCO;
8. Smart Field (Shell);
9. i-field (Chevron);
10. Field of the future (BP);
11. Digital oil field of the future DOFF (CERA);
12. Intelligent Field Optimisation and Remote Management/INFORM (Cap Gemini) and others [3, p. 10].

All these systems are quite similar to each other in their main goals and local tasks: they are designed with a high degree of accuracy to simulate various scenarios of the situation in the oil and gas industry and provide an opportunity to choose the most optimal solutions (including more efficient use of highly qualified specialists of the company).

In addition, there are various versions of the names of this approach (both in Russian and in English) (see Table 1).

Table 1 - *Variants of the names of the technology of the "digital" field [3, p. 11].*

Title	Where use
Digital Oilfield (DOF)	Marathon, Baker Hughes, Petrobras, SPE, Газпромнефть
Digital Oilfield of the Future (DOFF)	CERA
Field of the future	BP
Smart Operations	Petoro
Smart Field	Shell
Field Monitoring	Total
iField (Integrated Field)	Chevron, Saudi Aramco, Accenture
Intelligent Oilfield (IOF)	Invensys, Emerson, Лукойл
Digital Energy	Schlumberger
Integrated Operations (10)	Statoil, Baker Hughes, Eni, SPE, CERA
Operations Excellence (OE)	ConocoPhillips

All these technologies provide "intellectualization" of the process of oil production, transportation and refining. Therefore, when considering such innovative technologies, it is necessary to take into account that, in translation from Latin, "intellect" means "knowledge, understanding".

The presence of intelligence in any complex system, be it biological (man) or even engineering (well, oil field, oil pipelines, etc.), suggests the possibility and existence of independent regulation and optimization of multiple internal parameters of its work in relation to various and constantly changing conditions. or manifestations of the effects of the environment [3, p. eleven].

Hence the need for the introduction of the so-called "intelligent" technologies at the enterprises of the oil industry. They are necessary first of all in order to maximize the productivity of using the growing well stock, to reduce operating costs, as well as to speed up production and increase its volumes.

At the same time, the term "intellectual" technology in the oil field is understood as a system of automatic control of oil and gas production operations, which provides for continuous optimization of the integral model of the field, as well as models of efficient production management [4].

The most promising "intelligent" oil and gas technologies are robotics for drilling, observation and maintenance, low-temperature reservoir processing, underwater oil production, automated (unmanned) platforms and wireless systems.

The use of real-time production data allows oil and gas "digital" companies to achieve the following goals (see Table 2):

- expanding the resource base of the enterprise;
- increasing recovery rates and oil production;
- reducing the number of all types of emergency incidents (including leaks and emissions);
- increasing enterprise productivity and personnel security;

Improving operational activities in the field of production, transportation and processing of oil and gas, as well as at various drilling and oil refineries (both in stationary and field conditions) [3, p. 12].

Table 2 - *Advantages of "intelligent" technologies [3, p. 13].*

Indicators	Field Management Technologies		
	Traditional - automated (active management)	Digital (reactive control)	Intellectual (proactive control)
The increase in oil production,%	1,0	4,0	10,0
Increase in oil reserves, billion tons	5,0	10,0	15,0
The increase in oil recovery,%	1.0	5.0	10.0
Unit costs for automation,% of revenue or tons	0,5-1,0	1,0-2,0	2,0-4,0
Reduction of the specific cost of oil production,%	2,0	5,0	15,0
Labor productivity growth,%	1,0	5,0	10,0

The main indicators that determine the economic feasibility of all costs incurred in the development of oil fields, as well as the further implementation and subsequent operation of the "intellectual" technologies in the oil fields include: annual economic effect; profit increase; payback period of capital investments [5].

Network installation of industrial Internet, network expansion using wireless technologies, incl. the ability to support the built-in voice communication network via Internet protocols allows you to reduce employee downtime and, as a result, optimize operational costs. The wireless network established by Honeywell allows processing the traffic for monitoring the technological process and at the same time performing full video surveillance of the object [3, p. 14].

Thus, the basis of the fourth industrial (“digital”) revolution - the processes of digitalization of the economy lead to radical changes in entire industries. Given the nature of the changes and the positive economic effects provided by digitalization in the long term, we should expect the positive impact of digital innovations on the market value of oil and gas companies both abroad and in Russia.

References

1. Rudskaya E.N., Gurieva K.N. The Internet of Things: a new stage in the commercialization of the achievements of the technological revolution // Young Scientist. - № 25. - 2016. p. 365-371.

2. Leventsov V.A., Radaev A.E., Nikolaevsky N.N. Aspects of the concept "Industry 4.0" in the design of production processes // Scientific and technical statements SPbGPU. - № 1. - 2017. p. 19-30.

3. Tcharo Kh., Vorobyev A. Ye., Vorobyev K. A., Digitization of the oil industry: basic approaches and the rationale for "intellectual" technologies // Herald of Eurasian Science. - 2018 - № 2. 17 p.

4. Zhdanyuk A.B., Cherepovitsyn A.E. Evaluation of the possibility of using intellectual technologies by oil and gas companies // SPbPU Science Week: materials of a scientific conference with international participation. Institute of Industrial Management, Economics and Trade. Part 1. – SPb, 2017. p. 33–35.

5. Bahturin G.I., Logunov A.B., Mironov N.A. New production technologies: a view of experts in the scientific and technical sphere // Innovation and Expertise. - № 3. - 2016.

6. Ewing B.T., Thompson M.A. // The Energy Policy. - 2016. - No. 98. P. 576–581.

7. New Realities in Oil and Gas: Data Management and Analytics // White paper Cisco public. - 2017

伐木活动的会计模型
THE ACCOUNTING MODEL OF THE LOGGING ACTIVITIES

Ulyasheva Larisa Gennadjevna
Senior Lecturer
Syktyvkar State University named after Pitirim Sorokin

注解。 该研究的目的是建立一个记录活动的会计模型，该模型被整合到采矿业的发达国际会计方法中。 在理论和实证数据的分析，综合，系统化和分组的基础上，确定了具有国际和俄罗斯重要性的规范性文件现有规定的局限性，不允许向高用户提出自然管理的采矿过程。 质量。 该研究的结果是作者关于将测试操作应用于各种资源用于基本性能的建议，这使得能够形成测井的会计模型，以便为用户提供每个森林资源提取的可靠图像。 对应于客观经济现实的阶段。

关键词：采矿活动，采伐阶段，会计，IFRS，RAS。

Annotation. *The aim of the study is to develop an accounting model of logging activities that is integrated into the developed international accounting approaches to the mining industry. On the basis of analysis, synthesis, systematization and grouping of theoretical and empirical data, limitations of the existing provisions of the normative documents of international and Russian importance were identified, which did not allow to present the process of mining nature management to users with high quality. The result of the study was the author's proposals on the application of testing operations on the use of various resources for essential performance, which allowed to form an accounting model of logging for the purpose of providing users with a reliable picture of forest resource extraction at each stage corresponding to an objective economic reality.*

Keywords*: mining activities, logging stages, accounting, IFRS, RAS.*

The specifics of economic activities for the extraction of various natural resources have always led to the development for this type of business both at the international and national levels of individual accounting standards containing such requirements that would help mining companies to provide users with high-quality information taking into account industry specifics.

Currently, the issue of unification of accounting rules for the entire extractive sector of the global economy is of particular relevance. Creating a unified model of financial accounting for extractive activities is necessary to ensure transpar-

ency and comparability of data presented in financial statements, since the classic version of financial accounting, aimed at regulating the standard questions for all industries, does not allow to form and report in a report useful economic indicators production specifics.

However, all the ongoing international developments and discussions in this direction are associated only with mineral and oil and gas reserves, which are non-renewable. However, there are no developments for logging, which also belong to the extractive industries and are not so significant in comparison with the mining and oil and gas industry, but still are a no less important component of international capital markets. E.V. Morozova notes that the absence of indications of forest resources related to renewable, to a greater extent indicates not the exclusion of this resource from the field of accounting, but the lack of attention of developers to this type of natural resources [5].

However, extractive industries at the international level are recognized as industries "involved in the discovery, extraction and associated processing of natural resources located on or near the earth's crust". In accordance with this definition, logging activities are most definitely part of the extractive business of humankind. Therefore, it is quite obvious that the accounting representation of logging should correspond to the global approach to the schematization of mining activities. This requirement is determined not only by the affiliation of the logging industry to the extractive industry, which plays a huge role in the economy of the Russian Federation, but also by the connection of the domestic economy with world capital markets. This means that in the conditions of modern user requests to achieve a unified approach to correctly reflecting in accounting and reporting used in the extraction of resources, to improve the accuracy, reliability and comparability of the formed reporting indicators for the industry, the logging process technology must be correlated with international accounting approaches applied to mining process in general. This circumstance determined the purpose of the study - to develop an accounting model of logging activity that corresponds to the developed international accounting rules for the unification of accounting in all areas of the extractive industry.

It should be noted that the International Financial Reporting Standards contain so far only one standard disclosing the procedure for accounting for costs at mining companies - IFRS 6 "Exploration and evaluation of mineral reserves" [1]. But it is of an intermediate nature, since it is valid for the period until the completion of work related to the creation of detailed guidelines for reporting for the extractive industry under IFRS and concerns only the block that is associated with the exploration and evaluation of (E&E) mineral reserves.

This situation confirms that, because of their complexity and specificity, accounting and reporting issues in the extractive industries, as many researchers

have noted, of the mining process accounting problems, do not yet have a single comprehensive guide. Acceptable solutions are required to eliminate white spots in world-class standards. These issues were included in the work program by the IASB Committee as early as 1998, but so far they have not been finally settled. In particular, in 2010, the IASB as a result of the conducted research published the project "Extractive Activities", offering solutions to many specific industry problems aimed at improving the transparency and comparability of financial reporting indicators, but work on them is still ongoing.

However, for accounting purposes, IFRS recommends that IFRS should be divided into the following stages:

- pre-intelligence activities;
- exploration and assessment of natural resources (E & E);
- field development and resource extraction;
- deposit closure and restoration work.

However, as mentioned above, there is currently no common standard for the entire extractive sector in the global accounting space, which provides for a specific order of reflection of operations in selected stages. A special document regulating accounting in the forest industry and taking into account additionally the technological features of the logging process has also not been developed. This circumstance leads to the fact that all extractive enterprises to keep records and resolve emerging issues at all stages, except E & E, and presentation of them in the financial statements of the data are forced to be guided by common accounting standards that do not take into account industry or technological specifics. In the absence of suitable provisions, accounting options are developed independently. This diversity hinders, first of all, the achievement of comparability of indicators of the reporting of enterprises in this industry.

In addition, as O. Afanasyev draws attention, in practice the above "stages can follow each other, and can partially overlap" [4, p.38]. Indeed, the principle boundary between the pre-prospecting stage of work and the work on E & E is considered to be the license for exploration obtained after the pre-prospecting work was done. Or the proven and officially documented technical feasibility and commercial viability of extracting natural resources will be an important separator between E & E and the stage of extracting resources for properly reflecting costs in accounting and reporting. But the economic reality is such that sometimes work on E & E is carried out either before the designated date of their beginning, or after the end of the E & E, there is a need to supplement them - already in the process of production. In such circumstances, even the current standard IFRS 6 "Exploration and evaluation of mineral reserves" becomes "powerless." In spite of the fact that its developers indicated that it should only regulate the accounting of costs incurred in connection with E & E. This is the result of a simultaneous clear limi-

tation of its scope - from the moment the enterprise receives legal rights to carry out exploration in a certain area until the moment when the technical feasibility and commercial viability of mineral extraction became apparent. The practical application of this rule often violates the connection of the results of the measures taken with future economic benefits and, accordingly, misinforms users regarding the reliability of the economic indicators obtained. Therefore, in our opinion, for correct reflection in accounting and reporting of information on the carried out stages of the mining process and the volume of movement of resources of various nature that arose on them, it is necessary to test each operation for essential performance. This will contribute to the qualitative solution of the issue of allocating the cost of resources either to assets (including using the capitalization process) or to expenses (including allocation to ordinary and other types of activity).

Since the general requirement of IFRS is the identification and separate accounting of costs related to each stage of activity, a critical analysis is required of the procedure used in the Russian Federation for presenting logging activities in accounting and assessing the possibility of bringing it in line with the stages of natural resource extraction in international practice.

The Russian branch accounting standards for the entire forestry sector of the economy are the "Sector specific features of the costs included in the cost of production at the enterprises of the timber industry complex" approved by the Ministry of Economics of the Russian Federation on 10/19/1994. They are used together with the Methodological Guidelines calculation of the cost of production of the timber industry complex, approved by the Ministry of Economy of the Russian Federation on July 16, 1999. According to the specified documents [3], as expenses, the current accounting should reflect all the main works foreseen by the technology, which include:

- organizational logging, which is of a preparatory nature and recognized as expenses of future periods, - preparation of project documentation, organization of loading platforms for temporary storage and shipment of wood, construction of temporary roads, construction of temporary shelters for workers;

- Actually logging, consistently carried out in phases (cutting area, hauling, lower construction work), attributable to the full amount of the cost of the produced timber.

In addition to these documents on the regulation of sectoral accounting specifically in logging, currently in the Russian Federation there is ПБУ 24/2011 "Accounting for the costs of developing natural resources" [2], which expands the sectoral regulation of accounting in the extractive industries as a whole. It was adopted in 2011 following the release in 2004 of an international standard governing the accounting of the costs of exploration and evaluation of minerals. However, as well as a document of international importance, ПБУ 24/2011 concerns the

recognition and evaluation of only search costs, i.e. determines the procedure for recording the costs of extractive companies solely for exploration and appraisal work and does not concern other aspects of accounting.

Thus, it is obvious that the provisions of the current regulatory documents of international and Russian significance are limited and do not help uniformly represent the process of mining environmental management.

However, users need a clear and complete picture of the business associated with the procurement of natural resources to assess investment attractiveness and competitiveness.

In real economic reality, the process of logging begins with the choice of a forest area and the legal recognition of the right of commercial logging in a certain cutting area. If in international practice, pre-prospecting activities are recognized work performed prior to the acquisition of a license for exploration work, then in the logging it can be considered activities undertaken prior to the conclusion of a forest management contract in the form of logging. Since forest lease contracts are concluded based on the results of auctions that require preparation for participation in them, at this stage financial resources are used in the form of payment of extracts from the state forest registry, legal fees and consulting services related to the preparation of documents necessary to participate in Forest auction, the transfer of the deposit. International accounting practice prescribes the costs incurred at the pre-intelligence stage to include in current expenses as they arise, since the overall situation indicates that it is inappropriate to capitalize on these expenses due to the high degree of uncertainty in the mining operations in the future as a result of the measures taken. this stage.

The Russian accounting approach to pre-prospecting costs in logging fully complies with the principles of IFRS and those close to RAS, since accounting for the emerging movement of resources at the stage prior to entering into a forest management contract should be guided by the regulations of the general-purpose accounting documents. There are no special "sectoral" indications on this score either in Russian or in international practice. Therefore, all of the above costs, with the exception of the transfer of the deposit, are included in general business expenses and in the period of their occurrence are written off to reduce the financial result as expenses for ordinary activities.

Thus, at first glance, the disposal of resources at the pre-exploration stage of work of a logging organization does not lead to the creation or emergence of an equivalent resource that should be recognized as an asset. However, a more thorough study shows that such a document, such as, for example, an extract from the state forest registry, allows a qualitative and quantitative assessment of the forest plot put up for auction, to obtain an economic characteristic of the plantations on it, i.e. It helps to make a preliminary assessment of the natural resources (standing

timber) that are supposed to be developed. And these operations, in fact, relate to the area regulated by international financial reporting standard 6 "Exploration and evaluation of mineral reserves", which entered into force in the territory of the Russian Federation on February 9, 2016, and PBU 24/2011 "Accounting for the costs of natural resources "Used with reporting for 2012.

Despite the difference in names, both of these documents concern the regulation of financial accounting for only prospecting, evaluation and mineral exploration, although they operate in addition to this concept and the concept of natural resources, which, of course, include forests.

The second stage, namely E & E, according to E.V. Morozova, "in the form that is characteristic for the extraction of mineral resources, cannot be in logging" [p. 50]. Indeed, "in its pure form" at this stage should be carefully studied and assessed using geological and exploration work of a certain geographical area that has the potential to develop. With regard to the forest plot put up for auction, the feasibility and feasibility of logging is already evident from the outset, since there is no uncertainty about the availability of natural resources on its territory. The standing wood is located on the ground, information about forests is presented in the state forest registry, respectively, there is no need to organize special prospecting to assess the profitability of the future development of the forest area allocated for this. It is believed that these factors are sufficient and allow experts to draw appropriate conclusions. However, after concluding a lease agreement for the forest area at the preparatory organizational work stage, the logging company develops a document entitled "Forest development project", which technically and technologically specifies preliminary estimates of the forest area, obtained from an extract from the state forest registry.

This circumstance, identified on the basis of testing operations for the use of resources for their essential performance, suggests that at the junction of pre-prospecting work and work on the extraction of natural resources in logging there is an E & E stage. It represents an assessment of the forests allocated for logging, and leads to the formation of an asset of intangible nature - information, without which the technologically and ecologically correct development of the forest area is impossible.

Thus, the harmonization of the technology of the logging process as a direction of the extractive industry with international approaches, involving a breakdown of this process into certain stages, is possible only on the basis of taking into account the factor of specific environmental management. This factor is the lack of need for geological exploration due to the presence of natural resources on the surface of the earth. The accounting model of extractive activities associated with logging, in order to provide users with a reliable picture of the implementation of forest resource extraction at each of its stages, should have the following form:

Stage 1. Pre-intelligence activities (prior to the conclusion of a forest lease agreement for logging), with the exception of diverting financial resources to receive an extract from the state forest register.

Stage 2 Evaluation activity that allows you to create information about the forest area allocated for logging. Presented in part at stage 1 and work on the creation of the Forest Development Project at the stage of mining activities. It is subject to IFRS 6 and PBU 24/2011.

Stage 3 Mining activities, consisting of preparatory and main logging stages.

4 stage. Reforestation activities.

References

1. International Financial Reporting Standard (IFRS) 6 "Exploration and assessment of mineral reserves" (entered into force on the territory of the Russian Federation by the Order of the Ministry of Finance of the Russian Federation of 25.11.2011 N 160n).

2. Position accounting "Accounting for the cost of the development of natural resources" (PBU 24/2011) [Electronic resource]: order: [approved. RF Ministry of Finance 06.10.2011, № 125n] // ATP "Consultant Plus": Legislation.

3. Sectoral features of the composition of the costs included in the cost of production at the enterprises of the timber industry complex [Electronic resource]: [approved. 10.19.1994] together with the Methodological Recommendations (Instruction) for planning, accounting and calculating the cost of production of the timber industry complex [Electronic resource]: [approved. Ministry of Economics of the Russian Federation July 16, 1999] // ATP Consultant Plus: Legislation.

4. Afanasyev O. Features of the application of IFRS in the extractive industries // IFRS: practice of application. 2007. № 3 (9). Pp. 37-48.

5. Morozova E.V. The account of wildlife management in logging: the dissertation ... Candidate of Economic Sciences: 08.00.12; [Place of defense: St. Petersburg State University]. St. Petersburg, 2009. 164 p.

民法交易规则的心理方面
PSYCHOLOGICAL ASPECTS OF CIVIL LAW REGULATION OF TRANSACTIONS

Rodionov Leonid Aleksandrovich
PhD in Law
Associate Professor at the Department of Professional Disciplines at the Samara Law Institute of the Federal Penitentiary Service of Russia
Professor, Department of Civil Law and Process Samara Branch of Moscow City Pedagogical University
Ivanova Svetlana Vladimirovna
Candidate of Psychological Sciences
Associate Professor of the Department of Management and Information Technology Support of the Penal System of the Samara Law Institute of the Federal Penitentiary Service of Russia
Associate Professor of the Department of Psychology and Corrective Education MBOU ODPO "Center for the Development of Education" Samara

注解。 作者在交易结论，俄罗斯民法行为引起的财产和义务关系领域的民事法律关系主体心理关系的基础上强化了自己的立场。

关键词：交易，交易动机，当事人意志，意志作为心理概念，债务人的心理状态。

Annotation. *The authors reinforce their position with the basic foundations of the psychological relations of the subjects of civil legal relations in the field of property and obligation relations arising from the conclusion of transactions, actions of civil law of Russia.*

Keywords: *transaction, the motives of the transaction, the will of the parties, the will as a psychological concept, the psychological state of the debtor.*

Declaring a topic for research, the authors consider it expedient to refer to the Russian civil law meter, O.S. Ioffe, who emphasized that the transaction is a volitional legitimate act and these qualities are different from events and illegal actions. The willful nature of the transaction is due to the need to respond to legal

pressure. In this regard, the psychological component of transactions is a relationship of will and consciousness. However, it should be noted that according to S. S. Alekseev, the relationship of legal relations with the individual will in transactions is mediated by the state will that motivates the interests of citizens; and, on the one hand, not dependent on the will of individuals, on the other - formed by the volitional actions of individuals who are in certain relations with each other. There is an externalization of the will, due to which it takes the form of a will, becomes known to other participants in civil turnover and can give rise to legal consequences, contribute to the establishment, modification or termination of civil law relations, to which the deal is directed.

Thus, the basis of the transaction are motives (mental phenomenon, directly encouraging a person to choose one way or another way of action and its implementation). The motives of the transaction, on the presence of which its legal nature depends, are called the basis of the transaction (causa). The grounds are valid regardless of whether they were directly expressed in the transaction, except as required by law. Thus, the very basis of the transaction has a psychological foundation.

The transaction itself is an integration of volitional, with its inherent psychological characteristics, and legal acts and can be represented by the following algorithm:

1. The emergence of motivation for the transaction - the desire to make it (inner will). In the absence of a motive, it is impossible to assert that a transaction has occurred.

2. The will, that is, bringing the content of the internal will to the attention of the other party to the forthcoming contract, which, in turn, must correspond to the content of the internal will.

3. Coordination (agreement) of the internal will of both parties to the future contract and their unity with the will of the result of the transaction.

From the algorithm it is clear that the transaction process itself is also psychologized. This was proven in Soviet civil law science. Will, as a legal construction of the transaction, was viewed as a purely psychological concept. E. P. Ilyin believes that will is not so much an explanatory as a classification concept, which allows us to separate arbitrary (conscious, rational) actions from reflex (involuntary) reactions. A generalized concept denoting a certain class of mental phenomena, processes and actions, united by a single functional task - the conscious and deliberate control of human behavior and activity. Such activities include: self-determination (motivation), self-initiation and self-restraint, self-control, self-mobilization (attention) and self-stimulation.

Representatives of the regulatory approach in psychology shared the same opinion with respect to the content of the concept of “will”. Disclosing the con-

tent of the will, the authors regarded it as a free choice of action (L. Vygotsky); conscious level of regulation of its own activities (V. I. Selivanov); kind of special arbitrary control (E. P. Ilyin).

Thus, already at the level of inner will, the transaction process acquires a psychological character.

Psychologization of the transaction is also due to the types of will:

1) direct expression of will in oral or written form;

2) implicit will;

3) expression of will through silence in cases provided by law.

Direct willfulness requires the parties to the transaction well-developed communication and interactive skills; conclusive and through silence - the use of perceptual skills. That is, the result of the exteriorization of the internal will and its adequate perception by the other party to the contract directly depends on the three sides of communication (according to G. M. Andreeva).

The civil code of the Russian Federation recognizes by the agreement the agreement of two or several persons on the establishment, amendment or termination of civil rights and obligations. The rules on bilateral and multilateral transactions apply to treaties, as provided for in ch. 9 of the Civil Code, unless otherwise provided by the Civil Code. To the obligations arising from the contract, the general provisions on obligations (art. 307 - 419), unless otherwise provided by the rules of Sec. 27 "The concept and terms of the contract" and the rules on certain types of contracts contained in the Civil Code. Article 154 of the Civil Code directly refers to bilateral or multilateral transactions to the number of contracts (clause 1).

One cannot but agree with O. A. Krasavchikov, who noted that “every contract in its social and psychological nature (regardless of the number of its parties and participants) is an elementary or complex system of agreements of its parties. A contract is not a legal sum of unilateral wills, unilateral acts, unilateral transactions and, moreover, unilateral agreements."

The authors note that a mental state such as knowledge is legally significant in many institutions in civil law: "A person who knew or should have known about the grounds for the invalidity of a contested transaction, after the recognition of this transaction as invalid, is not valid." 167 of the Civil Code). The legislator applies the property of “wrongfulness” to the purpose of the transaction, and thus admits that the goals themselves can violate legal norms, which, therefore, can apply not only to the actions of a person, but also to his thoughts.

At the same time, when the legislator uses the terms "will", "intention", "understanding", "knowledge" and other similar expressions indicating psychological phenomena, he most often does not disclose any way to establish them, taking it for granted that the court initially has the opportunity to study them. At the level of normative civil law regulation, not only accounting, but also legal assessment

of mental phenomena is allowed. An example is the construction of an "illegal purpose" fixed in the first part of the Civil Code of the Russian Federation. So, according to paragraph 1 of Art. 10 of the Civil Code of the Russian Federation does not allow "the exercise of civil rights solely with the intent to cause harm to another person, actions to circumvent the law with an unlawful purpose, as well as other deliberately unfair exercise of civil rights (abuse of the right)."

Of particular note is the psychological aspect - the preservation of "peaceful" relations, the elimination of hostility between the parties - is indisputable, important for ordinary, interpersonal relations. World transactions concluded by citizens in the process of meeting their everyday needs, in most cases, are aimed at eliminating the dispute and precisely at reconciling the opponents. Thus, according to the German scientists Baur and Grunsky, the significance of a world deal is that in this case there are no winners and losers, and this fact becomes more important when the parties, for example, are neighbors, members of a society or a family, that is, they must live on together life. Is it possible to talk about such a psychological aspect, as reconciliation of the parties, in the relations of commercial turnover, which are significantly different from the "infinite variety of everyday relations" associated with the daily needs of citizens? It seems that there are no objective obstacles for replacing one of these concepts with others. The current procedural legislation does not accidentally provide for the procedure of the pre-trial order as a settlement agreement of the parties.

It is well known that the scope of commercial turnover differs significantly from the sphere of household relations, everyday, which are not specifically regulated by law. The specificity inherent in each of the designated areas of relations is seen when the parties make global transactions; the differences between these areas have a real reflection in the meaning of the committed global transactions.

The humanization of the norms of the Civil Code of the Russian Federation devotes a worthy place to good faith in the performance of obligations. It is appropriate here to reflect that, unlike good morals, conscientiousness reflects the psychological attitude of the obligated subject to the interests of the creditor and other interested parties to the transaction. As a rule, interpersonal relations, regulated by relevant moral and ethical standards, are at the heart of good faith. In this case, the person concerned violates obligations arising from the mutual agreement of the parties. In most cases, a person abuses personal trust relationships arising in the process of performance of a contractual obligation. As a general rule, a person is brought to various types of legal responsibility upon the application of the injured person (who suffered the corresponding losses). Thus, conscientiousness is manifested in the obligation of the debtor to be guided by the implied terms of civilian traffic and the corresponding moral concepts. In contrast to good morals, good faith reflects the psychological attitude of the obligated subject to the interests of the creditor and other interested parties to the transaction.

Thus, with regard to the nature of civil-law regulation of transactions, the dualism of this process can be noted. On the one hand, we note the psychological basis of the transaction, which is reflected both in the external behavior of a person and in his inner world. On the other hand, civil law regulation of transactions gives a legally significant character to will, intentions, knowledge, errors, etc. and, by means of state bodies, expands the range of possibilities (as compared with the capabilities of the parties to the transaction) to identify will, thoughts and intentions than the parties to the transactions themselves.

References

1. Davtyan A.G. German Civil Procedure Law. - Moscow: Gorodets-izdat, 2000. p. 159.

2. Ilyin E.P. Psychology of the will. SPb., 2009. p. 55, 63.

3. Ioffe O.S. Legal Relationship on Soviet Civil Law // Selected Works on Civil Law. Moscow, 2003. p. 575;

4. Krasavchikov O.A. Civil law contract: concept, content and functions // Civil law contract and its functions: Interun. Sat scientific tr. Sverdlovsk: Ural worker, 1980. p. 7

5. Novoselova L.A. Transactions assignment of rights (claims) in commercial practice. Factoring Moscow: Statute, 2003

6. Petrov A.Yu. The civil legal significance of the will and the expression of the will in the transaction // Social and Human Sciences. p. 180.

关于哈萨克斯坦无期徒刑执行处罚顺序的几个问题

SOME QUESTIONS OF THE ORDER OF EXECUTION PENALTY OF LIFE INPRISONMENT IN KAZAKHSTAN SOME QUESTIONS OF THE ORDER OF EXECUTION PENALTY OF LIFE INPRISONMENT IN KAZAKHSTAN

Kulbayeva Maiya Muratovna
Master of Law
Caspian State University of Technology and Engineering named after Sh. Esenov., Aktau, Kazakhstan

抽象。 在这篇文章中，作者揭示了哈萨克斯坦共和国有关终身监禁的一些问题。
关键词：惩罚，终身监禁，执行殖民地，刑事执法立法。

Abstract. *In this article, the author reveals some problems concerning undergoing life imprisonment in the Republic of Kazakhstan.*

Keywords: *punishment, life imprisonment, execution colonies, penal enforcement legislation.*

According the Decree of the President of the Republic of Kazakhstan "On Introduction of the moratorium on the death penalty in the Republic of Kazakhstan" of 17 December 2003 in order to further humanization of the criminal policy of the state and in accordance with paragraph 1 of Article 15 and paragraph 2 of Article 40 of the Constitution of the country a moratorium on executions of death sentences has been introduced until the question of its complete abolition is solved» [1].

The use of life imprisonment as an alternative to the death penalty for the most serious offenses against human life is provided by paragraph 4 of Article 48 of the Criminal Code of the Republic of Kazakhstan. This type of punishment is found in all the sanctions of offenses for which penalty to death may be sentenced and it is appointed by the court as well as by the way of pardon. Life imprisonment is not imposed on women, as well as the persons who committed crimes before the age of 18, and men who have reached the age of 65 by the time of sentencing » [2].

Procedure and conditions for the execution of life imprisonment in Kazakhstan are regulated by the Penal Code of the Republic of Kazakhstan dated December 13, 1997, which came into force from January 1, 1998

In accordance with Part 3 Article 68 of the Penal Code of the Republic of

Kazakhstan persons sentenced to life imprisonment, whose punishment to a death penalty was commuted to life imprisonment for way of pardon, are sent to serve their sentences in correctional institutions of special regime at the location»[3].

In 2003, the local site to house convicted to life imprisonment was set up in the country. In this regard, in Kostanai region two dormitories were refitted for cell-type rooms with accommodation for four convicts in one chamber. This local site is equipped with the latest video observations equipment, and engineering and technical means of protection.

The people, against whom the sentence of death entered into force before the moratorium or during the moratorium on the death penalty, are held in prisons (Part 8 of Art 69 of PEC RK).

Conditions of serving imprisonment in the penal colonies of special regime for prisoners sentenced to life imprisonment shall be governed by Art 123 of REC RK, according to which people sentenced to life imprisonment are placed in chambers, as a rule, no more than two people in one chamber. At the request of prisoners, and in other necessary cases, on the decision of the correctional colony chief, in the event of threats to the personal safety of prisoners, they can be kept in single cells. The labor of such prisoners is organized taking into account safety regulations in which convicts are kept in their cells.

The colonies of the country today, do not meet the security requirements for this category of convicts. Standards of living space in colonies of special regime are - 2 square meters, as in any other correctional colony for men. Applied to the chamber system, in double cells, such norm is clearly low, and will not comply with the standards of physiology and hygiene.

At present the colony of special regime for sentenced to life imprisonment is under construction in Pavlodar region. 350 million tenge were allocated by the Government of the Republic of Kazakhstan for the design and construction work of this establishment and completion of the colony construction is planned for 2009. Taking into account the danger to the society condemned by this category colony, it will be equipped with modern engineering and technical systems of security and surveillance»[4]. Certainly, the construction of the colony for the "lifers" requires considerable investment and accommodations for sentenced to life imprisonment in existing colonies of special regime are associated with some risk, because these are highly dangerous criminals posing a real threat to the lives of colony staff and other prisoners.

In correctional colonies of special regime persons sentenced to life imprisonment may be kept on normal, strict and relaxed conditions (Part 2 of Art.82 PEC RK).

On arrival at the colony of special regime people sentenced to life imprisonment are placed in strict conditions of imprisonment. Transfer from strict conditions into normal conditions of punishment can be done after serving at least ten

years under strict conditions and in the absence of penalties for violation of the order of punishment, and into relaxed conditions after having served not less than ten years under normal conditions in the absence of penalties for violation of the order and conscientious attitude to work.

Convicted recognized as violators of the established order sentence and serving sentences in normal and relaxed conditions are transferred into the strict conditions of imprisonment. Retransfer into the normal or relaxed serving is made according to the general procedure established for this category of prisoners.

Transfer of convicted persons from one setting to another for the above reasons by decision is made by the commission of an institution in which local authorities may participate. The commission of correctional institution also decides the question of transfer the convicted prisoners from the general form into the strict regime and from strict into the general one (part 4 of Art.82 of PEC RK).

Material and social provision of people sentenced to imprisonment, including life imprisonment, regulated st.95 PEC Kazakhstan, under which prisoners are provided with individual beds and bedding. They are provided with clothes, underwear and shoes for the season due to climatic conditions. In this case convicted to life imprisonment are prohibited to violate the dress code. Nutritional standards and material and social provision norms for prisoners are set by the Government.

Convicts serving sentences under strict conditions are eligible for two short visits, one parcel (or transfer) and one packet. They can only spend the money earned while serving their sentences, and received as pensions and social benefits for food and other basic necessities. As for the invalids of the first and second groups, as well as inmates of medical prison, they can buy food and other essential items for the funds deposited in their personal accounts.

Normally prisoners get the right to have two short and two long visits, to receive within three parcels (handovers) and the book posts. They can spend money on food and basic necessities from their personal accounts in the amount of two monthly estimates each month. Upon transfer to relaxed prison conditions they have the right to have three short and three long visits, four parcels (handovers) and four book posts, as well as the expenditure of money available in their personal accounts in the amount of five MCI.

Food, including tea, and other essential items are purchased by prison staff for persons sentenced to life imprisonment on their application and are paid by bank transfer in the stores located in the institution. Purchased goods are handed to convicts under signature on the application.

Short visits with relatives or other persons in the presence of the management of the institution which are provided to convicts last from two to four hours, long ones are held in the prison and last from one to three days, and the prisoner has the right to live together with his spouse, close relatives (parents, children, adoptive

parents, adopted children, brothers, sisters, grandfather, grandmother, grandchildren). Convicts have the right to meet lawyers on their application to get legal assistance, at the request of both parties private meetings are granted in a specially equipped room.

Apparently parcel norms governing by the terms of punishment in the institutions executing a life sentence, are not entirely justified. For example, according to part 3, article. 121 PEC RK people sentenced to life imprisonment, under strict conditions of punishment, may buy food and other essential items only on money earned while serving the prison. In this case, the use of identical conditions of punishment to lifers and especially dangerous recidivists is not entirely justified. It should be noted that, at first, the sentencing to life imprisonment does not always take place in the case of recidivism; secondly, to organize labor of convicts of this category serving their sentence in prison under strict conditions in cell-type rooms is practically impossible. Therefore, sentenced to life imprisonment can not afford to buy any clothes, no toiletries, no cigarettes, etc. for ten years. Only one parcel or book post is allowed per year, the weight of which parcel is limited to eight kilograms in accordance with the post rules. Long visits during ten years are not provided. As a result, quite naturally raises the question of such a harsh punishment practicability when convicted persons can not diversify their food, buy clothes and toiletries for ten years.

For this purpose, it seems to be appropriate to provide life prisoners the possibility of transfer from strict into general or relaxed serving the sentence after five years and permit them to purchase convict food and other essential items for the funds available on his personal account after one year serving punishment under strict conditions»[5].

In accordance with Part 2 of Art 123 of the PEC RK sentenced to life imprisonment are entitled to a daily walk for half an hour. In this cell basis walks are held in the afternoon on specially equipped outdoor parts of the prison. With good behavior of the convicted person and subject to availability the walk can be extended to two hours. In the case of a convicted person violates the established internal regulations walk can be terminated ahead of time.

In accordance with Art. 85 PEC RK sentenced to life in prison have the right to communicate in writing, sending and receiving money transfers. So, sending and receiving letters and telegrams at their own expense is carried without limitation of their number, with any correspondence is censored. Receiving and sending money transfers are permitted to spouse, close relatives, and with permission of administration - to other persons.

Persons sentenced to life imprisonment may be permitted to have a telephone conversation only in exceptional personal circumstances, and the telephone conversations of the prisoners are controlled by prison staff (Part 3 Art 85 PEC RK).

In accordance with Article 94 of the PEC RK persons sentenced to imprisonment, who are employed, are subject to compulsory social insurance, in addition, they are entitled to social pension under the current legislation of Kazakhstan.

People convicted serving a life sentence may, conditional early release may be applied (Article 70 of the Criminal Code), subject to actual completion of a minimum of 25 years in prison and the absence of malicious violations within the preceding three years (Part 1 of Art. 170 PEC RK). This requires a court decision on that a person does not need to continue serving this kind of punishment. If the sentenced person while serving a life sentence committed a new serious or especially serious crime, then he is not applied to the conditional early release (part 2, p.170 PEC RK). Thus, the conditions of this category of prisoners are quite severe. However, they suggest the creation of certain social prospects of improving conditions in depending on the behavior of the convicted person and encourage the formation of his law-abiding behavior.

If the court refuses to provide conditional release of the convicted, resubmission is allowed only in three years from the date of the court refusing decision (part 3 of article 170 of the PEC RK). persons to whom a sentence of death commuted to life imprisonment by way of pardon are not subject to conditional early release (part 70 Art.8 of the PEC RK).

In conclusion, we indicate the main directions of improving the effectiveness of execution of the life imprisonment penalty. First of all, it is associated with the improvement of the legal framework. It seems necessary to make changes to the criminal and penal laws of Kazakhstan for further differentiation of conditions of serving life imprisonment (review of the life imprisonment sentence and transfer prisoners to other regimes, lowering limit of served period for the early release). Specialized correctional institutions – prisons with a special regime for the detention of persons sentenced to life imprisonment are created in Kazakhstan.

The development of institutional and scientific and methodological support of institutions executing a life sentence is required, the improvement of social, educational and psychological work with prisoners serving life sentences should de done in the direction of individualization and intensifying the correctional process. In this regard, organizing of a special training of institutions executing a life sentence is needed, the improvement of social protection of their staff is required, a system of social and psychological rehabilitation staff should be created.

References

1. Law of the Republic of Kazakhstan "On amendments and additions to some legislative acts of the Republic of Kazakhstan on the fight against crime" from 05.05.2000, the / / Kazakhstan Pravda, 2000 May 12.

2. The Criminal Code of the Republic of Kazakhstan (as amended as of 30.12.2005.) - A.: Baspa, 2006. - P.224.

3. Criminal Code of the Republic of Kazakhstan (as amended as of 03.07.2014, the)-A.: Lawyer, 2017. -P.84.

4. Golyshkin B. Jail for inmates for life / / Legal newspaper, 9 November 2005.

5. Posmakov P.N. The introduction of life imprisonment - practical steps and perspectives. / / Proceedings of the international scientific - practical conference "Life imprisonment: international standards and practices." - Almaty, 2003. - P.33.

外国关于违反劳动保护要求责任的刑事立法
CRIMINAL LEGISLATION OF FOREIGN STATES REGARDING RESPONSIBILITY FOR VIOLATION OF LABOR PROTECTION REQUIREMENTS

Kulbayeva Maiya Muratovna
Master of Law
Caspian State University of Technology and Engineering named after Sh. Esenov., Aktau, Kazakhstan

抽象。 本文分析了国外关于违反劳动保护要求的刑事责任问题的刑事立法
关键词：劳动保护，刑法，劳动法，雇主，工人。
Abstract. *In this article the author analyzes the criminal legislation of foreign countries concerning the issues of criminal liability for violation of labor protection requirements*
Keywords: *labour protection, criminal law, labour code, employer, worker.*

In many states, the issue of labor protection has been and remains relevant. In the modern period, most countries of the world proclaimed labor protection policy at the legislative level. At criminal codes of various countries, there are provided rules aimed at the protection of public relations and in the field of civil law to safe working conditions. These rules have both similarities and significant differences depending on the legal system of a particular country, by state political system, membership in a particular legal family, regional location of the state, sources of law, historical development of criminal law protection of citizen's rights, the rulemaking process and the implementation of legislation of a particular state. In this connection, with which the similarities and differences in criminal law on labor protection in different countries cause a certain interest in the study and use of experience in the future. A selective comparative analysis of criminal law in this area seems to be justified in the context of this article since the criminal legislation of the studied states differs significantly from each other according to numerous criteria. To structure comparative analysis, it is necessary to divide the selected states into groups based on the belonging to their legal systems and to larger groups - legal families.

The legal systems of individual groups of states are built on similar grounds, such as cultural identity, the confession of one religion, the geographical proximity

of countries, common sources of law, its structure and historical path of formation. In fact, this is the foundation and justification for the separation of types of legal families.

The "classical" typology of legal families was proposed by René David, who included in the definition of this concept a set of legal principles, institutions and norms, legal doctrine and the dominant ideology in a particular state in a certain period of time [1, p.81].

Therefore, with regard to criminal liability for criminal violation of labor protection requirements under the laws of the countries of the Romano-Germanic legal system, first of all, we should mention the generalized group of countries of the participants of the former Union State, which are now in the Commonwealth of Independent States. The disposition of norms in the criminal codes of these states is for the most part similar to art. 156 of the Criminal Code of the Republic of Kazakhstan, but there are a number of differences that are worth paying attention as well.

The similarity in design of the criminal law to protect the right of citizens to safe working conditions, due to the long period of stay within the single legal system of the Soviet state. During this period, a single legal unit was developed, including a community of legal institutions. In the modern period between our countries, close cooperation and interaction in the fight against crime continue.

In the Republic of Belarus Art. 306 of the Criminal Code, in the Republic of Uzbekistan Art. 257 otherwise determines the totality of social relations, to protect which the labor protection standard is directed. Here the legislator defines the patrimonial object not the constitutional rights and freedoms of a person and a citizen, but the state of public safety (Article 306 "Violation of labor protection rules" is located in Chapter 27 "Crimes against public safety" of the Criminal Code of the Republic of Belarus, and article 257 of the Criminal Code of Uzbekistan). section 6 "Crimes against public security and public order"). In addition, the socially dangerous consequence of Part 1 of Art. 306 of the Criminal Code of the Republic of Belarus is such an alternative feature as "occupational disease". The problem of the object of criminal law protection, it must be said, goes back to the Soviet science of criminal law. So, M.S. Greenberg argued that the isolation and limited size of the enterprises of the era of the first scientific and technical revolution, low power machines, etc. determined the situation in which the risk due to the use of equipment was carried only by those who were directly connected with it, in the modern enterprise, which employs thousands and tens of thousands of people, some of whom are not connected with the direct maintenance of equipment, the problem of labor protection is naturally reduced in the problem of public security [2, art.37].

The Ukrainian legislator went even further, highlighting the independent section X «Злочини проти безпеки виробництва» ("Crimes against production safety"), which opens with article 271 "Violation of legislation on the protection of labor" ("Violation of the requirements of legislation on labor protection"). In

this section, the Ukrainian legislator, in addition to an article with general rules on liability for violations in the field of labor protection, placed four more articles: violation of safety rules when performing work with increased danger; violation of safety rules in explosive enterprises or in explosive workshops; violation of nuclear or radiation safety regulations; violation of the rules relating to the safe use of industrial products or the safe operation of buildings and structures [3].
In our opinion, the absence of an indication of the reckless form of guilt in criminal laws suggests that the legislators of these countries proceed from the duty of a special subject to anticipate the consequences of their behavior when constructing a crime, which is due to the method of legislative description of this crime.

From the point of view of the Kazakhstan legislator, firstly, taking into account the provisions of Part 2 of Art. 24 of the Penal Code of the Republic of Kazakhstan, indicating negligence in relation to socially dangerous consequences, allows solving qualifying questions of delimitation of crimes (intending to cause socially dangerous consequences as a result of a conscious violation of labor protection rules, such encroachment is qualified as a crime against a person). Secondly, in relation to article 156 of the Penal Code of the Republic of Kazakhstan, the legislator established reckless guilt in a crime with material composition, and means that a person can consciously violate labor protection requirements, but unlike article 140 of the Criminal Code of the Kazakh SSR, criminal liability under this article occurs only when negligently cause grievous bodily harm or death. In cases of violation of state regulatory labor protection requirements contained in the laws of the Republic of Kazakhstan and other regulatory legal acts of the Republic of Kazakhstan, which did not result in the specified consequences, responsibility shall be incurred under Art. 57 of the Code of the Republic of Kazakhstan on Administrative Offenses (CAO).

In many criminal codes of the CIS member states, the disposition of the articles provides for a qualifying attribute, which establishes increased responsibility for causing harm to health or death to two or more persons through negligence. In Art. 156 of the Criminal Code of the Republic of Kazakhstan such a qualifying sign ("entailed by negligence the death of two or more persons"). However, such a decision can hardly be agreed. In our opinion, increasing responsibility for the number of victims of this crime does not alter the fact that the act itself primarily infringes on the social and labor rights of citizens enshrined in the Constitution (the main functional purpose of article 156 of the Criminal Code of the Republic of Kazakhstan. Based on the principle of justice .6 of the Criminal Code of the Republic of Kazakhstan), it does not seem appropriate to increase responsibility for the occurrence of more serious consequences that are not covered by the intent of the perpetrator (careless attitude of the person in this case to the socially dangerous consequences), since it generally does not want the onset of any socially

dangerous consequences. The introduction of such a qualifying attribute plays an unnecessarily repressive role and does not bear the preventive burden.

It is also noteworthy that the criminal legislation of the Republic of Kazakhstan (article 156 of the Criminal Code of the Republic of Kazakhstan 2014) turned out to be conservative, retaining the provisions of the Criminal Code of the KSSR (Criminal Code of the Kazakh Soviet Socialist Republic): “Part 1 Violation of safety regulations, industrial sanitation or other labor protection rules committed by a person who was responsible for organizing or enforcing these rules, resulting in negligence in causing moderate harm to health. " As can be seen, in the disposition of the article of the Kazakh Criminal Code there is a definition of the type of rules in violation of labor protection - “industrial sanitation”, and in the Criminal Code of the RK, there is no reference to such norms. In our opinion, the reference to this type of rules unnecessarily overloads the article.

On the other hand, in our opinion, the Criminal Code of the Republic of Kazakhstan has correctly revised the decriminalization of injury to moderate health. This harm is very serious for a person. Responsibility for causing these consequences should be provided for precisely in criminal law. Another technical and legal method attracts attention: if under art. 156 of the Criminal Code of the Republic of Kazakhstan is a person who is charged with compliance with labor protection requirements, then under Art. 156 of the Criminal Code of the Republic of Kazakhstan, the person had to fulfill obligations to organize or ensure compliance with these rules. In our opinion, the content of the disposition of art. 156 of the Criminal Code of the Republic of Kazakhstan more correctly reflects the essence of the duty imposed on a person. In accordance with Art. 21 of the Labor Code of the Russian Federation, an employee is obliged to comply with labor protection and occupational safety requirements [4].

This suggests an involuntary conclusion about the possibility of recognizing an ordinary worker as the subject of this crime.

In the conclusion of the review of the criminal norms of the CIS countries, it is necessary to mention the Model Criminal Code for the States members of the Commonwealth of Independent States. This document is proposed by Art. 160, consisting of three parts. Part 1 of this criminal law regulates responsibility for violation of labor laws, responsible for their compliance. Socially dangerous consequences for this part are the infliction of serious or moderate bodily injury or occupational disease.

Differentiation of criminal responsibility is carried out according to the signs: “which entailed the death or grave harm of several persons” (Part 2) and “entailed by negligence the death of two or more persons” (Part 3) [5].

The criminal legislation of some countries of the Romano-Germanic legal system does not at all contain norms similar to article 156 of the Criminal Code of the Republic of Kazakhstan. These are mainly continental European countries:

Denmark, Belgium, Sweden, Germany, France. This means that legislators do not distinguish between injury to health or death due to non-compliance with the precautionary rules in everyday life and the same consequences caused by the violation of workplace safety requirements. The laws of these countries in the sections (chapters) on crimes against life and health contain a general rule governing liability for the careless infliction of death or injury.

An analysis of the criminal law of foreign countries on countering labor law violations would not be complete without recourse to the Anglo-Saxon legal family (the Anglo-American legal system). As is known, at its core, this legal family unites the UK and its former colonies, which include the United States of America (USA) and the countries of the Commonwealth of Nations. The situation in the United States is most indicative in this respect.

Protecting the right to work in safety and health in the United States is carried out by the United States Occupational Safety and Health Administration (US Department of Occupational Safety and Health).

As for Japan, over the centuries, written (codified) law in this country has only nominally played the role of a regulator of social relations. In Japan, free from the influence of Western civilization, for many centuries the very idea of law, as a regulator of social relations, was transformed into a set of norms governing the relationship of individuals in all spheres of life. This complex of unwritten norms is called weights. Giri replaced the right, and, according to some Japanese, and morality. They were automatically respected not so much because they corresponded to a certain concept of morality, but because of the fear of condemnation from society in the event of disobeying the weights. For the Japanese, it was considered shameful not to perform any weights. The code of honor, bearing the character of custom, defined behavior. In the future, the legal system of Japan changed many times, absorbing the features of other legal systems, but so far the role of “weights” is great in Japanese society, and the regulator of citizens' law-abiding behavior in most cases is a shame. According to many researchers, this circumstance explains the low crime in Japan.

References

1. David R. Basic legal systems of our time. Comparative right. - Moscow: Progress, 2007. - 243 p.

2. Grinberg M.S. Technical crimes. - Novosibirsk, 2012. - 127 p.

3. Criminal Code of Ukraine. - Kiev, 2012. - 361 p.

4. Labor Code of the Russian Federation. - Moscow, 2015. -347 p.

5. Model Criminal Code for the States - participants of the Commonwealth of Independent States // http://docs.cntd.ru/document.

教学游戏作为一种提高年龄较小学生认知活动的方法
DIDACTIC GAME AS A WAY TO ENHANCE THE COGNITIVE ACTIVITY OF YOUNGER SCHOOLCHILDREN

Bystrova Alena Igorevna
Master
Moscow City Pedagogical University

注解。 选择最有效的教学方法和技术的问题一直在教育学中发挥着重要作用。 目前，这个问题备受关注。 对科学文献的分析表明，许多教学和心理学研究都致力于研究这一问题。 学习过程中的现代综合性学校解决了为年轻一代做好准备等重要任务：积极的生活，参与科学，技术和社会过程。 反过来，教育活动的有效性直接取决于学生在课程中，整个教育过程中的活动水平。

关键词：教学游戏，计算技能，成就，数学文化

Annotation*. The problem of choosing the most effective method and technique of teaching has always played an important role in pedagogy. Currently, this issue has received much attention. The analysis of scientific literature showed that a lot of pedagogical and psychological research is devoted to the study of this problem. A modern comprehensive school in the learning process solves such important tasks as preparing the younger generation: for an active life, for participation in the scientific, technical and social process. In its turn, the effectiveness of educational activities directly depends on the level of students' activity in the lesson, in the educational process as a whole.*

Keywords:*: didactic game, computational skills, attainments, mathematical culture*

In elementary school, at the first stage of general school education, basic general educational knowledge, skills and abilities of educational activity are formed, as well as emotionality, activity, the need for communication. Schoolchildren's mastery of knowledge and skills is carried out in the learning process under the guidance of a teacher, during which schoolchildren develop cognitive interest in the content of educational material and form the basic thinking processes: comparison, analysis, reasoning, arbitrariness of behavior, ability to further master learning knowledge.

One of the most effective ways to enhance the cognitive activity of younger students, the awakening of lively interest in the school subject is a didactic game. Therefore, the problem of using didactic games in mathematics lessons in elementary school is relevant.

In our work, we proceed from the fact that the result of increasing the efficiency of the formation of computational skills are didactic games in mathematics lessons.

Object of research: didactic game in the process of learning mathematics in elementary school.

Subject of research: the process of improving the computational skills of younger students by means of didactic games.

Theoretical analysis of the research problem allowed to form the following **hypothesis**: the improvement of computational skills of younger students by means of the didactic game will be more effective when implementing the following pedagogical conditions:

- selection of a complex of didactic games and their systematic conduct in the classroom;
- selection of game content and strict adherence to the stages of the game.

The formation of computational skills and abilities is a complex and rather long process, the effectiveness of which largely depends on the individual characteristics of the student, the level of his training and the ways of organizing computational activities.

The game is the most accessible activity for children. Knowledge gained by schoolchildren from the environment is processed by them through the game. In the game, features of personal qualities of a child, his thinking, imagination, memory, attention are actively manifested. In games, children learn to solve play problems on their own, find the best method for implementing the plan, use their knowledge, and express them in speech in everyday life. However, this does not mean that classes should always be held in a playful way. The game is just one of the methods of increasing cognitive activity. The use of the didactic game in the classroom must be justified and thought out [3].

Let us give an example of a fragment of one of the lessons “Journey to the Country of Mathematics”.

Exercise 1.

Stop "Savvy"

1. Write down all two-digit numbers in which the number of tens is 3 times more than the number of units.

2. Scrooge MacDuck has gold coins apparently invisible. One crow got into the habit of dragging them. Fly, grab one coin - and into his nest. Crow flew 5 times. How many coins did she take off?

3. Pinocchio dreamed that out of five of his gold coins grew on a tree, and on each tree 4 new gold coins. When he woke up, he saw that all his money was stolen. How many coins was Buratino richer in a dream than in reality?

Task 2.

Stop "Mathematical fishing" at the blue sea

Here we are on the shore of the blue sea. A goldfish with its girlfriends came to visit us and offered to play a game. Look at the drawing.

1. Which fisherman caught more fish?

It is necessary to paint the bait of every fisherman and fish that he caught in the same color.

2. It is required to catch a small fish, on the reverse side of which an example is written. The fish are placed in the "sea". The teacher invites the children one by one to the blackboard, they “catch” the fish with a fishing rod with a magnet, read an example, decide, call their answer. All students find the correct answer and show the number card to the teacher.

Task 3.

Stop "Flower - Seven-color"

A kind old woman from the tale "Flower - Seven-color" sent us her magic flower. Now we have become wizards and will fulfill the wishes of our comrades.

Whoever breaks the petal and performs the task correctly, has the right to three wishes that the wizards will fulfill. But these desires are mathematical.

The student goes to the command of the teacher, breaks the petal, correctly answers and asks his three questions to the class.

The result of the game: those whose wishes were fulfilled won.

Tasks on the petals:

1st card: Read examples and count

14 - 7 + 8

12 - 8 + 9

13 - 5 + 6

2nd card: Solve a logical puzzle

Three little hares were afraid of the wolf. How many ears are there trembling near the old tree?

3rd card: Compare expressions:

6 + 8 ... 12 - 4

0 + 7 ... 11 – 3

Stop "Circular Examples"

The peculiarity of these examples is that the answer of the 1st example is the beginning of the 2nd example, the answer of the 2nd example is the beginning of the 3rd example, etc.

As observations of the teaching of children show, the use of entertaining material in mathematics lessons activates the thinking process, increases speed, flexibility of thinking, develops cognitive activity, observation, attention, memory, and maintains interest in the material being studied. A mathematical culture is formed, the ability to solve extraordinary tasks, a sense of humor develops. This is due to the fact that in the process of conducting games, many tasks require not only mental but also volitional efforts from children - organization, endurance, ability to observe the rules of the game, subordinate their interests to the interests of the team.

In confirmation, I would like to cite the words of V.A. Sukhomlinsky:

"Without a game, there can be no full-fledged mental development. A game is a huge bright window through which a life-giving stream of ideas and concepts flows into the spiritual world of a child. The game is a spark that ignites the light of inquisitiveness and curiosity. "

The teacher must skillfully and methodically correctly use active methods and means of learning, organizing the computational activities of younger students. In preparation for the lesson, the teacher must carefully consider the distribution of didactic games at different stages of the lesson. At the very beginning of a lesson, didactic games can be conducted to organize and stimulate the activity of students, in the middle of a lesson - to master a new topic. At the end of a lesson, didactic games usually have a search character. At each stage of the lesson, didactic games should be interesting, diverse. They must include students in different activities and have many options for graduation.

In conclusion, I would like to quote the words of the famous psychologist Elkonin D.B.: "No other type of human activity forms such a powerful "pedagogical field" as a game".

References

1. Arginskaya I.I. Methodical features of the formation of computational skills and abilities // Pedagogical University. "The first of September" - 2005. - № 22.

2. Asmolov A.G. Systematically active approach to the development of standards for the new generation of the GEF. Publications. 2010

3. Bobrovskaya T.P. Mathematics lesson in the system of developmental education // Elementary School. - 2010. - No. 12. P.25.

4. Danchenko T. Gaming technology in elementary school // Teacher. - 2007. - № 5.

6. Episheva OB Teaching schoolchildren to study mathematics: the formation of methods of learning activity: a book for a teacher. - Moscow: Enlightenment, 2010. P. 152.

7. Erofeeva T.N. Education and development of younger students. - Moscow, 2010. P. 304.

技术大学学业成绩评估的点评系统
POINT-RATING SYSTEM OF ACADEMIC PERFORMANCE ASSESSING IN A TECHNICAL UNIVERSITY

Prakhova Marina Yuryevna
Associate Professor
Zaichenko Nadezhda Viktorovna
Candidate of Technical Sciences, Associate Professor
Svetlakova Svetlana Valeryevna
Candidate of Technical Sciences, Associate Professor
Ufa State Petroleum Technological University

注解。在整个学习过程中，对学生接受的高等教育质量的评估是教育过程中非常重要的组成部分。该评估是一个不可或缺的指标，不仅表征了特定学生的进步，而且间接表征了教育过程的组织水平和某些学科的教学。

本文讨论了评估教育质量的系统之一 – 点评系统（PRS）。在俄罗斯高等教育机构中使用这一系统最近才开始，并且经常给学生和教师带来某些问题。本文的目的是分析这些问题，并为高等技术导向教育机构制定PRS概念。对该领域工作的审查揭示了不能充分利用减贫战略的所有优势的主要原因，有时甚至使其失去信誉。

在乌法州立石油技术大学测试的文章中提出的PRS的概念允许作者认为充分利用PRS的积极方面并平衡其缺点。这一概念提高了教育过程的效率，并为教育过程中的所有参与者 – 学生，教师和潜在雇主 – 提供了福利。

关键词：点评制度，能力形成评估，学科发展评估。

Annotation. *The assessment of the quality of a higher education received by a student is a very important component of the educational process throughout the course of study. This assessment is an integral indicator characterizing not only the progress of a particular student, but also indirectly the level of organization of the educational process and the teaching of certain disciplines.*

The article discusses one of the systems for assessing the quality of education - the point-rating system (PRS). The use of this system in Russian higher educational institutions began relatively recently and often creates certain problems for both students and teachers. The purpose of the article is to analyze these problems and develop the concept of PRS for higher educational institutions of technical orientation. The review of work in this area has revealed the main reasons that do not allow to fully use all the advantages of the PRS, and sometimes even discredit it.

The concept of the PRS proposed in the article, tested in the Ufa State Oil Technical University, allows, in the opinion of the authors, to fully use the positive aspects of the PRS and level its shortcomings. This concept increases the efficiency of the educational process and provides benefits to all participants in the educational process - a student, a teacher and a potential employer.

***Keywords**: point-rating system, assessment of the formation of competencies, assessment of the development of the discipline.*

The problem of an objective assessment of students' knowledge exists as much as the education system itself exists. In the Soviet and then in Russian education, including higher education, for a long time, the only system for assessing academic progress was used and continues to be used, in which the student's knowledge is assessed by marks on a 5-point scale: from 1 (the worst result) to 5 (the best result). In higher education institutions, the number of possible options for assessment is even smaller - only four ("Unsatisfactory", "Satisfactory", "Good" and "Excellent").

At the same time, any teacher and student knows how different levels of mastering a discipline can be, evaluated by the same mark. Thus, the range covered by the troika starts from the well-known principle of "three sets, two in mind" and ends with the almost full four, to which a little something was not enough.

Another disadvantage of the traditional assessment system (very significant) is the assessment of only the final result of mastering the discipline. At the same time, a good mark can be the result of elementary luck at the exam, the skillful use of conservative cribs or modern wireless technologies, etc. A large amount of information in almost all disciplines is impossible to check in one exam even the most corrosive teacher. At the same time, the unsatisfactory result of the exam does not allow one to understand what caused him - simple negligence of a student, some serious gap in the corner section of the discipline, or just a confluence of personal circumstances.

The reorganization of the structure of higher education in accordance with the Bologna concept naturally led to the need to change the system of knowledge assessment - this is how a rating or point-rating system entered our life. This event took place on July 11, 2002, when the Ministry of Education of the Russian Federation published a list of 15 universities participating in an experiment in organizing an educational process involving the use of a rating system for assessing students' academic performance in universities of the Russian Federation [1]. Several other regulatory documents of the Ministry of Education and Science, for example, [2] were devoted to introducing the PRS. In all these documents the following are indicated as the main tasks of the rating system:

- increasing the motivation of students to master educational programs by means of a higher differentiation in the assessment of their academic work;

- increasing the level of organization of the educational process at the university.

At the same time, the definition of the PRS is exactly how the system is missing in these documents. Perhaps the most common definition of PRS is given in [3]: the score-rating assessment system is a systematic cumulative approach to giving and integrating points to students on a regulated scale based on the results of all types of educational activities in mastering basic educational programs.

In other words, it is a system of quantitative assessment of the quality of mastering any structural unit of the curriculum, for example, a separate discipline that assesses the work of a student during the entire time of studying this discipline. Rating is, in fact, an integral assessment of both knowledge itself and the process of their accumulation and practical use in the course of classes.

Currently, there are many PRS [4], which are used for you-manifestations of the level of students' knowledge. Each of them is based on different assessment criteria, which depend on the specifics of the subject being taught, and on the policy on this issue of the entire educational institution. Many universities have developed their “Regulations on the PRS”; in particular, the Temporary Situation is in UGNTU. The presence of such a common Provision does not preclude the independent development and implementation of the PRS in each department. At the same time, it turns out that, despite the external similarity of the types of work being assessed and the general structure of the PRS, they are taught by teachers in completely different ways. This, firstly, creates additional problems for students, and secondly, it does not allow to fully realize the benefits of the PRS.

The analysis of many PRSs, including those used in different departments of our university, revealed several drawbacks that are significant in our opinion.

First of all, it is necessary to honestly say that the deepening differentiation of the assessment of the level of knowledge, marked as an absolute advantage of the PRS, is, in fact, absent, because the total mark put on the statement and in the student’s record book remains the same. The scores received under the PRS are still transferred to the traditional system. For example, from 60 to 74 points (out of 100) - “satisfactory”, from 75 to 88 - “very good” and from 89 - “excellent”. Another thing is that now the teacher does not need to assess all the nuances in the mind, choosing between the "solid three" and "conditional four", and then listen to the accusations of bias.

Further, not all teachers are aware of the fact that the rating system is a set of rules, guidelines and the corresponding mathematical apparatus implemented in a software package that provides information processing both in quantitative and qualitative indicators of students' individual educational activities, allowing to assign a personal rating (integral score, number) to each student in the context of any academic discipline, any kind of classes, as well as generalized for a number of

disciplines [5]. In addition, the rating system is inextricably linked with the fund of appraisal funds (WCF) used for all types of control of the level of mastering the discipline.

A formal approach to the choice of control points of the midterm control, tasks for current control and, most importantly, arbitrary, unreasonable assignment of points for each type of occupation (what is called "by eye") can completely discredit the PRS. With the ill-conceived assignment of "cost" of certain types of work in the overall rating, the assessment of students' academic performance is determined not by the level of their knowledge, but by the vicissitudes of the PRS.

The next negative point is unacceptability for some teachers of the PRS as a full-fledged tool for intermediate certification for the discipline. They consider the accumulation of points only as a tool for admission to the exam, which ultimately creates a double burden on the student. At the same time, the very purpose of the PRS is emasculated - an assessment of the level of knowledge during the entire semester. This is partly due to the fact that in most universities, despite the transition to a credit-modular system, two types of organization of the educational process continue to exist. This is the old system with such key concepts as the curriculum, semester education, exam session, cycles of academic disciplines, etc. And the second type is the declared credit-modular system with a fundamentally different set of educational process organization schemes, criteria, requirements, terms. It is clear that these two systems do not correspond to each other and their symbiosis is viable only on paper [6]. That is why PRS is so difficult to take root in universities and is often used formally, for the "tick".

Another disadvantage is the inclusion in the PRS of a specific discipline of types of work that are difficult to implement. For example, the indicator “Activity in lectures” is often found in the PRS. When studying special disciplines at senior courses, it is quite viable. But imagine its implementation at a lecture for the first course, which is being read to a stream of 5-6 groups ... Even if someone answers the teacher's question, it is almost impossible to take this into account with the help of points.

And yet, in our opinion, the future belongs to the PRS. First of all, because these shortcomings do not relate to the PRS itself as a knowledge assessment system (except, perhaps, the first), but to its implementation in the educational process. The second essential argument in its favor is the competence approach to assessment, i.e. it is necessary to evaluate not the level of mastering the discipline, but the level of formation of the competence that this discipline provides.

What should be the PRS? Immediately make a reservation that we offer the design of the PRS, partially tested at the department of automation of technological processes of UGNTU for technical disciplines.

First of all, it is structured in such a way as to allow intermediate certification,

i.e. 100 points are distributed between the current control, mid-term control and the CDS. The exam is only for those who did not score the required number of points in the se-mestre. This is especially important for the disciplines according to which a test is set (simple or differentiated). Using the PRS together with the sequential-parallel construction of the semester schedule [7] will finally relieve the exam session due to the fact that part of the disciplines will end in attestation weeks and at the same time will be set off on the basis of points earned.

This system does not include attendance at lectures. In the senior courses, students work part-time, so they cannot always attend all classes. In addition, the purpose of the PRS is to assess the level of mastering the discipline, and the attendance accounting makes it less objective - the student can receive points, which the entire lecture is occupied with their gadgets.

The use of this indicator by a sufficiently large number of teachers most often indicates their unwillingness to develop additional tasks for obtaining the required amount of points. Providing 20 points for attending 10 lectures is much easier than developing, say, 20 test items for admission to four laboratory work.

Assignments for midterm certification (control points) should differ both in type and degree of difficulty. Of course, the most common (and attractive) type of such a task is a test, but its capabilities as a tool for diagnostics are limited - it checks mainly the conceptual apparatus, knowledge of the basics of the theory, but it is not possible to evaluate the ability to use them (actually competence) -the lines. Therefore, it is necessary to provide colloquia or case type assignments. Any competence requires the presence and development of student communication skills, so it is advisable to carry out at least one midterm control in the form of public speaking, albeit very small.

Many technical disciplines provide for the implementation of a course project or course work. It is evaluated by an independent assessment, therefore it is not included in the PRS for the discipline (although the assessment of the course work itself can also be set on the basis of the PRS created for it). This approach again contradicts the competence - knowledge is evaluated separately, the skills and abilities to use them - separately. Formation of competence (or its part) will be assessed more objectively if the fulfillment and protection of course work will be included in the “common pot". This is especially true for disciplines in which a test of theoretical material is provided as an intermediate certification, and topics related to its practical application are submitted for course design. In this case, you can set a mark for your own coursework by recounting the points received for it in a certain proportion.

It is clear that the proposed approach to the PRS is not ideal. Its implementation is a complex process for both objective and subjective reasons. First of all, the introduction of the PRS means a significant increase in work for the teacher.

He must calculate the parameters of this system - how many points are given for each task and evaluation criteria, to develop tasks of different levels of complexity [8]. The volume of individual work with students to conduct ongoing monitoring increases, the time spent on checking these tasks (the hours allocated to monitoring the IWS today at the rate of 15 minutes per semester (!) per student looks like a frank mockery). But it would be naive to believe that the increase in hours will become a magic pa-lochkoy and immediately provide the transition to the PRS. No less important is the change in the psychology of the teacher, the willingness to depart from the usual criteria for assessing performance. And if the introduction of special programs for calculating the rating (Moodle, for example) is added to this, the BRU will turn from Cinderella into a full-fledged Queen.

References

1. Order of the Ministry of Education of the Russian Federation of 11.07.2002 No. 2654 "On the conduct of an experiment on the introduction of a rating system for assessing the progress of students in higher educational institutions": [Electronic resource]. - URL http://www.lawmix.ru/expertlaw/143204 (request date 01/13/2019).

2. Letter of the Ministry of Education of the Russian Federation of March 9, 2004 No. 15-55-357ин / 15 "On the approximate provision on the organization of the educational process in a higher educational institution using the credit system": [Electronic resource]. - URL http://www.lawmix.ru/pprf/25950 (appeal date 01/13/2019).

3. Regulations on the score-rating system for assessing the quality of mastering the main educational programs of the State University of Management: [Electronic resource]. - URL guu.ru ›files / norm / 2013 / PRS. pdf (appeal date 01/13/2019).

4. Zvonnikov V.I., Chelyshkova M.B. Modern means of evaluating learning outcomes. - Moscow : Publishing Center "Academy", 2007.

5. Kossova, L.A. Prospects and features of the use of point-rating system for assessing students' knowledge: [Electronic resource]. - URL http://lfostu.ucoz.ru/publ/innovacionnye_podkhody_i_tekhnologii/2t/30-1-0-234 (the date of appeal 07.02.2019).

6. Bekhterev D.Yu. Credit-modular system: good or harm? (background and state of the problem): [Electronic resource]. - URL http://forum.cosmo.ru/index.php?showtopic=137544 (appeal date 07.02.2019).

7. Prakhova M.Yu., Pavlova Z.Kh. Experience in optimizing work curricula. Materials of the III scientific-methodical conference "Prospects for the introduction of innovative technologies in the educational process": Ufa: RIC UGNTU, 2014. - P. 4-6.

8. Bravichev S.N., Bykovskaya L.V., Zhumasheva B.K. The use of point-rating system in the teaching of electrical engineering. Materials of the All-Russian scientific and methodical conference "University complex as a regional center of education, science and culture." - Orenburg, 2014. - p. 2831 - 2835.

问题训练是历史课上精神和道德教育形成的手段
PROBLEM TRAINING AS MEANS OF FORMATION OF SPIRITUAL AND MORAL EDUCATION AT HISTORY LESSONS

Kutakova KseniaVasilyevna
Applicant of the Department of Personality Psychology and Special Pedagogy of Vladimir State University A.G. and N.G. Stoletov

注解。 本文认为，精神和道德教育是学校历史教育的主要目标。 以问题教学法为例，介绍了历史课中形成精神和道德教育的技巧。

关键词：基于问题的学习，精神和道德教育，俄罗斯公民的精神和道德教育观念。

Annotation. *The article considers spiritual and moral education as the main goal of school history education. On the example of the problem teaching method, the techniques of forming spiritual and moral education in history lessons are presented.*

Keywords: *problem-based learning, spiritual and moral education, Concept of spiritual and moral education of a citizen of Russia.*

The question of the spiritual and moral education of the personality of the citizen of Russia is put in the first place and is of the greatest importance in modern society.

The last decades in the country are characterized by a series of reforms and colossal changes in all spheres of social life. The result of all the changes was a sharp decline in the spiritual and moral education of citizens. Hence, the most pressing issue facing the modern state and society is the creation of conditions conducive to the spiritual and moral education of the individual.

In 2009, the Concept of Spiritual and Moral Development and Upbringing of the Society of the Citizen of Russia was developed. Much attention in the Concept is paid to the goals and objectives of spiritual and moral development, upbringing of children and young people, and the main social and pedagogical conditions, principles of spiritual and moral development of the upbringing of a student.

Thus, the main goal of modern school education is the formation and development of a highly moral, responsible, creative, competent citizen of Russia.

The school subject "History of Russia" is directly interconnected with the Concept of spiritual and moral development and education of a citizen of Russia.

Russia is a country with a long history; the state in the territory of which a large number of peoples, nations, ethnic groups and cultures live.

The history of Russia is one of their striking examples of how to create the strongest state requires common faith, common norms of morality and rules, national self-consciousness, and spiritual and moral values. The main goal of historical school education is the formation of the student's holistic picture of Russian and world history, taking into account the interrelation of all its stages, their importance for understanding the modern place and role of Russia in the world.

According to the Federal State Educational Standards, the high school student must have the skills of individual and collective work; skills of research, research and design work. Graduates of secondary schools should be motivated to modern innovative activities.

The reform of the education system, first of all, touched upon the issue of teaching methods and the formation of necessary knowledge and skills of students.

"Dry knowledge" that the teacher passes on to the lesson-lectures to students about the spiritual, cultural development of society will not allow the student to understand and realize the spirituality of that time, to realize the significance of this concept not only in a certain period of history, but also in modern life and society.

Modern teachers in school face the task of not only exploring the cultural heritage of each historical era with children, but also showing the importance and significance of the spiritual saturation of society.

It is worth starting the formation of spiritual and moral values from the first lessons of studying the history of Russia. Schoolchildren's attention should be focused on the spiritual values of each historical epoch; it is necessary to form a sense of responsibility for the fate of their homeland; instill in children understanding and acceptance of universal moral values.

Working with historical documents, historical monuments give students the opportunity to independently study and evaluate the historical event. At the end of each topic, section should be given time for students to independently assess the historical event or the historical era as a whole.

Problem teaching method has a huge variety of forms of problem teaching: problem presentation, joint study, research, creative learning, etc. Pupils must learn to work both in a team and individually.

Only a well-designed, systematic and purposeful, well-built, adjusted for each student teacher program, which will include a variety of methods and forms of training for the study of the school program History of Russia will contribute to the formation of cultural values, and hence the spiritual and moral person.

Problem teaching method - there is a set of actions, techniques, aimed at the assimilation of knowledge, through active mental activity, containing a contradiction.

To fully achieve the implementation of the goals and objectives, it is important to interest the students, to develop interest in them for future independent work. It is interest in the topic of the lesson that will allow you to be sure that the students will not forget the material studied.

Problem teaching method has a number of features. It is very important that students understand the importance and relevance of the chosen topic, even if it is a question of an event of many centuries ago. Studying the topic of the adoption of Christianity, for example, in the Old Russian state it is important to let the students understand for what purposes the religion was adopted, why this particular religion was chosen. Pupils should realize the importance of the historical moment not only for a certain period of history, but also for the whole history of Russia, as a whole. When studying the material, it is necessary to acquaint the student with historical sources, with the opinions of contemporaries, so that students can clearly see, understand and be able to assess the historical situation.

It is important in the lessons to provide students with the opportunity to choose their own point of view on a certain historical fact. Schoolchildren should be able to argue their point of view, analyze and appeal to hysterical facts to be able to defend their point of view and the possibility of presenting an alternative course of events.

For example, when studying the topic of "Thaw" in the spiritual life "in class 9, there are two alternative points of view:

1. "The thaw policy has failed and has not had a due effect on the spiritual development of the state";

2. "The Thaw" was the first attempt to reform the social system that had been established in the USSR in the 1930s, and to free it from the most odious elements; it was not consistent, holistic, but made significant changes in the spiritual atmosphere as a step towards freedom, towards socialism, cleansed of deformation and distortion, towards civic responsibility, independence, initiative. "

When choosing one of the alternative points of view, students should know the state of the spiritual life of society, the consequences of the reform being carried out and the practical application of reform in the life of the state; only then can the student be able to correctly voice his point of view, accompanying it with historical facts.

The history is quite an ambiguous science, which includes a huge number of opinions and arguments on the same event. Of course, it is necessary to teach students to view the event from different perspectives.

The problematic method of learning has one significant drawback - a limited time. Student research work takes much longer than a regular lesson. Do not forget about the rigid framework of the thematic plan and work program. In turn, it should be understood that it is impossible to transfer the entire school course of the

subject through independent and research activities of students. There is material in a school course that a student must simply learn and memorize.

But when conducting a lesson-lecture, it is also possible to put problematic questions to students, to which they will be able to answer only after listening to the entire lecture. For example, when studying the topic "The Partisan Movement in the USSR during the Great Patriotic War" before the lecture, the following questions could be asked: "What were the causes of the mass heroism of the Soviet people?", "Main objectives, tasks and results of the operations "Rail War" and "Concert".

The formulation of problematic issues before the lecture sets the task of conscious perception of the material.

When consolidating the material, you can use the "role discussion" technique. In class, students can independently, under the supervision of a teacher, hold a court session. On this type of lesson, you can characterize a historical character. The main characters of such a lesson will be the historical person herself, the attorney and the prosecutor. In advance, students are given historical characters and roles in which they will appear in court, defending or accusing the historical person. The teacher in this lesson can act as a judge. Depending on the number of students in a class, additional roles can be introduced, such as defense and prosecution witnesses, a secretary who, before making the decision, read out all the arguments voiced and the jury. Thus, the whole class will be involved in this lesson, each will have their own role and, accordingly, their own task.

All the goals and objectives of the lesson can be fully disclosed when, both the teacher and the students have high intrinsic motivation and interest in learning new material.

教育是文化中小男人进入的条件
EDUCATION AS A CONDITION OF ENTRY OF THE LITTLE MAN IN THE CULTURE

Savenkova Lyubov Grigorievna
Doctor Of Pedagogical Sciences, Professor
Corresponding Member RAE
Chief Researcher
Institute of Art Education and Cultural Studies
of the Russian Academy of Education

注解。 在文章中，作者从综合多元化教育的角度分析了幼儿和小学儿童的培养问题 – 儿童天生能力发展的最重要条件：视觉，听觉，运动，沟通，心理过程和思维。。 作者的研究结果得到了综合教育领域多年研究的支持。

关键词：综合教育，polyart教育，儿童心理特征，先天能力，不同类型的艺术。

Annotation. *In the article, the author analyzes the problem of upbringing children of preschool and primary school age in terms of integrated polyartistic education - the most important condition for the development of the child's innate abilities: sight, hearing, movement, communication, mental processes and thinking. The findings of the author are supported by many years of research in the field of integrated education.*

Keywords: *integrated education, polyart education, mental characteristics of children, innate abilities, different types of art.*

The main task of an educational organization is to develop the abilities given to them by nature to the maximum extent equivalent to children.

The problem of the development of innate abilities in pedagogy has been debated since ancient times. What did nature give to every child at birth? Firstly, - the ability of a person to see, perceive the world around him through vision. Secondly, - she gave the child the ability to hear - to perceive the world around with the help of hearing. Thirdly, it gave everyone the opportunity to comprehend the world through movement and action, smell and touch. Fourth, the ability to form ideas about the environment, based on mental processes (the ability of a person to perceive, feel, remember, imagine, feel). Finally, nature has endowed man with the most important thing that distinguishes him from animals - thinking. The listed

areas of talents constitute something special that distinguishes one child from another and his predisposition to any actions.

In this case, we should recall the words of an outstanding teacher who lived in ancient Rome about 2,000 years ago - Mark Fabius Quintillian. In his famous book "Instructions in the Oratory", he described the laws of teaching a child, relying on his innate abilities. On the one hand, this refers to the teacher, who notices and tries to take into account in the process of learning the individual characteristics of students, "the difference of minds and find out who is capable of anything from nature." On the other hand, the teacher should try to develop the personal qualities of each child in "natural talents and guide the minds" in accordance with the interests and desires of the student [9].

Another founder of the pedagogy of science, Jan Amos Comenius, in "Great didactics," noted that the training of a student, as well as the cultivation of plants, trees, animals, should be based on individual natural features. "One must be treated in the same way, with the other in a different way and it cannot be used for the same purposes by everyone and equally ... an alien is something that is not typical of the nature of this or that student." The form of his pedagogical position is "education and upbringing only for the future, when their laws begin to be derived from the unchanging nature of man." According to J.A. Komensky, if even for different kinds of trees, special soil is needed, special conditions for it to bear fruit, and flowers to bloom, then for the upbringing and education of children, all the more an individual approach is needed to develop the unique abilities given by nature [4].

«The one who considers it necessary to teach children not to the extent that they can assimilate, but to what only he himself wants, since the educator of the youth needs help, not the suppressor, as well as the doctor, he is only a helper of nature, and not his master» [6].

This approach is particularly relevant in preschool education, when the child is most open to the manifestation of abilities. One more quotation should be made by A. Distervega: "The infant, having no trace of memories, has the ability to take them faster or slower, brighter or dimmer reflect, keep more or less firmly, combine and reproduce more lively or slower. These innate abilities depend on the characteristics of the nervous system ... A child, if I may say so, thinks in forms, colors, sounds, sensations in general, and he *would forcefully and inadvertently rape a child's nature who would want to force her to think differently.* Thus, putting the initial learning into forms, colors, sounds - in a word, making it accessible to as many sensations as possible for children, we also make our learning accessible to the child and enter the world of children's thinking ... If pedagogy wants to educate a person in all relationship, she must first recognize him in all respects, too "[1].

After the above, it is probably no longer necessary to prove why and why it is necessary to introduce different types of artistic activity in the process of education and training? The answer to this is quite simple and obvious. We are all different, each of us has its own characteristics, preferences, own predisposition to any activity, given to us from birth. But at the same time, each of us has not equal abilities for specific types of activity: one has a natural ear for music, the other has a unique ability for graphic activity, the third has mathematical abilities, the fourth has the ability to dance, etc. Therefore, when in kindergartens developmental types of creativity are limited (for example, leaving only visual arts and music), they thereby deliberately deprive children of other forms of art: theater art (art of communication), dance (beauty of movements), poetry (artistic word) and etc.

This is what had in mind A.V. Zaporozhets, highlighting the task of moving forward, which is solved in accordance with the peculiarities of the child's individuality (motility, motives, a certain situation). Such adaptation and flexibility, according to the author, characterize the "highest stage of its arbitrariness" [2]. Another largest researcher of preschool childhood N.N. Poddjakov believed that one of the conditions for the intensification of the child's mental activity and independent creativity was "observance of a measure of uncertainty, the incompleteness of some part of preschool knowledge". Another condition is to support the activity of children. This, according to the scientist, is the basis for obtaining certain concepts and planning a special zone for knowledge, which allows to expand the cognitive activity of children [7].

Integrated education and the poly-artistic upbringing of children are connected with the decision of the aforementioned directions of development of students. The basis of which is to shift the emphasis from perception to the active creativity of the children themselves. This ensures the activation of the child's imagination, his actions. He does not wait for explanations of the adult, he tries to find a way out of the created situation. That allows you to create a high emotional effect in class, to feel the joy of the work performed and the act of cognition, to stimulate the desire of children to independently explore and enjoy created, recognized, accomplished.

Different types of art with such training serve as a special polyartistic space filled with positive emotions. This ensures children a joyful existence and dedication to the activity.

This implies the tasks of polyart education of children, which at different stages of growing up have their own characteristics.

• Develop a child's ability to perceive nature and works of art through emotions and feelings.

• Foster the desire and ability of children to reinforce impressions, obtained in the process of observing the artistic image.

• To form children's ideas about the diversity of arts and the importance of art in the lives and activities of people.

• Mastering the skills and abilities of cultural behavior in the concert hall, in the museum, the ability to maintain a dialogue about works of art.

• Fostering interest and love for the works of folk art of different nationalities. [10].

As stated above, it is based on the fact that any person, a child in features, perceives and is aware of each action in its own way: some children better understand with the help of auditory perception, others in the process of reviewing, the third one needs to perform some additional actions with the object being studied, for example, tactile sensations. It should also be noted that due to their age characteristics (which are expressed in distraction of attention, not the ability to perform long work and the desire to engage in different types of activities), the child is always ready for a change of activity, active participation in collective forms of work. Consequently, it would be a mistake not to take this into account in the organization of classes, including using additional means, such as: figurative associations, different types of artistic activities, impressions of what they saw or heard. The most commonly used forms of work in the practice of teaching preschoolers and younger students are: the inclusion of different types of art according to themes, associations, mood. For example: a color image of words and moods, a graphic transfer of music, the performance of free movements ("figurative choreography") to the music of others. All this develops children's imagination, representation, independent thinking. Another developing means of "turning on" the thinking of babies is playing up different situations (from life, from fairy tales, songs, verses), which are realized through actions with objects, toys, with children with the help of gestures, movements, sounds. The most interesting and fascinating for children are the revival of paintings, plots, writing stories with objects, paints, etc. The work in small groups, including the creation of paintings, books, puppet shows, etc., are crucial for their development.

An integrated approach to the upbringing and education of children in educational organizations allows us to compare and compare the possibilities of different types of art in children's groups.

The dynamics of the child's development are as follows [3,8].

2 years. Aesthetic perception of the forms and colors of animate and inanimate nature (people, animals, birds, fish, insects, plants, shells, stones, earth, sand, clay, water, snow, etc.), man-made objective environment (toys, everyday things etc.). Primary development of artistic features and features of the material in the process of experimenting with colors, words, movements, actions. Development of children's curiosity and intuition, interest and emotional responsiveness to the aesthetic side of the surrounding reality. Formation of a sense of rhythm in everyday life and in nature (day-night, seasons, etc.), in art (rhythm of movements, sounds,

forms, lines, etc.). Initial creative experiences in various activities, including the development of elementary image skills.

3 years. The development of a sense of diversity of color and light in nature and the objective world on the example of active perception of the surrounding: diversity of tree and leaf shapes, colors and smells, stones and shells, elements in nature (wind, rainbow, thunder, rain, sun, moon); objects of the world that make up the residential and educational environment; a variety of moods and feelings; capturing the rhythms of life, nature, in art. All of the above matters in the formation of the sensory experience of children, expressed in a living creative act, in the process of independently creating an artistic image, including with the help of colors, voice, and movements.

4 years. Formation of the ability to distinguish objects according to their shape in the space of the surrounding life, everyday environment. Raising the desire to decorate the room itself, a group of kindergarten. Development of the ability to express one's personal attitude to heroes of fairy tales and stories, to other children in a group and adults, ability to interact with different children in a group (on the street, in a museum), to distribute duties, to be able to listen to others and express one's opinion about what is happening. Raising the child's emotional and sensual sphere through perception and action (creating color and linear-graphic compositions for the transfer of mood, three-dimensional shape and texture of objects; using gestures, intonations, facial expressions in communication with other people). The development of ideas about the diversity of spaces (closed and open) and the ability to freely navigate a small, narrow, wide space

5 years. Observations, comparisons, finding the general and the particular in the same subjects in life, in nature and their reflection in works of art. Formation of the ability and desire to express their observations, impressions, moods in artistic creativity (drawing, sculpting, dancing, theater, playing). Maintaining interest in collective types of creativity in different types of art, in game situations and in life. The development of mental processes, such as associative thinking, creative perception in the process of listening to music, perception of pictures, listening to poetry and literary works.

6 years. The development of spatial sensations in the real environment, in works of art, self-representations within space (the role of color, form, word, sound, movement in different spaces). Acquaintance with color in life and art, development of a sense of individuality of color. The development of interest and desire to study and study the causes: the variety of colors and forms in the surrounding life, the sounds and smells that fill life, the characteristics of gestures and movements in communication, intonational diversity in nature and in everyday life. The development, study, research, specific objects in the environment, in painting, in decorative and applied arts. The development of the desire and needs to decorate the surrounding space on their own

7 years. The development of interest and desire to experiment with color, light and colors in painting, with the forms of objects in sculpture, with gestures and movements in playing and theatrical activities. Conduct experiments with sounds, smells, intonations and their display in the figure. The development of the child's feelings through: capturing moods in nature and in art, the development of a sense of space in life and in art. Interest in the surrounding objects: their shape and color, matching the form of its purpose, the creation of their original forms and their decoration. Interest in color and forms in nature (rainbow, plants, animals, birds, insects). Interest in the use of colors and shapes in art. Creation of color, graphic, motor, sound compositions for the transfer of mood.

8 years. Art in the world. Fostering a desire to get acquainted with different arts. Special and common in the display: the subject in the picture, words in poetry, sound in music. Formation of interest in the diversity of people's lives in different countries of the world (climate, plants, animals, seas and oceans, their display in paintings and music). As a person explores the space of the Earth. Visual perception of the space of nature in the summer, autumn, winter, spring (the color and location of objects relative to each other). Subject in architecture, in the environment. The creation of form in nature, in the history of the development of life on Earth. Color and shape in architecture. Mood in the picture, in the word, sound. Composition in the visual arts - the interaction of the elements of the image.

9 years. Formation of ideas about the expressiveness of the artistic language of different types of art (general and particular): form, space, dynamics, rhythm. The development of the concept of composition in a musical work, in painting and decorative and applied arts, in sculpture and architecture. Beauty and expediency of form and color in objects of decorative and applied arts. The interaction of elements in the decorative composition: the rhythm of spots and lines. Correspondence of external and internal forms in natural objects. The development of ideas about the sign in life and works of art. Formation of the concept of human exploration of the Earth’s space: countries – nature-landscape-people. A variety of natural landscapes of different regions and the creativity of their peoples.

10 years. The role and importance of folk art in human life. Traditions in folk art (word of mouth, songwriting, decorative art, folk theater). Display of the surrounding nature and ethnic features in folk art. Spatial sense of the world: architecture, life, clothing. The dependence of folk art on national traditions, climate, landscape. The form and composition in folk arts and crafts (traditions, customs, etc.). Color, plastic and symbolism of folk toys. Color as an important expressive element in solving the shape in folk toys.

Work with children of different ages in the development of any artistic activity is built in *five areas of development*.

1. *The development of children's observation, the formation of a differentiated vision and artistic and figurative perception of nature and art.* The accumulation of a certain experience of emotional-figurative perception of art and the surrounding nature. Display of the surrounding world of nature and reality in art: visual, sculpture, verse, music, theater, dance, clothing, decorative and applied. Observation of the surrounding world is based on the formation of the idea that any space is a special world, which consists of its constituent objects, colors, sounds, movements. Of great importance is the observation of specific objects, such as plants, stones, animals, birds, people - their relationship with each other.

2. *Formation of ideas about the diversity of expressive artistic language of different types of art.* The introduction of children in the "temple of art" (familiarity with different types of artistic creativity, the role and importance of art in people's lives). Ideas about the features and history of different arts: drawings of ancient people, ritual holidays, fairy tales.

3. *Reliance on the creative activity of children, the transfer of the observed in the art form. Polyart game character of activity, natural for any child.* The game involves the simultaneous inclusion of the child in a variety of actions, interaction with partners, expressing yourself in words, movements, thinking, communication, fantasy.

4. *The development of emotional and sensual sphere, mental processes as a result of mastering the diversity of the surrounding world.* Art as a means of discovering the world in its diverse manifestations through various forms of involving children in the process of co-creation with a tutor, with children, with parents, with a guide. Development of children's abilities to understand, appreciate, love art, consciously approach the process of aesthetic perception of reality and art.

5. *The development of imagination and imagination through the various enrichment of the process of perception, based on different arts* (painting, music, sculpture, poetry, literature, theater, dance), on the same artistic and expressive means. Development in children of the ability to generalize, transfer images from one art form to another, using associative thinking, analysis, comparison of one artwork with another. Fairy tales (folk, authors, composed by the children themselves) are a great help in this activity.

The results presented in the article were obtained within the framework of state tasks Ministry of Education of the Russian Federation
Registration number 115031940007

References

1. Disterveg, A. Selected pedagogical works. - Moscow: Uchpedgiz, 1956.

2. Zaporozhets, AV. Psychological study of the development of motor skills of a preschooler.

3. Klyueeva I.N. , Zuykova E.N., Savenkova L.G. Kaleidoscope. Integrated program for children of preschool age. - Tolyatti, 2000.

4. Komensky, Ya.A. Great didactics.- SPb: Typography A.M. Kotomina, 1875.

5. Coumarin V.V. Pedagogy of nature conformity and school reform. Moscow: Public Education, 2004.

6. Coumarin V. Pedagogy of standard or why children are bad at school. - Moscow, 1996.

7. Poddyakov N.N. On the issue of the development of thinking of preschoolers. - Moscow: Publishing House of the Moscow University, 1981.

8. Savenkova L.G. Education of man in the space of the world and culture. - Moscow: MAGMU-RANEPA, 2014.

9. Titov K. Instructions to the speaker. Quintilian. Moscow. Liters, 2017, 8 p.

10. Yusov B.P. The modern concept of the educational field "Art" // News of the RAO. 2001. N 4.

根据联邦国家教育标准（基于信息和通信技术）的要求，年轻学生的综合工作形式在社交语言教育环境设计中的作用

THE ROLE OF INTEGRATED FORMS OF WORK OF YOUNGER STUDENTS IN THE DESIGN OF A SOCIALIZING LANGUAGE EDUCATIONAL ENVIRONMENT IN THE LIGHT OF THE REQUIREMENTS OF THE FEDERAL STATE EDUCATIONAL STANDARD (BASED ON INFORMATION AND COMMUNICATION TECHNOLOGIES)

Taran Olesya Sergeevna
Candidate of Pedagogical Sciences, teacher of English
State Budgetary-Educational Institution of the City of Moscow
"School No. 1416"Lianozovo"

注解。 本文致力于根据联邦国家教育标准对初等通识教育的要求，通过使用作为选定信息和通信基础的各种形式的工作，在小学设计社交语言教育环境。技术。

关键词：社会化，社会能力，教育环境，外语，年龄较小的学生，工作形式，信息和通信技术。

Annotation. *The article is devoted to the design of a socializing language educational environment in elementary school in the light of the requirements of the Federal State Educational Standard of the primary general education through the use of various forms of work that underlie the selected set of information and communication technologies.*

Keywords: *socialization, social competence, educational environment, foreign language, younger students, forms of work, information and communication technologies.*

The most important guideline of modern education in our country is the development of the student's personality, which determines the need for innovative renewal of the scientific, educational and creative environment in educational institutions. The Federal State Educational Standard of Primary General Education (hereinafter referred to as FSES PGE) is based on a system-activity approach, which involves a transition to a social design strategy and design of the learning process, the development of its didactic support, ensuring the achievement of the

quality result of students' personal development (FSES PGE, art. 7). This actualizes the problematics of pedagogical design as one of the mechanisms for the development of modern education.

Democratization of the school's educational activities is manifested in the exercise of the right of teachers to choose educational and training methods, various forms of organization of students' activities, the system of control and evaluation of their knowledge. At the same time, the creation of an educational environment in which the learner becomes the subject of his learning activity acquires special relevance.

Human development in interaction with the environment in its most general form is defined as the result of its socialization, that is, the assimilation and reproduction of cultural values and social norms, as well as self-development and self-realization (A.V. Mudrik). Social competence as a person's ability to take responsibility, jointly develop a solution and participate in its implementation, tolerance to various societies, ethnic cultures and religions, manifestation of personal interests coupled with the needs of society is one of the key meta-subject achievements of students. The younger school age is especially sensitive for the formation of social values, the development of psychological and social roles. The standard emphasizes the need to develop personality traits that meet the requirements of the information society, the tasks of building a democratic civil society based on a dialogue of cultures and respect for the multi-ethnic, multicultural and multi-religious composition of Russian society (FSES PGE, Article 7).

The process of language education can play a significant role in solving these problems. In accordance with the FSES PGE and the Approximate General Educational Program of Primary Education, today the process of mastering a foreign language at the level of primary general education should contribute to the formation of an active life position of students, their acquisition of initial communication skills with native speakers based on their speech capabilities and needs; in the development of the rules of speech and nonverbal behavior.

The key concept of our research is "socializing language educational environment". In order to determine the essence of this pedagogical concept, we analyzed a number of scientific works and dissertation research revealing the features of such concepts as: "*socialization*" (G.M. Andreeva, E.N. Zemlyanskaya, A.V. Petrovsky, A.V. Mudrik, M.I. Rozhkov, F.G. Giddings, E. Durkheim, J. Mead, and others), "*educational environment*" (V.I. Slobodchikov, M.V. Urbanskaya, E.A. Yamburg, V.A. Yasvin and others.), "*social competence*" (T. G. Brazhe, E. F. Zeer, N. V. Kalinina, M. I. Lukyanova, O. V. Solodyankina, etc.), "*foreign language*" (M.Z. Biboletova, N.D. Galskova, Z.N. Nikitenko, E.I. Passov, S.Y. Romashina et al.).

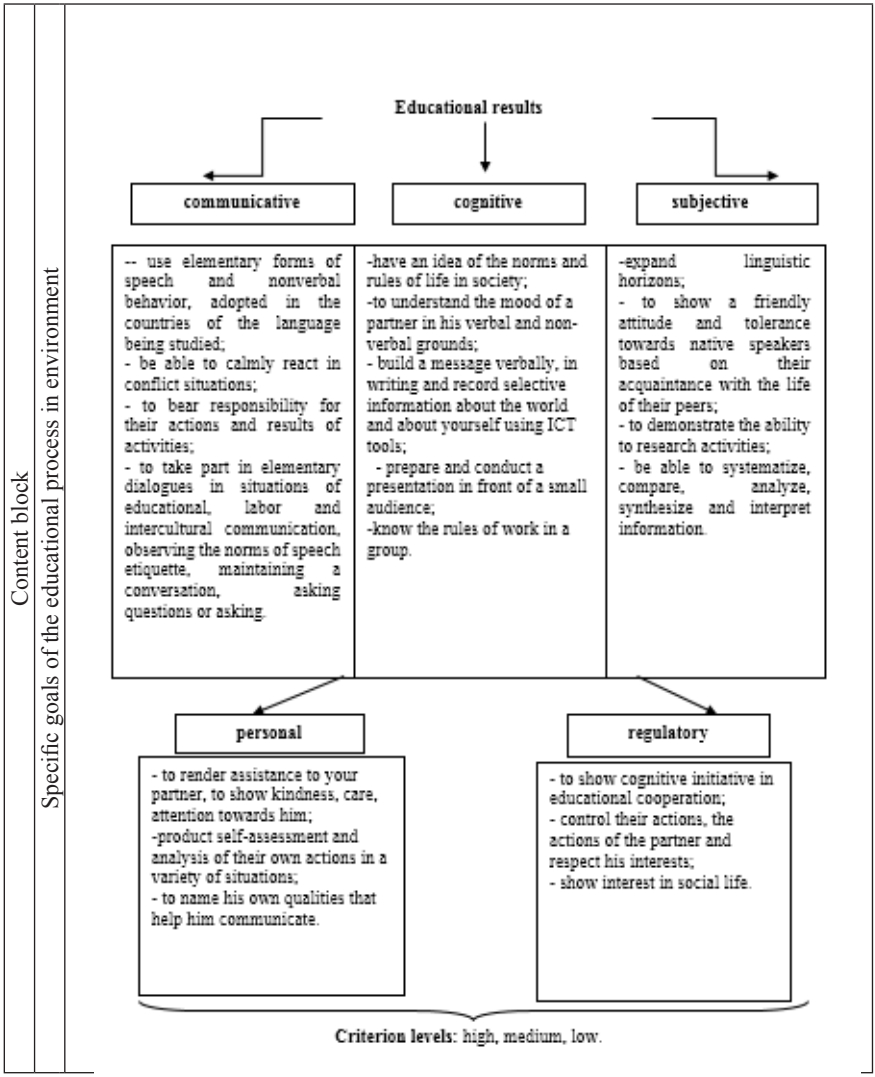
As a result of the analysis of scientific works and dissertation research of domestic and foreign scientists, the concept of "**socializing the language education-**

al environment of an elementary school" is defined by us as a set of specially created conditions and targeted influences in the pedagogical system that ensure the formation of social competence of a younger schoolchild in the process of learning a foreign language and spatial-objective environment [1].

The problem of **designing** a socializing language educational environment that is adequate to the modern requirements of society is particularly acute today. Based on the analysis of scientific papers N.F. Vinogradova, E.S. Zair-Beck, I.A. Kolesnikova, V.P. Lebedeva, V.A. Yasvina, we consider the design as a preliminary development of the main components of the upcoming activities of teachers and students in secondary schools (IA Kolesnikov) [2]. Design is also closely related to the modeling method. A model is defined as a sign object (scheme, design, formula, table) that reproduces information in a more accessible form, preserving the structure and integrity of its content [3, p.22].

The model of the socializing language educational environment of an elementary school is presented in Figure 1 [4, p.51-70].

Target block	Educational ideology, modality	**Objective:** the formation of social competence of younger students in the process of learning a foreign language. **Principles:** creativity, differentiation and individualization, reflection of the process and the result of socialization, situationality**.** **Approaches:** competence, communicative-cognitive, personality-oriented, interactive, activity, cultural studies**.**


Content block
Specific goals of the educational process in environment
Educational results
communicative
cognitive
subjective
-- use elementary forms of speech and nonverbal behavior, adopted in the countries of the language being studied;
- be able to calmly react in conflict situations;
- to bear responsibility for their actions and results of activities;
- to take part in elementary dialogues in situations of educational, labor and intercultural communication, observing the norms of speech etiquette, maintaining a conversation, asking questions or asking.
-have an idea of the norms and rules of life in society;
-to understand the mood of a partner in his verbal and non-verbal grounds;
- build a message verbally, in writing and record selective information about the world and about yourself using ICT tools;
- prepare and conduct a presentation in front of a small audience;
-know the rules of work in a group.
-expand linguistic horizons;
- to show a friendly attitude and tolerance towards native speakers based on their acquaintance with the life of their peers;
- to demonstrate the ability to research activities;
- be able to systematize, compare, analyze, synthesize and interpret information.
personal
- to render assistance to your partner, to show kindness, care, attention towards him;
-product self-assessment and analysis of their own actions in a variety of situations;
- to name his own qualities that help him communicate.
regulatory
- to show cognitive initiative in educational cooperation;
- control their actions, the actions of the partner and respect his interests;
- show interest in social life.
Criterion levels: high, medium, low.

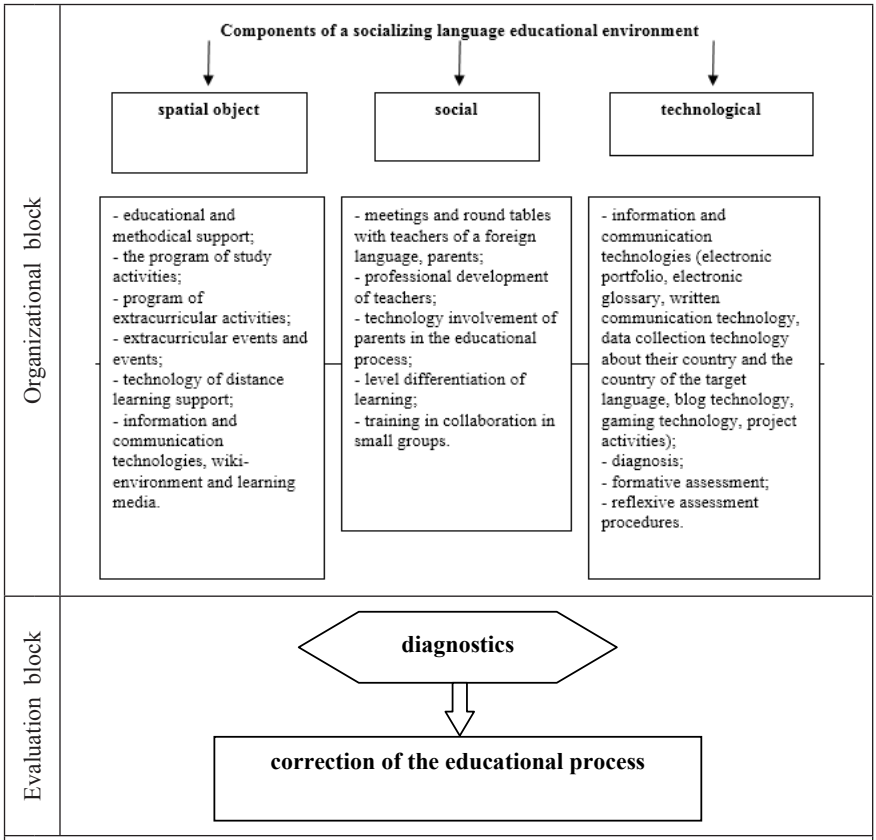


Figure 1 - Model of the socializing language educational environment elementary school

Considering the technological component of the socializing linguistic educational environment, let us dwell in more detail on the complex of information and communication technologies (hereinafter - ICT) and the forms of students' work (Table 1), aimed at forming a high level of formation of social competence of younger schoolchildren.

Table 1

The complex of information and communication technologies for the formation of social competence of younger students

№	ICT name	Groups of educational results	Conditions for using ICT in practice	Work form
1	PowerPoint Presentation	regulatory, cognitive, subjective	lesson/ extracurricular activities	dynamic pair / small group
2	Written communication technology	regulatory, cognitive, subjective	lesson/ extracurricular activities	"Pipeline type" interaction
3	Distance learning	regulatory, cognitive, subjective	extracurricular activities	cooperation type of interaction
4	Modern technical recording tool - voice recorder	cognitive, communicative, subjective	lesson/ extracurricular activities	work in differentiated pairs
5	Electronic glossary technology	cognitive, communicative, subjective	lesson	work in pairs based on the “constructive conflict” mechanism
6	Blog technology	regulatory, cognitive, communicative, personal, subjective	lesson/ extracurricular activities	cooperation type of interaction
7	Mutual dictation technology	regulatory, communicative, personal, subjective	lesson	role interaction (encouraging-testing)
8	Animation cartoon	regulatory, cognitive, communicative, personal, subjective	lesson/ extracurricular activities	work in differentiated pairs on the basis of pair cooperation

As can be seen from table 1, the technology component reflects not only the ICT complex that we selected, but also draws a parallel to each of them with the main forms of work of students to form one or another UEA in FSES in order to achieve the goal set by the teacher - to design a socializing language educational environment in the initial the school. Consider the importance of each form of work of students in the formation of social competence in the process of learning a foreign language.

Working in a dynamic pair (or small group), students were asked to create several **PowerPoint presentations** on the topics: “My School Timetable”, “Working Together”, “Traveling Around Russia”. While doing work, younger students demonstrated a high level of development of regulatory and cognitive UEA, namely:

organized their activities, following the algorithm of the assignment; worked with information, selected the necessary information and recorded it with the help of ICT tools; preparing oral speech to protect the presentation; evaluated their work and the work of others on the criteria, amending; carried out self-assessment and analysis of their own actions, summed up their learned knowledge.

Using the **technology of written communications**, we also sought to obtain a positive trend in the level of formation of regulatory and cognitive UEA. This technology assumed the "pipeline type" of interaction [5], in which students observed the sequence of operations to solve the problem. They were asked to create a FactFile (information page) about their friend using the ICT tools in the electronic program "Padlet". The homework involved the mutual evaluation of information pages created by students according to the criteria (distance learning). Using the Skype application, students were able to discuss the personal pages created by classmates about their friend, thereby demonstrating the cooperative type of interaction. Summing up the formation of subject educational results, the presented forms of work underlying the technology of written communications allowed younger students to build a dialogue not only in the classroom, but also in extracurricular and extracurricular activities, to use ICT tools to improve the efficiency of their academic work.

In order to reflect the positive dynamics of formation of personal educational results and communicative UEA, students were offered work in differentiated pairs to compile a dialogical utterance on the topics: "Favorite Subject", "School Day", "Teens' Hobby in Russia". To do this, we tried to distribute the students in pairs, using the method of differentiated learning (strong student – weak). Thus, students learned to begin and end the conversation with elementary sentences orally, working in pairs; record information on the recorder; evaluate the result by the criteria. In addition, work in differentiated pairs using a voice recorder allowed us to form such educational results as: participation in elementary dialogues, observing the norms of speech etiquette; manifestation of a friendly attitude to the partner; listening comprehension

Using **the technology of creating an electronic glossary** in practice, we increased the level of formation of cognitive and communicative UEA. Students, working on the topic "Hobby teenagers of Britain and Russia" based on the "constructive" confessional mechanism in differentiated pairs, created electronic glossaries (in Microsoft Word) containing lexical material on previously studied topics. In the course of work on the basis of the "constructive" confessional mechanism, junior schoolchildren learned to listen and hear the interlocutor, to show respect for him; record information using modern technology and digital media; make self-analysis of their actions, familiar with the life of their peers in foreign countries; broadened the linguistic outlook; developed attention, thinking, imagi-

nation in the process of creating an electronic glossary.

The blog technology has made it possible to form a high level of all educational results of younger students in the process of learning a foreign language. Working in cooperative groups or couples to create a web page, we have formed cognitive, regulatory, communicative UEA and personal educational results for younger students. The "pipeline type" of interaction, which is the basis of the presented technology, allowed younger students to build an elementary dialogue of etiquette nature in oral and written form; master the technique of writing letters of the English alphabet with respect for spelling; show sociocultural awareness; tell your peers of foreign countries in a foreign language using ICT tools; keep up the conversation by asking a question or asking again.

Writing **mutual dictations** in pairs in a Microsoft Word text editor assumed the role interaction of students according to the scheme: a strong learner (or encouraging, able to help his partner, set an example of the assignment, point out shortcomings in a polite way) - a weak learner (or checking, able on the basis of correct create your own sample, taking into account the mistakes of the previous partner, able to see success and gaps for their further elimination) and vice versa. A differentiated approach was used to ensure that a weak learner could survive a situation of success with a strong student, since it is success that increases the motivation of the teaching and allows everyone to feel the satisfaction of learning activities. Thus, the students managed to carry out mutual control, checking the electronic dictations of each other, adequately assess their achievements (regulatory UEA), create a favorable working environment, showing a friendly attitude towards each other when discussing emerging issues (communicative UEA); to show kindness and courteous attitude to each other, turning by name; to show mutual help, prompting the correctness of spelling of words during vocabulary dictation; control your actions while working on the task; discuss the result obtained in a pair and highlight what else everyone needs to work on (personal educational results).

Also, to increase the level of formation of all educational results of younger schoolchildren in a socializing language environment, we offered them work on creating an **animated cartoon**. Improving the lexical material on the topics "School Subjects", "Traveling", "Hobby in Russia and in Britain", students firstly offered to work at the level of group cooperation related to listening to texts on the topic "School". Younger schoolchildren needed to pick up the corresponding pictures for small dialogues, listening to the audio recording. Then they had to work in differentiated pairs of interests: those who love to travel, love to engage in the same hobby, show an increased interest in the life of the school and their favorite subjects. The trainees made a dialogical statement based on the existing samples, showed educational cooperation in solving questions, were able to start and end

the conversation (communicative UEA); controlled their actions and actions of the partner, showed an interest and tolerant attitude to the life of peers of other countries (regulatory UEA). The results of the observation led to the conclusion that in the process of working on the task in differentiated couples, we formed educational results, expressed in the ability of younger students to work together, listen and hear their interlocutor, to show cognitive activity and creative approach when performing the task, to record information using ICT tools, self-assess and analyze your own actions in a variety of situations.

Thus, with specific examples of assignments, we evaluated the practice of using the forms of work presented in Table 1 on the basis of the selected ICT complex in accordance with the UEA types of the FSES PGE, which is evidence of the successful dynamics of designing a socializing language educational environment that allows us to expand the subject experience of students social creativity.

References

1. Taran, O.S. Socializing language educational environment at school: model design // School of the Future. - 2017. - №4. - August. - p.39-45.

2. Kolesnikova, I.A. Pedagogical design: Textbook. allowance for higher. studies. institutions / I.A. Kolesnikova, M.P. Gorchakova-Siberian / Ed. I.A. Kolesnikova. - Moscow: Publishing center "Academy", 2005. - 288 p.

3. Dakhin, A.N. Pedagogical modeling: the essence, efficiency and ... uncertainty // Pedagogy. - 2003.- № 4.- p.21–26.

4. Taran, O.S. Designing a socializing language educational environment in elementary school: dis. ... Cand. of Ped. Sciences: 13.00.01 / Taran Olesya Sergeevna. - Moscow, 2018. - 248 p.

5. Vorontsov, A. B., Chudinova, E. V. Educational activity: introduction to the system D. B. Elkonin - V.V. Davydov. – Moscow: "Rasskazov", 2004. - 304 p.

培养社会工作专家的实践导向方法：问题和解决方案
PRACTICE-ORIENTED APPROACH IN TRAINING SOCIAL WORK SPECIALIST: PROBLEMS AND SOLUTIONS

Mihailova Tatiana Alexandrovna
Candidate of Pedagogical Sciences, Associate Professor
Moscow State University of Psychology and Education

注解。本文讨论了在新的教育范式中培养具有竞争力的社会工作专业人员的问题。作者侧重于在社会领域的专家培训中使用以实践为导向的培训。注意到以实践为导向的培训作为系统创新的优势。分析了国内外社会教育实践。在分析高等教育机构活动的基础上，确定了现有培训体系在构建社会工作未来专家职业能力过程中的局限性。制定了改进培训未来专家的实践导向系统的建议。本文针对参与社会工作职业教育理论与实践的教师和专家，管理人员，研究人员。

关键词：实践导向，实践导向学习，社会教育，社会工作专家，实践训练，社会领域，专业能力，社会教育，问题导向学习，教育标准，雇主。

Annotation*. The article deals with the issue of training competitive social work professionals in the new educational paradigm. The author focuses on the use of practice-oriented training in the training of specialists in the social sphere. The advantages of practice-oriented training as a system innovation are noted. Foreign and domestic practices of social education are analyzed. Based on the analysis of the activities of higher educational institutions, the author identifies the limitations of the existing training system in the process of forming the professional competence of future specialists in social work. Formulated proposals to improve the practice-oriented system of training future specialists. The article is aimed at teachers and specialists, managers, researchers involved in the theory and practice of vocational education in social work.*

Keywords*: practice-oriented approach, practice-oriented learning, social education, social work specialist, practical training, social sphere, professional competence, social education, problem-oriented learning, educational standard, employer.*

The change of the educational paradigm from knowledge to competency, which has been formalized in the FSES of the latest generations, actualizes the

problem of training graduates who can apply the theoretical knowledge learned during training to solve emerging non-standard production problems. The federal state standard, at present, fixes the strengthening of the applied and practice-oriented nature of higher education, its adequacy to the modern requirements of the economy, science and public life [6, 7]. All this requires the introduction of a new graduate training system, which gives the student the opportunity to acquire relevant personal and activity experience. Practice-oriented approach has several advantages. It allows you to: 1) improve the quality of training of social professionals and bring it in accordance with the requirements of the employer; 2) reduce the period of adaptation of young professionals in the institution and reduce the level of staff turnover; 3) to ensure the attractiveness of the profession; 4) strengthen the motivation of students to the process of learning and self-improvement in the professional aspect; 5) to build a system of partnership interaction between the university and employers, and 6) to expand the educational space through networking.

At the same time, the classical problem of social education, both in domestic practice and abroad, is precisely practice-oriented. The problem of training bachelors of the social sphere is solved in different ways. For example, in Denmark and Norway, the training of specialists is carried out outside the university system, training is conducted by teachers with practical experience, and the movement is "bottom-up" from practice to theory. In England, students are trained in practical institutions for 200 days, they interact with clients, supervisors, and learn how to work in a team. The curriculum plans of the US social work departments for "field work" include at least 50% of school time. In Holland, the emphasis in student learning is on using a problem-oriented method. In Italy, training is given at least 1500 hours, of which approximately 600 hours (40%) are practice. In the UK, practice is not less than 900 hours, which is 60% of the total number of hours [1, 4, 5, 6].

Studying the experience of universities in European countries leads to the conclusion that the basis of training specialists in the social sphere is practice orientation, which is expressed in a number of features [1, 5, 7]:

- practice is given up to 50% of the total number of hours for the entire course of study;
- basic methods for teaching students: the method of problem-oriented learning, cases, projects;
- the learning situation is as close as possible to the real one and its solution gives the student the opportunity to get a holistic view of his future professional activity;
- work of students in a group, team;
- university professors have a long standing of practical work in social institutions, they regard their practical work as a way to increase their promastership.

In FSES 3 ++ (registered on 02.28.2018 at the Ministry of Justice No. 50185) in the direction of preparation for the bachelor degree 39.03.02 “Social Work”, the practice is given at least 720 hours, i.e. less than 10% of the total number of training hours. As you can see, there is quite a big difference in determining the hours for practice abroad and in our country.

In Russian science, the work of such scientists as T.F. Zolotoreva, A.M. Panova, N.B. Shmelev et al. [1, 2, 3]. The analysis of scientific papers allowed us to identify the following areas of practice-oriented teaching of social work: societal and activity approach; continuous practical training; Differential practical training [4, 6, 7]. The content of practical training in them is characterized by the presence of certain priority disciplines that contribute to the formation of certain skills among students and the types of social institutions that are the basis of student practice. Today, there are many scientific papers and publications devoted to resolving issues of organizing and conducting practices that enhance the practical readiness of a graduate to practice [1, 3, 5, 6]. As a solution is proposed:

- an increase in the number of hours devoted to training in practice institutions;
- Conducting study (training) practice on 1 course;
- assigning responsibility for the acquisition of practical skills to mentors and tutors of institutions;
- carrying out practices without discontinuing theoretical training;
- organization of practice based on modular technology;
- creation of conditions on the basis of practice, in which the student realizes the full cycle of work with the client;
- inclusion in voluntary practice;
- development in the course of the practice of social projects taking into account the problem field of social work [3, 6, 7].

The study of practical activities in the implementation of the practice-oriented approach at the University allowed us to identify a number of problems such as:

1) the lack of conditions of practice, which would contribute to its maximum efficiency. A survey of students of 2-3 courses, showed that, unfortunately, in the institutions where they did their work, the workers disregard them. During practice, students often perform only paper monotonous work, while they do not have the opportunity to fully communicate with the client.

2) the content of training during the internship. Practical training of students at universities begins with educational (familiarization) practice and is systematically completed by pre-diploma. One of the objectives of educational practice is to familiarize students with the basics of their future professional activity through familiarization with the working documentation, functional responsibilities of employees. During the implementation of educational practice, the student mainly performs the function of an observer and performs situational tasks. Practice is

"passive", a student cannot show any activity, independence, initiative. And the content of training assumes that only at senior courses, namely during the internship, the student will have such an opportunity. But, unfortunately, in the process of mastering professional skills, students experience certain difficulties. First of all, this is due to the fact that at the lecture and seminar classes mainly theoretical material prevails, there is a discrepancy in the approaches to solving professional problems presented in educational literature and used in social institutions, existing psychological barriers when working with clients, and difficulties in establishing contact with employees. And indeed, if we analyze the training of students in real conditions, we can conclude that the content of the activity of the teacher and the student is determined by the study of educational texts as a set of "knowledge-skills-skills" defined by work programs and subjects. The teacher chooses the most convenient form of concise presentation of the volume and complex material for students and the possibility of its use in practice. The result of the student's learning is the assimilation by him of a certain didactic material, the finding of methods and principles of combining theoretical material into a coherent structure, facilitating the solution of a number of real professional tasks. Accordingly, the student must transfer the received theoretical knowledge and skills to practical activities. The student performs this task under conditions of strict regulation of the transfer of finished material, alienated from the existing practice of solving such problems and taken from the context of independent activity of the individual.

3) the organization of interaction between the university and the institutions of the social sphere, regulated by legal documents, on issues of on-the-job training and involvement of employers in the development of criteria for assessing the professional competence of future specialists after the results of internship. Leaders of social services are not sufficiently motivated to participate in the development of a graduate competency model.

4) the training of teachers-mentors. The head of practice should be a specialist. The profession of social work is very young and the percentage of qualified specialists capable of being heads of internship, mentors for future specialists in the practical field is not very high. Not all specialists want, within their professional activities, to perform additional duties associated with accompanying the practice of students.

The problems identified during the implementation of the practice-oriented approach led to the conclusion that to solve them, it is necessary to build practical training of a specialist on the following principles:

- The relationship of theoretical and practical training. The essence of this principle is that practical training should be a logical continuation of theoretical classroom training or go parallel to it, which will provide an opportunity to more effectively consolidate and work out the theoretical knowledge gained during practical

training. It is the teacher of basic professional disciplines who must be the head of the practice from the educational organization.

- continuity. The student must have a constant immersion in their future profession. This is facilitated by students mastering the skills of analysis, project activities, modeling and design of social systems and processes during the classroom, first. And secondly, the implementation of extracurricular activities, such activities as participation in volunteer activities, work in student scientific communities, the implementation of research together with teachers, involvement in surveys conducted by social institutions.

- sequences. Practical student activities should be phased. At each of the stages, a task should be solved that contributes to the formation of certain professional competences and the result of all activities is the development of professional competencies defined by professional standards. Practical training is provided by programs, methodical recommendations, individual and group tasks, which are complicated from educational practice to undergraduate.

- multifunctionality. The graduate should be able to perform various roles and functions in the implementation of professional activities with different categories of the population. In this regard, the content of the practice of undergraduates should be structured in such a way as to enable the student to master as many professional functions of a specialist in various fields of his activity as possible. As part of the implementation of disciplines teachers need to use the case tasks, the method of projects.

- mentoring. Supervision is a tool to support students during internships in various social institutions. It gives students the opportunity to analyze their perception of professional activities in social work and to reflect on their own attitude towards it. Supervision helps students in their theoretical knowledge to use in practice.

- innovation. When developing programs of practices, it is necessary to take into account areas of social work that are just emerging and have not yet gained great popularity in the labor market, but are promising. Sending students to institutions where there are no specialists, but social services are provided, will give them the opportunity to transfer their theoretical knowledge to the practical field of solving professional problems, show initiative, creativity, activity.

- partnerships. In the course of practical activities, a trusting relationship should be formed between the student and the supervisor, which will allow the student to adapt more quickly to the conditions of the social system establishment, not to be afraid to make mistakes, show initiative and curiosity and thereby improve their professional skills.

In order to more effectively implement a practice-oriented approach, it is necessary:

1. To create in an educational institution a vocational development environment that will enable the student to immerse himself in the world of the profession. Such an environment presupposes the availability of professional equipment, specialized classrooms, teaching by practitioners, holding creative contests, shows, regular interaction with potential employers.

2. Include students in the main types of professional activity through classroom and extracurricular work. To conduct field classes in institutions in the study of disciplines of the appropriate profile and to assist students in the implementation of professional activities in specialized institutions during part-time training.

3. Training students to build on the basis of the implementation of a modular system, which includes a practice-oriented component. Development of theoretical material during educational practice or during the workshop.

4. Use typical professional (competence) tasks in the content of training in accordance with the main activities.

5. Expand the functions of teaching. In the course of practice-oriented training of bachelors of social work, teachers should implement such functions as intermediary, marketing and supervisory.

Thus, practice-oriented orientation in the preparation of bachelors of social work will contribute to the formation of their professional competencies necessary for successful practical work in the social sphere, which will allow the future specialist to be more competitive in the labor market.

References

1. Avchinnikova S.O. Designing educational practice of bachelors of social work in the context of FSES VPO // Vestn. Tomsk State. Ped. Un-ty. - 2013. - Vol. 7 (135). P.180-183.

2. Azizov E.K.; Koposova A.A.; Fedorov, O.G.; Shpinev, A.K. Conditions and factors affecting the professional development and development of social professionals // Social relations. - 2015. - 2 (13). - p. 73-82

3. Evrasova V.V., Fedorov O.G. Modern conditions and factors influencing the training of specialists // A look into the future: ways of human development, social relations and society: Materials of the All-Russian scientific-practical conference. Moscow, 5-6, December 12-13, 2015 / Compiled by: A.G. Kashuba, A.O. Kashuba, E.E. Gorina, O.G. Fedorov; Under the general ed. O.G. Fedorov. - Moscow: Moscow State Pedagogical University, Bibirevo MDGSD, 2015. p. 169-174.

4. Klushina N.P. Theoretical and methodological aspects of practice-oriented training of bachelors of social work // Education. The science. Innovation: The Southern Dimension. - 2014. - № 4 (36). P.107-114.

5. Lvov E.N. Modern concepts and models of vocational training in social work in Russia and abroad // Simbirsky Scientific Bulletin. - 2011. - № 1 (3). p.101-107.

6. Mikhailova T.A. Professional competence of a social sphere specialist: theoretical and methodological approaches // Social Relations. - 2017. - № 4 (23). - p. 111-119.

7. Fedorov, O.G. Modern approaches to the development of innovative competence of social workers // Kazan pedagogical journal. Part 1. - 2015. - №5. - pp. 51-58.

学生管理能力发展的水平和指标 – 未来体育教练

LEVELS AND INDICATORS OF THE DEVELOPMENT OF MANAGERIAL COMPETENCE AMONG STUDENTS - FUTURE SPORTS COACHES

Bernina Yuliya Sergeevna
Postgraduate
Ivanovo State University
Leading Specialist
Training center for national teams of Russia

注解。 本文论述了高等教育体系中专业能力的形成。 介绍了体育教练管理能力的指标和发展水平。

关键词：管理能力； 专业培训;培训师； 培训师的管理活动。

Annotation. *The article deals with the formation of professional competencies in the system of higher education. The indicators and levels of development of managerial competencies of sports trainers are presented.*

Keywords*: managerial competence; professional training; trainer; managerial activity of the trainer.*

In the conditions of transition of the Russian higher education system to new Federal state educational standards of higher education (GEF 3 ++), educational organizations are tasked with the independent formulation of a list of professional competencies corresponding to the direction of training, professional standard (if available), as well as social order - market requirements labor and potential employers.

In this regard, the purpose of our research was the formulation of a list of professional competencies of future sports coaches aimed at shaping graduates' readiness for the successful implementation of all stages of the management cycle (analysis, planning, organization, motivation, control, accounting and correction).

To achieve this goal, we carried out a qualitative content analysis of regulatory legal documents governing the training process and the professional activities of sports coaches in the Russian Federation. We also used data obtained by us in the course of many years of research into the management of coaches in sports [1, 2, 6]. The results obtained allowed us to formulate a list of professional compe-

tencies necessary for future sports coaches for the successful implementation of management functions:

- able to plan the training and competitive activities of athletes at various stages of sports training;

- able to organize training and competitive activities of athletes, the activities of physical education and sports organizations, sports and sports activities;

- owns the methods of accounting, processing and analysis of the results of the training and competitive activities of athletes and other activities of the sports and sports organization;

- is able to exercise control and correction of training and competitive activities, the level of physical, technical, tactical, psychological, and functional preparedness of athletes.

The obtained professional competence can be used in the development of educational programs for the preparation of future sports coaches (bachelor degree, master's level).

In addition to forming a range of professional competencies, educational organizations are tasked with developing diagnostic tools to assess the level of their development of graduates. When creating this tool, we relied on the classification of V.F. Isaeva, who distinguishes four levels of professional competence:

The first level is adaptive - “the system of knowledge and readiness for their use is absent, the relatively successful solution of organizational and activity problems of a practical orientation is connected with its own previous experience and the experience of colleagues; professional activity is based on a pre-established scheme, which has become an algorithm. "

The second level - the reproductive - there is the ability to goal-setting, planning and forecasting the results of professional activity, "there are elements of finding new solutions in standard situations."

The third level - heuristic - “professional activity is connected with the constant search and introduction of new technologies, characterized by greater focus”.

The fourth level - creative - “a high degree of professional performance, knowledge mobility, a high level of technological readiness, analytical and reflexive skills are of particular importance” [4].

The main indicator of the development of professional competences of a graduate is to perform a specific labor function [3, 5, 7]. The results of our research using the working time photography method [1] of sports coaches, as well as the content analysis of regulatory documents allowed us to determine indicators of the development of managerial competencies of future sports coaches (Table 1).

Table 1

Levels and corresponding indicators of the development of managerial competencies of students - future sports coaches

Levels of formation of managerial competence	**Indicators of the development of managerial competence**
МК–1 – able to plan the training and competitive activities of athletes at various stages of sports training	
Adaptive	Обладает общими, неструктурированными знаниями о закономерностях физического воспитанияи спортивной подготовки. Способен в общих разработать «типичный план» (воспроизвести алгоритм) тренировочного занятия, цикла занятий
Reproductive	Обладает знаниями о режимах тренировочных воздействий, сенситивных периодах развития физических качеств, рекомендуемых объёмах тренировочных и соревновательных нагрузок. Разрабатывает текущие, этапные, перспективные планы подготовки спортсменов, соответствующие целям, задачам и планируемым результатам подготовки
Heuristic	Разрабатывает тренировочные планы, планы соревнований, программы предсоревновательной подготовки в соответствии с основными положениями теории и методики физического воспитания и спортивной подготовки. Планирует конкретно оцениваемые текущие и итоговые результаты спортивной подготовки
Creative	Разрабатывает индивидуальные планы подготовки с учётом данных функционального состояния спортсменов, уровня их физической, технической, тактической, психологической подготовленности, внешних данных и имеющихся условий с применением нестандартных форм, методов и средств спортивной подготовки
МК–2 – способен организовать тренировочно-соревновательную деятельность спортсменов, деятельность физкультурно-спортивной организации, спортивные и спортивно-оздоровительные мероприятия	
Adaptive	He knows the basic requirements for the organization of sports training, safety regulations and rules of the chosen sport. Able to independently conduct training sessions. Owns a basic set of forms of organization involved. Able to maintain discipline in class
Reproductive	He knows the requirements for the organization of sports training, safety regulations and rules of the chosen sport. Uses various methods of organizing the students, methods and means appropriate to the goals and objectives of the training.
Heuristic	Applies the right action algorithms to ensure the safety of athletes involved in the training and competitive activities. Carries out the training process, organizes physical education and sports events and competitions with a contingent of different gender, age and fitness level.

Creative	Implements new techniques and technologies in the process of sports training. Organizes joint activities of coaches (other specialists) to optimize the process of sports training and the activities of physical education and sports organizations
MK–3 – owns the methods of recording, processing and analyzing the results of the training and competitive activities of athletes and other activities of a physical education and sports organization	
Adaptive	Conducts the primary accounting and reporting documentation on the implementation of sports training programs
Reproductive	Uses the existing system of standards and methodologies for monitoring the main aspects of athletes' preparedness, keeps records of their own activities and achievements of those engaged in paper and electronic form
Heuristic	Develops and uses forms of accounting and analysis of the results of the training process, competitive activities, individual achievements of athletes. Applies methods of mathematical statistics to analyze the information received.
Creative	Identifies the problems of sports training in the organization, develops activities aimed at solving them
MK–4 – able to exercise control and correction of training and competitive activities, the level of physical, technical, tactical, psychological, functional preparedness of athletes	
Adaptive	Knowledge of the forms of control are absent. Applies "intuitive" forms of pedagogical control of actions, physical condition of the students and environmental factors of the classes.
Reproductive	He knows the content and the ratio of the volume of the training process according to the types and stages of sports training. Applies forms of operational, current and stage control. Uses the existing system of standards and methodologies for monitoring physical fitness involved
Heuristic	Uses the methods of biomedical, psychological and pedagogical control; uses instrumentation control
Creative	Interprets and uses data from biochemical control of blood, functional tests, physical, psychological, and technical-tactical readiness data to make the necessary changes to an athlete's training program.

The above list of indicators is not exhaustive. The work on its replenishment and correction will be continued, and its results are presented in our subsequent publications.

References

1. Bernina Yu.S. Leading the difficulties of professional activities of ski race coaches / Yu.S. Bernina, O.N. Stepanova // Science and School. - 2013. - № 2. - p. 136–139.

2. Bernina Yu.S. Criteria of efficiency of managerial activity of a sports coach / Yu.S. Bernina // Innovative Technologies in Sport and Physical Education: Proceedings of the V Interregional Scientific and Practical Conference with International Participation. – Moscow: Center for Social Forecasting and Marketing, 2016. – p. 49–54.

3. Galimzyanov Kh.M. Formation and assessment of competences in the process of mastering the educational programs of the Federal State Educational Standards of Higher Education: scientific and methodological manual / Kh.M. Galimzyanov, E.A. Popov, Yu.A. Storozhev. - Astrakhan, Astrakhan State Medical University, 2017 – 74 p.

4. Isaev I.F. Professional and pedagogical culture of the teacher: studies. allowance for stud. higher studies. institutions / I.F. Isaev. - Moscow: Academy, 2002. - 208 p.

5. Lozovaya N.A. Formation of research activities of future bachelors in conditions of prolonged mathematics education: dis. ... Cand. of Ped. Sciences / N.A. Lozova. - Krasnoyarsk, Siberian State Aerospace University. Academician M.F. Reshetnev, 2016. - 229 p.

6. Stepanova O.N. Managerial activity of a trainer: types, objects, performance criteria / O.N. Stepanova, A.S. Makhov, E.N. Latushkina, Yu.S. Bernina // Theory and practice of physical culture. - 2016. - № 3. - p. 66-68.

7. Shkerina L.V. Methods of identifying and evaluating the level of formation of professional competencies of students - future teachers of mathematics: a tutorial / L.V. Shkerina. - Krasnoyarsk: RIO KGPU them. V.P. Astafieva, 2015. - 264 p.

德国和俄罗斯童话的民族和语言文化特征
ETHNIC AND LINGUOCULTURAL FEATURES OF THE GERMAN AND RUSSIAN FAIRY TALE

Nechay Yury Petrovich
Doctor of Philological Sciences
Professor at the Department of German Philology
of the Kuban State University
Adamovich Anastasia Aleksandrovna
Applicant at the Department of German Philology
of the Kuban State University

注解。 这项研究以德国和俄罗斯人的口头民间艺术为特色，其内容和形式各不相同。 分析了其起源的特征，与神话的遗传联系，德国和俄罗斯语言文化社区不同时代的形成，以及它在现代语言学中的相关性和研究问题。

关键词：口头民间艺术，童话，体裁，动机，情节原则，语言文化社区。

Annotation. *The study features such kind of oral folk art of the German and Russian people as a fairy tale, which is diverse in its content and form. The features of its origin, genetic connection with myths, the formation in different epochs of German and Russian linguistic and cultural communities, as well as issues of its relevance and research in modern linguistics are analyzed.*

Key words: *oral folk art, fairy tale, genre, motive, plot principle, linguocultural community.*

Among the popular types of oral folk art of German and Russian people are fairy tales that are diverse both in its content and form, as noted by researchers of folk to be directly related to the ancient rites and rituals. According to sources from different periods of time, the term “fairy tale” itself is interpreted in many languages far ambiguously. In Latin, the term “fabula” is polysemantic: *conversation, gossip, subject,* as well as *story*, including *a fairy tale* and a *fable*. In the latter meaning , it is also used in German language. And only in the XVII century. the term "fairy tale" for the first time begins to denote precisely that kind of oral prose, for which, first of all, poetic fiction is characteristic. From this time until the middle of the XIX century fairy tales were perceived as “fun” or entertainment for children and the lower social strata.

In the Russian language until the XVII century, the terms *fable* or *yarn* were used to name this genre of folk art. The German language uses the term *Märchen*, that is, a short story (kurze Erzählung), the origin of which is associated with the word *Mär* or *Märe* (*high, outdated, legend; strange* [incredible] *history*) with the addition of the diminutive suffix *-chen*. In the dictionary of K. Duden it has the meaning of *news Nachricht, the legend of Sage*. In the same form, this lexeme from the XIII century was gradually consolidated in the meaning of "fairy tale". Nowadays in German linguistic culture there is a following definition: "Ein Märchen ist eine ursprünglich überlieferte Erzählung, die wunderbare Begebenheiten schildert. Unter Märchen verstand man unwahre, wunderbare Geschichten, die zur Spürten und zum Zeitvertreib erzählte. [10] That is, a fairy tale is an originally verbally transmitted story in which miraculous events and incidents are described. By "fairy tales" they understood fictional amazing stories that were told for pastime and fun.

Dictionary of the Russian language by S.I. Ozhegov presents a rather succinct but capacious definition: A fairy tale is a narrative, usually folk-poetic work about fictional people and events, mainly with the participation of magical, fantastic forces. [4]

We also note an interesting interpretation in the Brockhaus and Efron Encyclopedic Dictionary: "A fairy tale is also a fantastic story, not tied to time and place, either passed from mouth to mouth (and sometimes in writing), or wandering from people to people, perhaps tied to old myths narrative of folk art (folk tale), or the work of one individual author (literary tale) «. [8]

Many German linguists, including the brothers Jacob and Wilhelm Grimm, also studied fairy tales comprehensively. They wrote, for example, the fairy tales "Snow White and the Seven Dwarfs", "Golden Goose", "The Brave Tailor", "The Bremen Town Musicians", "The Twelve Brothers", "Hansel and Gretel", "King Thrushbeard", "Snow Maiden", "Golden Key"and many others.

By the beginning of the XIX century both languages had a huge number of fairy tales. This kind of situation has become a pretext for a broad analysis of the historical background itself and a clear classification of this genre of oral folk art. One of the first researchers that began this work was A.N. Afanasyev, who laid down a plot principle, as well as the principle of the hero's typification in his classification. According to the first principle, he singled out chain tales; tales about animals; fairy tales and domestic fairy tales.

The German researchers, for example, Wilhelm Max Wundt, were also engaged in the problem of classification of fairy tales in his work «Psychology of People. The study of the laws of language development , myths and customs» he divides the fairy tales as follows: mythological fairy tales (Mythologische Fabelmärchen); pure fairy tales (Reine Zaubermärchen); biological tales and fa-

bles (Biologische Märchen und Fabeln); pure animal fables (Reine Tierfabeln); fairy tales «about the origin» (Abstammungsmärchen); humorous tales and fables (Scherzmärchen und Scherzfabeln); moral fables (Moralische Fabeln). [11]

Russian researcher R.M. Volkov in his work "The Tale. Research on the plot of a folk tale" represents a slightly different vision of this issue. Along with the classification of fairy tale plots, and he has 15 of them, he also presents an analysis of individual fairy elements, calling them motives. These, in his opinion, include the personal qualities of the heroes (for example, "two brothers are smart, and the third is a fool"), their number ("three sisters", "three brothers"), due to the laws of the genre actions and acts of fairy-tale characters, magical creatures as well as items. [1] However, according to V.Ya. Propp, all the classifications listed above have their flaws, since they are based not quite on correct signs and principles of division. As a differential characteristic, as the scientist states, it is necessary to use the structural principle. Defending his point of view, he believes that all fairy tales differ in certain structural laws and, regardless of the plot, the details of the fairy tale have common types of structure. Actually, he considers only a fairy tale, justifying it by the fact that it is a story built on the alternation of functions in different forms, with some of them missing for each story and repeating others. [6] From this it follows that a fairy tale should be singled out not on the basis of magic or miraculousness, but on a completely clear composition. In his work V.Ya. Propp singles out and presents 31 functions in a non-repressive way.

In fairy tales about animals, and they are usually of satirical or humorous content, the characters mostly represent images of people and their relationships. Their most common character is a sly fellow, a cheater (hare, fox, raven, spider, etc.).

In domestic fairy tales, popular characters are people of various professions and occupations: soldiers, potters, carpenters, blacksmiths, peasants, and so on. In these tales, the negative characters' desire for enrichment, their greed, avidity, is condemned, which ultimately leads to the loss of human face and crime.

By their significance, for conducting scientific research, the most valuable material is represented by fairy tales, that directly reflect the mental processes of the collective unconscious. Their archetypes, presenting the most simple and concise manner, show us the key for understanding the processes taking place in the collective psyche. At the same time, it should be noted that the question of studying a fairy tale, its language specificity and especially genres in modern linguistics remains open until now. The reason for this is the existing difficulty in determining its genre.

The XVIII century was a turning point in the study of fairy tales. This time was not only the beginning of their purposeful gathering, but also the time of the first attempts to interpret their content, including by such scientists as I.I. Winckelmann, I.G. Gaman, I.G. Herder, K.F. Moritz and others. For example, K.F. Moritz

presents their interpretation from a poetic position, and I.G. Herder sees them as a symbolic reflection of ancient forgotten beliefs. Along with this, there was another direction — the symbolic school, the most famous representatives of which were F. Kreuzer (F. Creuzer) and J. Görres. In this case, we witness an intense desire of thinkers of that period to search for something new, more life-affirming and obvious disappointment in Christian doctrine.

An analysis of a significant number of fairy tales makes it possible to note that in a classical fairy tale a rather rigid and ordered structure is created of two, and mostly of the character's three tasks. In almost every fairy tale, the first task, which then leads to a miraculous resource, is a kind of threshold to the main heroic act. Sometimes there is a third stage, a kind of clarification or identification of the winner. The final ending, as a rule, is the marriage with a princess and the receiving of half a kingdom. A magic fairy tale, according to our observations, almost always begins with a certain “trouble”, i.e. with violations of prohibition, abduction, separation and so on. Then a hero appears, setting off on a quest, encounters a donator on the way, who gives him magic items and the like. Some actions may be missed or changed, but the structure is always preserved.

A distinctive feature of a fairy tale is a fiction, as V.Ya. Propp states. Some of the fairy tales were also originally associated with myths and had magical meaning. This tale creates a special magical world, living by its own laws. The events taking place in it are impossible in real life. It weakly reflects real life, and everything that comes from reality has the trait of “secondary education” [7].

A character in a fairy tale can appear as a result of various transformations and magic, for example: “he turned like a wolf”, “went to his right ear — washed himself, to the left one — equipped himself and became more beautiful than earlier”, “she turned into a frog”, “Und so verwandelte der Schwan Gwidon mit einem Spritzer des Wassers in eine kleine Mücke", "Er trank und wurde ein Böckchen", etc.

In both the German and the Russian fairy tales, not only space, but also the time of the event is unrealistic, for example: “once upon a time there were”, “once upon a time there was”, “l once upon a time there lived”, “Es lebte einmal”, “Es war einmal", "Einst lebte", "Es ging einmal", "Es war einmal", etc., it is closed and exists only within the fairy tale itself. The space of a fairy tale, according to D.S. Likhachev, is special, different, as the "space of a dream", it is unreal and conditional. [2, p. 338]

Notable is the fact that German and Russian fairy tales have a great similarity. There are good and evil characters in them. The evil itself is represented by unreal, scary and vile monsters. First of all, these are witches (Hexen): the most famous of them is the Grimm brothers “Hansel and Gretel / Hänsel und Gretel” (the diminutive German names from Johann and Margarita). The story of teenaged brother and sister threatened by a cruel ogre witch living deep in the forest.

German mythology there was a belief that once a year on Walpurgis Night

from April 30 to May 1, witches on brooms and forks flew to Mount Brocken. It was believed that at the time, when the grasses acquired a miraculous power, there was a coven of witches.

In Slavic mythology, the night of Ivan Kupala was considered to be a time of witch gatherings. In addition, the witches gathered at the solstice on Kolyada and at the meeting of spring, that is, on the most important pagan holidays. The mountains for the pagan Slavs were sacred places of sacrifice and games. Flying up the Bald Mountain, the witches, as it was believed, indulged in wild rampant and amorous pleasures, gorged, drank, sang songs and danced to the sound of discordant music. [9] In its negative aspect, the Witch is secretive, aggressive and cunning. Therefore, in fairy tales, they often live far from people as recluses - in a forest or in a swamp. Witches are the magician in "Yorind and Jorindel / Jorinde und Joringel", the godmother in "Rapunzel / Rapunzel", the cook in "Found / Fundevogel". The witch's manner and actions had the stepmother from "Snow White / Das Schneewittchen" and the fairy tale "Brother and Sister / Brüderchen und Schwesterchen", the evil Wolf from the fairy tales "Wolf and seven kids / Der Wolf and die sieben Geißlein" and "Little Red Riding Hood / Rotkäppchen". Two characters of the fairy tale "Bluebeard / Blaubart" and an evil wizard from the fairy tale "The Fowler Bird / Fitchers Vogel" are distinguished with particular bloodthirstiness.

Our observations indicate that already in those distant times the German Witches (Hexen) lived in neat, pretty, nice houses. Their houses are made of cookies, cakes and sugar, for example, in the fairy tale "Die zwölf Brüder": "... es war aber ein kleines Gärtchen an dem verwünschten Häuschen, darin standen zwölf Lilien Blumen / And behind the bewitched house there was a small garden, and twelve lilies grew in that garden. " They are predictable, consistent and, of course, responsible. They always have the order "Ordnung muss sein", "Ordnung ist das halbe Leben", tidiness, everything is highly organized, everything has its place. All this sheds light on the process of the birth and preservation of the mentality of the German nation.

The world of fairy tales is wide and diverse: the Heartless, White Wolf, Benedict and the Lord of the Dwarfs; Lean and wasteful; Hamelnian rat catcher; Talking donkey; Golden sheep; How the boy learned to conjure; Royal shepherd; Swan Lake; The dwarf lord and his bride; Tailor Hans and Know-It-All Beasts; Mermaid; Rubezahl and Anna; Strongman Gottlieb; Hide-away hat and many others.

The Russian fairy-tale world abounds with no less diversity of characters: Baba Yaga, White Duck, Vasilisa the Beautiful, Magic Pipe, Magic Ring, Geese Swans, Enchanted Queen, Ivan Tsarevich and the Gray Wolf, Kroshka Khavroshechka, Little Boy, Morozko, Sea Tsar and Vasilisa the Wise, Nikita Kozhemyaka, Sister Alyonushka and brother Ivanushka, Sivka-Burka, Tale of rejuvenating apples and living water, Snow Maiden, Tsarevna Frog, etc.

The traditional element of the tale is the beginning, which most often starts with

the words: “Once upon a time, there was; there were ... "," In a certain kingdom, in a certain state there lived - there was a king ... "," Vor einem großen Walde wohnte ein armer Holzhacker mit seiner Frau und seinen zwei Kindern ". In the magic fairy tales, the beginnings are more expanded: "In a certain kingdom, in a certain state, there was a king ...". But quite often fairy tales begin directly with a description of the action: “Once a hermit fell into a trap ...” «Hinter dreimal neun Ländern, im dreimalzehnten Zarenreich, in einem berühmten, mächtigen Staat lebte einmal ein mächtiger Zar», «In alten Zeiten, es ist schon lange her, hatte ein Zar drei Söhne» etc.

In fairy tales, there are also peculiar endings that sum up the development of a fairy tale action. “They lived happily ever after”, “Da hattenle Sorren ein Ende herrlich und in Freuden, wurden reiche Leute und tranken und aßen zusammen wie früher / After that, the king and his queen and the goatling began to live happily and continued to drink and eat together», «und wurden reich, und ihr Lob war in aller Munde / And they began to live in harmony with peace and love» etc. Fairy tales abound also in repetitions (quite often they are not literal). In each new one, individual parts can be found that not only contribute to the approaching fairy tale action to the denouement, but also reinforce the reader's impression of the action, for example: “Sie gingen und gingen und gingen ... /” Sister Alyonushka and brother Ivanushka walked, walked, walked ...”etc. At a close examination of the features of a fairy tale, the presence of a more developed plot of action is also noted, which is not typical of tales about animals and social and domestic tales. Plots of fairy tales created on a chain of wonders. It is impossible not to touch upon the fact that in both German and Russian fairy tales, the reader is presented with colorful pictures of the inner life of the people and their relationships in which the vices of society are ridiculed, the oppressed and underprivileged are defended, and the people aspirations for justice and the triumph of good over evil are represented.

In German fairy tales, there is a close proximity of the miraculous, the fantastic with the everyday, the real. The reader will see pictures of genuine events, cities, kingdoms, forests and provinces. Intertwined closely, these paintings create a vivid image of old Germany, its history and nature.

Thus, the world of fairy tales is very diverse, which makes it be one of the oldest forms of verbal art. This is the most popular and democratic form of verbal art among all nations of the world. Each nation invests in it its own specific life and social philosophy, determined by life and history. Meanwhile, the tale is understood absolutely by everyone. It freely passes all language boundaries, from one nation to another, and is preserved alive for thousands of years. [5]

No less important is the fact that the period of "life" of this genre of folk art is very long. It was created for centuries and transformed from one generation to another. Fairy tales represent not only the most varied artistic means of language (epithets, personifications, repetitions, songs, figurative expressions), but also

techniques of an improbable image of reality (fiction). Traditional forms of fiction have been formed for a long time and in close connection with the way of life of the German or Russian people. [3]

However, despite a certain difference between German and Russian fairy tales, there are many similarities, for example, similarities of aspirations, desires and hopes, which is also indicated by the coincidence of ideals and conflicts in the lives of both nations, that is, the opposition of poverty and wealth, intelligence and stupidity hard work and laziness. In both German and Russian fairy tales, in the end, there is necessarily a place for morality, most often it comes down to the fact that a person who behaves well in this life, does good, is rewarded and everything works out for him. There is no doubt that Russian fairy tales reflect the color of Russian cultural tradition, history and province. And the German fairy tales embody, of course, the life of the German countryside and cultural traditions.

References

1. V.Vokov, M., Tale. Research on the plot of folk tales. Odessa: State Publishing House of Ukraine, 1924. - 238 p.

2. Likhachev D.S. Poetics of ancient Russian literature. Moscow: Nauka, 1979. - 376 p.

3. Nechay Yu.P., Shishkina A.G. German and Russian mentality and ethnic culture in the linguistic space // Cognitive mentality paradigm in the ethno-linguistic and cultural space. Collective monograph. Maikop: ASU publishing house, 2015. pp. 175-194.

4. Ozhegov S.I. Dictionary of the Russian language / Ed. N.Y. Swedish. - Moscow: Russian, 1983. - 750 p.

5. Propp V.Ya. The historical roots of the fairy tale. - Moscow: Labyrinth, 2000. - 361 p.

6. Propp V.Ya. The morphology of the fairy tale. The historical roots of the fairy tale. - Moscow: Labyrinth, 1998. - 512 p.

7. Propp V.Ya. Transformations of fairy tales // Russian fairy tale. - Moscow: Art, 1992. - 127 p.

8. Brockhaus and Efron Encyclopedic Dictionary // Publisher: Russkoe Slovo. - Moscow: Big Russian Encyclopedia, 1996. - 272 p.

9. Encyclopedia of Russian magic // Magic and sorcery. Spb: Respex 1999. - 456 p.

10. Wilpert G. Sachwörterbuch der Literatur. Stuttgart, 2000. - 925 p.

11. Wundt Wilhelm Max Völkerpsychologie. Eine Untersuchung der Entwicklungsgesetze von Sprache, Mythos und Sitte. Leipzig: Wundt Wilhelm Max, 2012. - 694 p.

SELF-REGULATION OF PERSONNEL BEHAVIOR IN ORGANIZATIONS WITH DIFFERENT STANDARDS OF TIME REGULATION

Kuzmina Olga Viktorovna
Candidate of Psychological Sciences, Associate Professor
Ural State Economic University
Vorobyeva Marina Anatolyevna
Candidate of Psychological Sciences, Associate Professor
Ural State Economic University

注解。俄罗斯的现代市场条件表明，需要对时间调节采取自然态度，作为提高劳动生产率和活动组织有效性的机制。自我调节行为是质量工作的条件之一。本文介绍了一项实证研究的结果，该研究可以区分具有不同时间调节的组织中员工行为的自我调节特征。在缺乏精确时间调节和可自行规划时间的组织中，员工注意力集中在专注于专业活动，遵守法律和道德规范以及劳工标准的愿望上。在具有明确的外部临时监管和劳动标准化的组织中，员工需要能量和灵活性。由此产生的研究将帮助管理者站在工作组织体系中，同时考虑到员工的个人特征

关键词：行为自我调节，人员，组织，时间规范的调节，时间的组织。

Annotation*. Modern market conditions in Russia suggest the need for a natural attitude to the regulation of time as a mechanism for increasing labor productivity and the effectiveness of the organization of activities. Self-regulation behavior is one of the conditions for quality work. The article presents the results of an empirical study, which allow to distinguish features of self-regulation of the behavior of employees working in organizations with different time regulation. In organizations with a lack of precise time regulation and availability of the possibility of self-planning of time, employees are attentive, manifested in focusing on professional activities, a desire to comply with legal and moral norms and labor standards. In organizations with a clear external temporary regulation and standardization of labor, employees need energy and flexibility. The resulting research will help managers to stand the system of work organization, taking into account the personal characteristics of staff*

Keywords: *self-regulation of behavior, personnel, organization, regulation of the norms of time, organization of time.*

Analysis of the system of professional activity shows that the time factor is inherent in all objective actions. Any activity is a system of movements sequentially distributed in time. In domestic and foreign psychology, a lot of research has been done on the analysis of various features of the temporary organization of professional activity. Time, or rather the ability of a person to use it rationally, is a prerequisite for successful work.

In the psychology of labor defined the concept of time mode. As a result of the analysis of professional activity, from the point of view of the organization of time, the time regimes in which one has to work are determined [1]. However, as T.A. Nestik notes, the study of time in an organization is a difficult task, since science has not sufficiently developed the methodological foundations of complex time phenomena and there is no theory of time in an organization that allows the researcher to track key characteristics of time [3].

To study the peculiarities of self-regulation of employees in the organization, together with I.Galanova, an empirical study was conducted at the bases of ANO "Association" Dentistry "(the first group of employees) and "Northern Tram Depot" (the second group of employees). These organizations differ from each other in terms of time regulation.

The following techniques were used as diagnostic tools: the scale “Organizational norms of time” (M.Lerner, S.Zara and J.Kohavi-Gal (adaptation by T.A. Nestik)) [3], questionnaire “Style of self-regulation of behavior” (V.I. Morosanova, E.M. Konoz [2], a questionnaire for identifying the severity of self-control in the emotional sphere, activity and behavior (G.S. Nikiforov) [4], a questionnaire of volitional qualities of the personality (M.V. Chumakov) [5]. Statistical data processing was performed using the non-parametric criterion for differences U - Mann-Whitney. The study involved the participation of employees of related professions of the “person-to-person” group engaged in customer service (administrators, supervisors), a total of 40 people. The study was carried out in two stages. At the first stage, differences were studied that manifested themselves in the organizational norms of time in the organizations studied. The second stage was devoted to the study of the peculiarities of the self-regulation of employees in each of the organizations surveyed and the identification of correlations between the regulation of organizational time and the self-regulation of the personality of employees.

The results of the comparison of the organizational norms of time are presented in table 1.

Table 1 - *Statistical differences, manifested in the organizational standards in the surveyed organizations*

Compare Indicators	Average rank 1 group	Average rank 2 group	U – Mann-Whitney	P-significance
Planning and meeting deadlines	21,93	19,08	175,5	0,438
The inability to independently organize their working hours	15,95	25,05	**109**	0,012
The need to coordinate their efforts with the work of colleagues	20,1	20,9	192	0,825
Lack of time	23,73	17,28	**135**	0,051

Note: statistically significant differences are highlighted in bold.

The results of table 1 confirm the existence of differences in the organization of time in these organizations. The employees of the second organization, in contrast to the first, to a greater degree lack the possibility of independent organization of their working time (U = 109, with p = 0.012). These employees cannot set their own work schedule. The pace of work is determined by the labor process and the employee must fit into the given norms. Representatives of the second group have a great opportunity to work at their own pace and plan their professional activities. This group of workers is more aware of the lack of time, unlike the employees of the first group, where time is strictly regulated (U = 135, with p = 0.051). For specialists of the second group, time seems too stressful, most of the staff do not have enough time to rest during the working day.

Thus, the carried out statistical analysis confirmed the difference in the regulation of time in organizations in the presence of the possibility of independent organization of time and the sense of scarcity and tension of time.

At the second stage of the study, a comparative analysis of the features of self-regulation among employees of these organizations was carried out. The results are presented in table 2.

Table 2 - *Statistical differences of self-regulation of employees of the organizations under study*

Method name	Compare Indicators	Average rank 1 group	Average rank 2 group	U – Mann-Whitney	P-significance
Questionnaire to identify the severity of self-control in the emotional sphere, activity and behavior	The tendency to self-control in the emotional sphere	21,13	19,88	187,5	0,733
	Propensity to self-control in activity	23,3	17,7	144	0,128
	Propensity for social self-control	24,75	16,25	**115**	0,021
Questionnaire of volitional personality traits	A responsibility	22,43	18,58	161,5	0,281
	Initiative	19,85	21,15	187	0,722
	Determination	21,15	19,85	187	0,721
	Independence	17,15	23,85	**133**	0,052
	Exposure	20,75	20,25	195	0,891
	Perseverance	19,98	21,03	189,5	0,772
	Energy	15,93	25,08	**108,5**	0,012
	Attentiveness	23,73	17,28	**135,5**	0,052
	Purposefulness	20,95	20,05	191	0,803
Style of self-regulation behavior	Planning	23,33	17,68	143,5	0,119
	Modeling	21,63	19,38	177,5	0,536
	Forecasting	19,78	21,23	185,5	0,683
	Evaluation of results	21,03	19,98	189,5	0,772
	Flexibility	17,13	23,88	**129**	0,051
	Independence	16,6	24,4	**122**	0,031
	General level of self-regulation	19,98	21,03	189,5	0,775

Note: statistically significant differences are highlighted in bold.

The results of the table demonstrate the presence of statistically significant differences, manifested in the self-regulation of employees. So, for specialists of an organization in which the possibility of independent organization of time is provided (the first organization), higher social control is characteristic than for specialists of an organization with a strictly regulated time regime (second organization) (U = 115, with p = 0.021). People of the first organization to a greater ex-

tent than the second rely on the standards of the organization, the rules introduced in it, subject to administrative decisions.

In the professional activity of people of the first group, to a greater degree than the second, attentiveness during work is manifested (U = 135.5, with p = 0.052). They are focused on long-term attention, work without distractions and immerse themselves in the business entirely.

Specialists working in an organization with no possibility of independent organization of time are distinguished by independence (U = 133, with p = 0.052), vigor (U = 108.5, with p = 0.012), flexibility (U = 129, with p = 0.051) . The people of this organization are willing to independently master the new, lead a fairly active lifestyle, quickly restore their strength, can work for a long time.

The study of correlations showed the presence of several patterns (Table 3).

Table 3 - *Indicators of statistically significant correlation of indicators of organizational time norms with the self-regulation of employees of the organization ($p \leq 0.05$)*

Compare Indicators	Planning and meeting deadlines	The inability to independently organize their working hours	The need to coordinate their efforts with the work of colleagues	Lack of time
Responsibility	0,324	-	0,328	-
Determination	-	-	-	0,326
Exposure	-	-	0,445	-
Purposefulness	-	-	-	0,288
Flexibility	-	0,301	-	-
Modeling	-	-	0,344	0,313
Programming	-	-	0,447	-

These tables demonstrate the following patterns: 1) the higher the need to coordinate their efforts with the work of colleagues, the more responsible and steadfast employees; 2) the conditions for self-planning and meeting deadlines stimulate employee responsibility; 3) the inability to independently organize their time requires the manifestation of flexibility in behavior; 4) the more the lack of time is manifested, the more decisive and purposeful the employee must be; 5) the ability to program their actions and model the situation has a direct correlation with the need to coordinate their efforts with the work of colleagues.

The results of the study allow us to formulate the following conclusions:

1) Situations of self-planning of their actions, created in an organization, stimulate employees to show attentiveness, manifested in focusing on professional activities, a desire to conform to legal and moral norms and standards that exist in the organization;

2) Situations of the impossibility of independent organization of activities require from the employees manifestations of independence, vigor, flexibility.

The results of the study complement the information about the methods of self-regulation of employees of the organization in various time conditions.

References

1. Kuzmina O.V. Psychology of the temporal competence of the individual in life situations: Monograph. - Yekaterinburg: Information and Publishing Center of the Yekaterinburg Diocese. 2017. - 204 p.

2. Morosanova V.I., Konoz E.M. Style regulation of human behavior // Questions of psychology. - No. 2. - 2000. - P.118-127.

3. Nestik T.A. Attitude towards time in small groups and organizations. - Moscow: Publishing House "Institute of Psychology, RAS", 2011. – 296 p.

4. Psychology of communication. Encyclopedic Dictionary / Ed. A.A. Bodaleva. – Moscow: "Kogito-Center", 2011.

5. Chumakov M.V. Diagnostics of volitional personality traits // Psychological Issues. - № 1. - 2006. - P.169-178.

纺织品设计作为塑造建筑环境艺术形象的手段
TEXTILE DESIGN AS A MEANS OF SHAPING THE ARTISTIC IMAGE OF THE ARCHITECTURAL ENVIRONMENT

Salakhov Rasykh Farukovich
Candidate of Pedagogical Sciences, Associate Professor
Kazan State Institute of Culture
Merzlakova Valentina Olegovna
1st year undergraduate student
Kazan State Institute of Culture

注解。 文章讨论了建筑环境对社会心理素质的影响。 对现代建筑对象进行了分析，揭示了表达艺术形象的技巧。 作为对环境形象的翻新，作者考虑了工业用纺织品以及未来使用它的可能性。 作者还谈到了建筑中纺织品起源的主题。
关键词：艺术形象，建筑环境，装修，环境设计，纺织品，睡眠区。

Annotation. *The article discusses the influence of the architectural environment on the psychological qualities of society. There is an analysis of modern architectural objects, and the techniques of expressing the artistic image are revealed. As a renovation of the image of the environment, the author considers industrial textiles and the possibility of using it in the future. The author also touches upon the theme of the origin of textiles in architecture.*
Keywords: *Artistic image, architectural environment, renovation, design of the environment, textiles, sleeping area.*

The modern city is a complex phenomenon that includes historical, economic, political and cultural aspects. In the context of increasing urbanization, intensified research of urban space in various directions, including in terms of architecture and urban planning. Over the past half century, tremendous social changes have taken place in our country: millions of people have moved from villages to cities, and in the cities themselves - from barracks and communal apartments to separate apartments in high-rise buildings in residential areas. Rapid urbanization has exacerbated social tensions in society: the active growth of the urban population demanded an accelerated pace of housing construction. The housing problem of the majority of the population was solved by “overcoming the excesses in architecture and construction”. As a result, sleeping areas with impersonal block houses

resembling each other, called “Khrushchev’s” in Russia (Soviet model series of residential houses, massively built in the USSR from the late 1950s to the early 1980s), replaced the Empire style. Impersonal and sometimes aggressive environment of panel houses, unfortunately, turned out to be a problem not only aesthetic. Gray architecture began to have a certain impact on the psychological state of people, namely: sleeping areas that form a dull, depressed habitat, began not only to produce their marginals, but also to attract others. And any marginal population, as is known, is only a consumer of its resources.

The increase in the volume of such buildings and the number of people living in the so-called residential areas, led to the actualization of the theme of renovation of these areas. Architectural structures built in the second half of the twentieth century, have lost their imagery - the main quality of art. Consequently, the dullness and monotony of urban architecture affected the aesthetics of the city, the psychological state and the health of the inhabitants.

At present, most of the housing stock of large and medium-sized Russian cities is made up of mass typical buildings. [6]. Typical development arrays are large formations characterized by a primitive layout, a poor set of spatial solutions, functions and types of apartments. City suburbs with typical housing have similar negative characteristics regardless of the city or country: grayness and facelessness of typical development, lack of organization of the subject-spatial environment, lack of culture of living in the area.

Mass development is deprived of the subtext of an individual figurative form, which has a decorative and aesthetic function. A.I. Ikonnikov argues that “... a sign of architecture that separates it from the types of construction activities that solve narrow-building tasks is pre-programmed information that is laid into works. This information has social and cultural, emotional and aesthetic content, important for the practical orientation of people, for the formation of their psychological attitudes and the education of the individual” [3, p. 5-6]. Thus, according to A.I. Ikonnikov, only that which is of information and aesthetic value for society can be called architecture, and everything else is just a “construction object”. The search for means of creating expressive, high artistic qualities of the urban environment is becoming one of the central tasks of modern architecture [7, p. 282]. Consequently, in addition to the functional significance of architecture, it is also necessary to consider its artistic image as the cultural aspect of the architectural and spatial environment. Having studied this process, the architect gets the opportunity to lay artistic and aesthetic information into the work.

A composition of elements that are artistically meaningful, expresses an associative, metaphorical, semantic content, carries a vivid image, organizes the aesthetic form of the architectural environment. An example is the architecture of the modern era, when each building is an individual artistic way. This does not mean

the need to return to the past, especially since the architecture of the beginning of the 20th century has already passed the experience of rethinking historical tradition. In the conditions of rapid change of society, his real needs also change rapidly. The artistic side of the environment is just as functional and constructive as a time-variable category. The artistic image of the environment should correspond to the time in which the specific architecture is created, and actively emphasize the subject and purpose of the environment. Therefore, architecture built in the 20th century needs a new rethinking. In this sense, the problem of the content of the artistic image in architecture becomes particularly relevant.

Many countries are engaged in solving this problem, including at the state level. As for Russian realities, they especially need to decorate the facades of buildings built 50-60 years ago. The solution to this problem can be a temporary harmonization of the space of sleeping areas with the help of textile design. The use of durable and practical facades of architectural textiles will allow to maintain the appearance of buildings in a decent form for many years. Textiles - relatively budgetary material - can be effectively used in the transformation of the external appearance of the urban environment.

The history of the use of textiles in the architectural environment dates back to ancient times. Initially, these were primitive shelters that were used by ancient people more than six hundred thousand years ago. They were erected from hunted items such as hides and bones. Examples of such structures are Mongolian yurts, Koryak yarangs, Bedouin tents, tents of Roman legionnaires, etc. The first example in history of a bold solution of textile structures is the Colosseum. On its walls are preserved brackets, which served as supports for rods, to which, with the help of ropes, a giant silk awning-canopy — a velium — was attached, protecting the audience from the scorching rays of the sun. Later circuses became common, where the design of a stretch circus tent made it possible to create large spatial structures with a minimum of materials. At the peak of popularity were used tent circuses that could hold up to 10 thousand people [8].

From the middle of the 20th century, for architects, textiles are a material capable of embodying their vision of modern structures, the organization of the urban environment and objects that provide a higher quality of life, both in terms of comfort and in the effectiveness of sociocultural communications.

Among the modern buildings, which are based on the design of the fabric, emit tent, cable-stayed, membrane structures. Their use in the construction of large sports and exhibition buildings, airport coatings, railway stations, stops is justified both from a functional point of view and from an economic point of view:

- Textile constructions are built quickly, and their service life is very long;
- architecture with the use of textiles has a wide range of forms and purposes, for the implementation of which various materials and accessories are used;

- the fabric is transparent to light. From the side of the premises one can observe what is happening on the street. The mesh structure of the material involves the creation of light effects. Moreover, the illumination is carried out from the inside, which is impossible for the facades of their dense materials;

- fabric facades - this is a great opportunity to quickly transform the appearance of old buildings, to protect pedestrian zones and platforms of stations by canopies;

- textile facades are used as a giant advertising banner: on the grid, covered with PVC, photo printing is applied advertising images.

Textiles can be used both in new construction and installed on already existing buildings in order to veil the unattractive facades or drastically change their appearance, for example during the reconstruction and conversion of industrial, transport, storage and commercial buildings. The dynamism of modern life is different than before, and textile structures, responding to this dynamism, make it possible to introduce changes (technological and economic) adequate to their time.

Despite the long history of using textiles as a building material, modern tent architecture is a relatively recent phenomenon that has yet to reveal its shaping potential.

The study of textiles as an innovative material for the environment has shown that textiles in the environment with time can become one of the most common materials, due to its properties, allowing to achieve a unique artistic image of the environment. Also, when interacting with other materials as a frame, it allows you to create relief and three-dimensional structures in the environment. The advantages of using textiles in an architectural environment, such as low cost, building mobility and safety in case of collapse, were also identified.

Due to its variability of use and as a carrier of additional information (color, texture, graphics, etc.), textiles introduce unusual color and plastic solutions to the environment. Therefore, as a conclusion, it can be noted that the inclusion of textiles as a means of organizing the subject-spatial environment has unlimited possibilities.

References

1.Architekton: news of universities. - Access mode: http://archvuz.ru/2010_22/40 (Date of appeal 11/21/17).

2. Vafina D.D. Design of a postindustrial society: thesis / KGASU, design faculty. - Kazan, 2015. - 101 p.

3. Ikonnikov A.I. Function, form, image in architecture. - Moscow: Stroiizdat, 1986.– 288 p.

4. Complex of urban policy and construction of the city of Moscow. - Access mode: https://stroi.mos.ru/unikalnaya-arhitektura/mir/arkhitiektura-bibliotieki-v-saudovskoi-aravii-soiedinila-vostochnyie-traditsii-i-zapadnyie-tiekhnologhii (Date of appeal 15.01.18).

5. Mikhailov S.M. Design of a modern city: a complex organization of the subject-spatial environment. - Moscow: Education, 2011. - 362 p.

6. New News. - Access mode: http://www.newizv.ru/society/2005-11-18/35503-udar-v-glaz.html (Appeal date 02/24/18).

7. Sergeev A.V. Modern trends in the organization of the subject-spatial environment of urban areas // Man in the world of culture: research, forecasts: materials of the Intern. scientific of the congress (Kazan, April 17-18, 2007) / KGUKI.– Moscow: VINITI, 2007.– P. 282-287.

8. Architime. - Access mode: http://art-on.ru/rubric/architecture/68563.html/ (Date of appeal 07.03.18).

慢性牙龈炎青少年不同形式的杀螨剂的临床疗效
CLINICAL EFFICIENCY OF DIFFERENT FORMS OF PARODONTOCIDE IN ADOLESCENTS WITH CHRONIC GINGIVITIS

Dzech Olga Yurevna
Applicant at the Department of Pharmacology
Belgorod National Research University
Lazarev Alexey Ivanovich,
Professor at the Department of Otorhinolaryngology
Kursk State Medical University,

注解。 本文介绍了慢性牙龈炎青少年牙周指数动态变化的研究结果，以及各种一些牙周病药物剂型的使用。 该研究调查了84名年龄在14至17岁的青少年，其中59名女性（70.2%）和25名男性（29.8%）没有影响炎症性牙周病发病机理的一般躯体病理。 对照组由40名临床健康患者组成。 根据牙周指数的临床症状和动态，发现所研究的具有抗菌作用的药物组合与基础治疗相比更有效，而两种药物治疗方案具有更高的临床效率：metrogyl denta gel + spray或metrogyl denta + parodontocid凝胶。

关键词：青少年慢性牙龈炎，parodontocid。

Annotation*. The article presents the study results of the dynamics of periodontal indices in adolescents with chronic gingivitis on the use of various parodontocid dosage forms. The study surveyed 84 adolescents aged 14 to 17 years, including 59 females (70.2%) and 25 males (29.8%) without general somatic pathology affecting the etiopathogenesis of inflammatory periodontal diseases. The control group consisted of 40 clinically healthy patients. Based on the clinical symptoms and dynamics of periodontal indices, it was found that the studied combinations of drugs with antiseptic effects were more effective compared to the basic treatment, while two pharmacotherapy regimens had greater clinical efficiency: metrogyl denta gel + spray, or metrogyl denta + parodontocid gel.*

Keywords: *chronic gingivitis in adolescents, parodontocid.*

Introduction. The widespread prevalence of various forms of chronic gingivitis (CG), including among adolescents, determines the relevance of this disease. The disease with progression and lack of adequate treatment, progresses and be-

comes strong to result in disorders of the periodontal connection and ultimately leads to the loss of teeth at a later age. Teenage 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 (Berezina N.V. et al., 2014; Loktionov A.L. et al., 2015; Uspenskaya MN et al., 2012).

Of particular relevance is the development of methods of pharmacotherapy of inflammatory periodontal diseases in adolescence. In this regard, drugs of plant origin are of particular interest, however, the effectiveness of various dosage forms of such drugs remains quite disputable. The pharmacological effects of such drugs are primarily due to their composition: esters, aromatics, oils, phenyl salicylate, thymol, eugenol, etc. (Gavrilyuk V.P. et al., 2011; Yudina N.A. et al., 2012)

The aim of the study was the clinical evaluation of the efficiency of various parodontocid dosage forms in chronic gingivitis in adolescents.

Material and methods. The study included 84 adolescents aged 14 to 17 years, including 59 were females (70.2%) and 25 males (29.8%) without general somatic pathology affecting the etiopathogenesis of inflammatory periodontal diseases. Of the total number of patients examined, 19 people (22.6%) were at the stage of orthodontic treatment. The control group consisted of 40 clinically healthy patients.

All patients underwent a comprehensive clinical and X-ray examination of the condition of periodontal tissues, as a result of which 54 patients (64.3%) were diagnosed with chronic generalized catarrhal gingivitis, and 30 patients (35.7%) were diagnosed with chronic generalized hypertrophic gingivitis.

The criteria for inclusion in the study were: age range of 14 to 17 years, a verified diagnosis of CG, the presence of concomitant pathology in remission, the absence of oncopathology, tolerability of pharmacological drugs used in the study, written consent to participate in the ongoing studies. Randomization of patients with CG was conducted by sex, age, comorbidities.

Of multiple indices for assessing the state of periodontal tissues and the efficiency of therapeutic measures taken at the moment of the beginning and the end of therapeutic measures were used: hygiene index (PMA), community *periodontal index* of treatment needs (CPITN), Muhleman bleeding index (SBI), simplified Greene-Vermillion oral hygiene index. Index evaluation indicators were studied dynamically in the process of follow-up of patients. All patients according to the treatment were divided into 4 groups (table 1).

Table 1. - *The disposition of patients with chronic gingivitis according to the treatment*

1	Group of patients	Pharmacotherapy scheme	Number	
			Abs.	%
1.	1 group	Basic treatment	20	23,8
2.	2 group	Basic treatment + metrogyl denta gel + parodontocid solution	23	27,4
3.	3 group	Basic treatment + metrogyl denta gel + parodontocid spray	21	25,0
4.	4 group	Basic treatment + metrogyl denta gel + parodontocid gel	20	23,8
Total			84	100
Control group			15	

Group 1 (20 patients) received basic treatment that included professional oral hygiene, anti-inflammatory, antibacterial therapy (metrogyl denta gel), physical therapy;

Group 2 (23 patients) - in addition, as part of the basic treatment, received a parodontocid solution (as a daily rinse, 2-3 times a day (morning and evening) after teeth brushing, 15–20 drops, diluted in a ⅓ cup of warm water, within 1-3 minutes. Exposure of the drug 10-15 minutes, 2-3 times a day, for 7-10 days).

Group 3 (21 patients) - in addition to the basic treatment received a parodontocid spray (for irrigating the mucous membranes of mouth and gums, the vial is held in a vertical position, sent and sprayed into mouth by pressing 1-2 times on the dispenser. Exposure of the drug 10– 15 minutes, 2-3 times a day, for 7-10 days);

Group 4 (20 patients) - in addition to the basic treatment a parodontocid gel (after careful hand scrubbing and squeezing out a strip of gel 1 cm long, was applied with a cotton swab or a finger on the inflamed gingiva, slightly massaging and distributing evenly across its surface. Exposure of the drug 10-15 minutes, 2-3 times a day, for 7-10 days).

Statistical processing of the research results was carried out according to the criteria of variation-statistical analysis with the calculation of average values (M), arithmetic average error (m) using a software package. Differences with $p < 0.05$ were considered statistically significant.

Results. All patients complained of bleeding gums, and some of them (12 patients - 17.9%) additionally complained of itching and discomfort in the gum area. 50 patients (75.0%) noted mild soreness in the gums, 64 people (95.7%) were bothered by bad breath. All patients observed oral hygiene on their own according to the advice of a health care professional.

When examining the oral cavity, the pathology of attachment of the frenulum of the upper and lower lips was observed in 19 patients (28.5%). Abnormalities of occlusion were recorded in 10 patients (14.9%).

In determining the local status, 57 patients (85.7%) had a large amount of soft dental plaque, 55 patients (82.1%) had solid dental deposits. In all examined patients, the inflammatory process spread to the interdental and marginal parts of the gums, while the gums were hyperemic. The periodontal nipples were swollen, pasty, in most cases their shape was changed. When probing the gums with a bell probe, the bleeding of various intensity in all patients was determined. The depth of the gingival sulcus was 1-2 mm, epithelial attachment was not broken. Palpation of the gums was determined painful.

For the differential diagnosis of CG, a gingival sulcus was examined for the presence of a pathological pocket. In all cases, there were no signs of periodontitis.

All surveyed adolescents were in the age range of 14 to 17 years.

Diseases of the gastrointestinal tract dominated from the comorbidity, in particular, 61 patients (90.7%) had chronic gastritis and gastroduodenitis, and only 5 patients (7.1%) had cardiovascular system pathology.

All clinical and index indicators in patients with CG were significantly superior to the values of similar criteria for intact periodontitis. In the dental literature the issue of the impact of inadequate hygiene conditions and local inflammations on the condition of the mucous membranes as a result of the jaw fracture treatment with non-detachable splinting structures has long been debated. Studying the relationship of local factors, oral hygiene deficit and self-resistance of the oral mucosa, it is possible to make an assumption on the specificity of the process that occurs in the tissues of the oral mucosa.

In assessing the condition of periodontal tissues, preference was given to indices that allow evaluating the efficiency of therapeutic measures taken in dynamics for the moment of the beginning and the end of the study. For this purpose, the hygiene index of PMA, community *periodontal index* of treatment needs (CPITN), Muhleman bleeding index (SBI), simplified Greene-Vermillion oral hygiene index were used. Index evaluation indicators were studied dynamically while monitoring the patients.

The change of the PMA index made it possible to estimate the prevalence of the inflammatory process in patients with CG in the course of various treatment regimens. It was found that before the treatment, most patients (57 people - 85.1%) had a mild degree of spreading of the inflammatory process. After the basic treatment with combinations of metrogyl denta gel and parodontocid solution, adolescents with CG had a mild and moderate degree of inflammation in the gum area. Combinations of metrogyl denta, spray and parodontocid gel were the most effective, since there were no patients with severe and moderate degrees of inflammation when using these combinations, the mild degree did not exceed 15%, and the rest of the patients were normal (table 2).

Table 2. - *Changes in the hygiene index of PMA in adolescents with CG before and after various treatment regimens.*

Group	Before treatment		Basic treatment + metrogyl denta		Basic treatment + metrogyl denta gel + parodontocid solution		Basic treatment + metrogyl denta + parodontocid spray		Basic treatment + metrogyl denta + parodontocid gel	
Points	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%
0	29	34,5	4	20,0	8	34,8	10	47,6	7	35,0
up to 33	31	36,9	7	35,0	7	30,4	7	33,3	10	50,0
33-67	22	26,2	7	35,0	8	34,8	4	19,0	3	15,0
more than 67	0	0	0	0	0	0	0	0	0	0
Total	84	100	20	100	23	100	21	100	20	100

With the help of the CPITN index, the degree of need in periodontal tissues rehabilitation was determined, in addition, on the processes occurring in the tissues of the marginal gum in the course of various treatment regimens (table 3).

After the basic treatment and the use of the combination of metrogyl dent gel and parodontocid solution, some positive dynamics was observed, since compared to the pretreatment results there were no patients whose CPITN index was 4. The other two treatment regimens that included the metrogyl gel with spray or parodontocid gel appeared to be more effective as after its use in patients with CG, the studied index varied from 0 to 3 inclusively (table 3).

Table 3. - *Changes in CPITN index in adolescents with CG before and after various treatment regimens.*

Group	Before treatment		Basic treatment + metrogyl denta		Basic treatment + metrogyl denta gel + parodontocid solution		Basic treatment + metrogyl denta + parodontocid spray		Basic treatment + metrogyl denta + parodontocid gel	
Points	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%
0	22	26,2	4	20,0	6	26,1	6	28,6	6	30,0
1	27	32,1	5	25,0	5	21,7	10	47,6	7	35,0
2	27	32,1	6	30,0	9	39,1	5	23,8	7	35,0
3	8	10	5	25	3	13	0	0	0	0
4	0	0	0	0	0	0,0	0	0	0	0
Total	84	100	20	100	23	100	21	100	20	100

The study of the dynamics of the SBI index allowed us to estimate the severity of the inflammatory process of the gingival mucosa (table 4). Before treatment, patients with CG had SBI index values corresponding to moderate and severe gum inflammation. In the course of traditional treatment and the use of the combination of metrogyl denta gel and parodontocid solution, the number of patients with mild, moderate and severe degrees of inflammation became approximately the same. There were no patients with severe inflammation only after applying the combination of metrogyl denta gel and spray or parodontocid gel, and the values corresponding to mild and moderate forms of gum inflammation were recorded (table 4).

Table 4. *Changes in the Muhleman bleeding index (SBI) in adolescents with CG before and after various regimens.*

Group	Before treatment		Basic treatment + metrogyl denta		Basic treatment + metrogyl denta gel + parodontocid solution		Basic treatment + metrogyl denta + parodontocid spray		Basic treatment + metrogyl denta + parodontocid gel	
Value	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%
0,1-1	35	41,7	7	35,0	11	47,8	9	42,9	8	40,0
1,1-2	29	34,5	6	30,0	5	21,7	9	42,9	9	45,0
2,1-3	20	23,8	7	35,0	7	30,4	3	14,3	3	15,0
Total	84	100	20	100	23	100	21	100	20	100

The use of the oral hygiene index according to Greene-Vermillion makes it possible to evaluate the effectiveness of the treatment carried out in dynamics at the moment of the beginning and the end of the therapeutic measures in the course of various pharmacotherapy regimens (table 5).

In the study of changes of the Greene-Vermillion index, it was found that before the start of the treatment, only 27 patients with CG had good hygiene, 37 and 20 patients had satisfactory and unsatisfactory quality. After the basic treatment and the use of the combination of metrogyl denta gel with a solution or a parodontocid spray, only good and satisfactory oral hygiene was observed. The most effective treatment regimen turned out to be the combination of metrogyl denta gel and parodontocid gel, since when it was used, 10 patients had good and 10 – satisfactory oral hygiene (table 5).

Clinically, on the 4th day, the patients had a decrease in complaints of itching and discomfort in the gums , 26 patients (39.2%) had gum bleeding while brushing their teeth.

Table 5. - *Changes in the oral hygiene index according to the Greene-Vermillion in adolescents with CG before and after various treatment regimens.*

Group	Before treatment		Basic treatment + metrogyl denta		Basic treatment + metrogyl denta gel + parodontocid solution		Basic treatment + metrogyl denta + parodontocid spray		Basic treatment + metrogyl denta + parodontocid gel	
Value	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%
up to 0,6	27	32,1	7	35,0	5	21,7	9	42,9	10	50,0
0,7-1,6	37	44,0	9	45,0	12	52,2	8	38,1	10	50,0
1,7-2,5	20	23,8	4	20,0	6	26,1	3	14,3	0	0
more than 2,6	2	2	0	0	0	0	0	0	0	0
Total	84	100	20	100	23	100	21	100	20	100

A small amount of soft plaque, hyperemia, swelling of the gingival margin and periodontal papillae in 31 patients (46.4%) were visually detected on examination, bleeding during probing was recorded in 34 patients (50.7%).

On the 7th day from the start of the treatment, 7 patients (10.7%) had complaints about periodic gum bleeding when brushing their teeth. Visually, there was a decrease in hyperemia and swelling of the gingival margin. Bleeding persisted in 12 patients (17.8%) during probing .

The dynamics of the average indices of the periodontal indices of PMA, CPITN, SBI, Greene-Vermillion in adolescents with CG also confirmed the data obtained separately for each patient. Combinations of metrogyl denta gel with parodontocid gel or spray turned out to be more effective, and the treatment regimen using the combination of metrogyl denta gel and parodontocid solution appeared to be less effective. However, all studied combinations of drugs were more effective than the basic treatment (table 6).

Table 6. - *Dynamics of average indices of PMA, CPITN, SBI, Greene-Vermillion in adolescents with CG before and after various treatment regimens.*

Group / Index	1	2	3	4	5
	Before treatment	**Basic treatment + metrogyl denta**	**Basic treatment + metrogyl denta gel + parodontocid solution**	**Basic treatment + metrogyl denta + parodontocid spray**	**Basic treatment + metrogyl denta + parodontocid gel**
PMA	49,7±13,2	31,7±20,9^{*1}	19,7±16,5^{*1,2}	10,4±13,4^{*1-3}	14,4±13,9^{*1-4}
CPITN	2,6±1,30	2,0±0,08^{*1}	1,85±0,70^{*1}	1,14±0,70^{*1-3}	0,9±0,75^{*1-4}
SBI	1,93±0,58	1,67±0,91^{*1}	1,38±0,90^{*1,2}	0,88±0,50^{*1-3}	1,03±0,55^{*1-3}
Greene-Vermillion	1,90±0,87	1,37±0,71^{*1}	1,21±0,59^{*1}	0,71±0,34^{*1-3}	0,54±0,69^{*1-4}

Note: 1. * - p <0.05; 2. - the number next to the asterisk indicates the group to which the differences are reliable

Conclusion. In summary, on the basis of clinical symptoms and dynamics of periodontal indices, it can be concluded that the studied combinations of drugs with antiseptic effects were more effective than the basic treatment, while two pharmacotherapy regimens had greater clinical efficiency: metrogyl denta gel with spray or parodontocid gel.

References.

1. Berezina N.V., Silantyeva E.N., Krivonos S.M. The use of vitamin-mineral complex and antibacterial gels, rinse and toothpaste in the treatment of inflammatory periodontal diseases // Periodontology. 2014. № 4 (73). Pp. 72-75.

2. Gavrilyuk V.P., Belokonova OP, Konoplya A.I., Bystrova N.A. The effectiveness of various dosage forms of "Phosphogliv" in the correction of structural and functional disorders of the erythrocyte membrane in acute toxic liver damage. System analysis and management in biomedical systems. 2011; 10 (2): 269-73.

3. Loktionov A.L., Konoplya A.I., Lunev M.A., Karaulov A.V. Immune and oxidative disorders in the pathogenesis of inflammatory periodontal diseases // Immunology. 2015. № 36 (5) - p. 319-328.

4. Uspenskaya MN, Konoplya AI, Loktionov AL, Correction of immunometabolic disorders in chronic generalized periodontitis using gepon, hypoxen and phosphogliv forte // System analysis and management in biomedical systems. 2012. № 4. (11). Pp. 908-913.

5. Yudina N.A., Iryshkova OV, Lunev M.A., Uspenskaya M.N., Blekanova V.A. Lack of effectiveness of standard treatment in the correction of immunometabolic disorders in chronic catarrhal generalized gingivitis, generalized periodontitis and odontogenic osteomyelitis of the maxillofacial region // Fundamental research. - 2012. - № 7 (1). - p.204-207.

弥漫性冠心病患者的复杂外科心肌血运重建术
HYBRID EXTRAMYOCARDIAL CARDIAC MUSCLE REVASCULARIZATION IN PATIENTS WITH CORONARY HEART DISEASE AND DIFFUSE CORONARY ARTERY OBSTRUCTION

Shevchenko Yury Leonidovich
Academician of RAS, D. Med. Science., Professor, President
Federal state budgetary institution "National Medical and Surgical Center named after N.I. Pirogov" of the Ministry of Healthcare of the Russian Federation.
Borshchev Gleb Gennadyevich
Ph.D. Med. Sciences, associate Professor
Department of Thoracic and Vascular Surgery with a course of x-ray endovascular surgery
Institute for Advanced Medical Studies of FSBI "National Medical and Surgical Center named after N.I. Pirogov"

注释：使用心外心肌血运重建诱导法（YurLeon技术）和没有它的冠状动脉旁路移植术（CABG）的比较描述。 提出了该方法对术后晚期治疗结果的积极作用。

关键词：冠心病，心外心肌血运重建术，新生血管形成，心外膜，心包，CABG

Annotation*: a comparative description of coronary artery bypass graft (CABG) using the method of the extracardiac myocardial revascularization induction (YurLeon technique) and without it is presented. The positive effect of the method proposed on the results of treating patients in the late postoperative period is demonstrated.*

Keywords*: coronary heart disease, extracardiac myocardial revascularization, neoangiogenesis, epicardium, pericardium, CABG*

The treating patients with coronary heart disease (CHD), the main difficulties arise in patients with diffuse or distal coronary arteries lesions in the absence of using the currently available revascularization operations possibilities in full. In recent years, an active studying of angiogenic growth factors, stem cells, various minimally invasive techniques for the tissues blood supply improving and of myocardial reparative processes inducing, and more and more often there are discussions about the relative curability of these patients have been.

With the development of insufficient blood supply to the heart muscle, the body, trying to overcome the lack of blood supply, begins to use the intracardiac (formation of intrasystemic and intersystem collaterals) and extracardiac (pericardium, diaphragm, intercostal and internal thoracic arteries) as sources for feeding the cardiomyocytes as a variant of the "natural" neoangiogenesis. However, the reserves of these compensatory reactions are limited, and when decompensation is reached, these mechanisms can no longer provide for the need of cardiomyocytes for oxygen and nutrients without external stimulating.

The present day main surgical method of patients treatment with multiple hemodynamically significant lesions of the coronary bed, is the operation of coronary artery bypass graft (surgery) (CABG). However, with the development of therapeutic and endovascular methods of treatment, the number of cases of patients treatment with proximal lesion of the coronary arteries, an adequate peripheral bed of the coronary arteries, the absence of chronic occlusions and calcification of the latter, rapidly decreases from year to year. [1]. Numerous studies have shown that performing direct surgical revascularization of small-diameter heart arteries (less than 1.5 mm) is associated with a high incidence of shunts thrombosis, with subsequent development of myocardial infarction of the revascularized zone [2,3,4,5]. This fact is explained by the different diameter of the vessel, the discrepancy between the speed of blood flow in a shunt vessel and the speed of blood in the conduit supplying it, as well as the physiological inability of the receiving vessel (small diameter, calcification, etc.) to such a large volume of blood. However, if the reproducement the anastomosis of comparable diameter vessels and with a comparable blood flow rate, they can improve the blood supply to the corresponding part of the heart muscle, while reducing the severity of angina pectoris.

This can be achieved using pericardial sources of revascularization - branches of the internal thoracic artery, phrenopericardial branches, anterior mediastinal arteries, intercostal arteries and esophageal arterial branches [5]. Distal branches of these arteries have a diameter of 1-1.5 mm, sufficient blood flow to form a collateral network, however, there are numerous problems associated with the inability to technologically anastomize vessels of similar diameter and, most importantly, the number of such anastomoses should be large.

MATERIALS AND METHODS.

In the National Medical-Surgical Center. N.I. Pirogov (Moscow) from January 2008 to October 2018, 4550 patients underwent coronary artery bypass surgery. In 2064 patients, the nature of the lesion of the coronary bed did not allow complete myocardial revascularization to be performed, for the reasons set out in Table 1.

Table 1.

Reasons for refusing complete surgical myocardial revascularization

Parameter	Number of patients (%)
Small coronary artery diameter	1371 (66%)
Occlusion of the coronary artery and the absence of collateral circulation in this area	428 (21%)
Technical impossibility of performing shunting in this area due to the presence of a stent	58 (3%)
Intramyocardial artery position	90 (4%)
Coronary artery calcination	102 (5%)
The presence of a coronary shunt in this area, formed on the previous operation	15 (1%)

1930 of these patients were randomized at admission, using a random number generator and divided into 2 groups, depending on the chosen treatment tactics. Group I (n = 965) was implemented the classical surgical myocardial revascularization with the epicardium/pericardium desquamation technique, as well as the additional introduction of an aseptic solution excreted by drainage on the first day after surgery.

The technique was named «YurLeon». In control group II (n = 965) the classical surgical myocardial revascularization was performed.

The patients of these groups were comparable in age, gender, main laboratory and instrumental indices, as well as the nature of the atherosclerotic lesion of the coronary bed. The study was carried out in accordance with the protocol and standard operating procedures. The protocol, conciliation form and other documents relating to the object of study are reviewed and approved by independent members of the Ethics Committee of FSBI «NMSC N.I, Pirogov» of the Ministry of Healthcare of the Russian Federation

METHOD AND RESULTS.

During the operation of coronary bypass surgery, patients of the first group were manipulated to form an aseptic inflammatory process in the pericardial cavity and stimulate myocardial extracardiac revascularization. The complex included:

1. Precision extraction of the left internal thoracic artery, leaving the medium-sized branches not tied with the purpose of the subsequent development of the anastomoses between them and the arteries of the anterior surface of the heart.

2. Scarification of the epicardium and pericardium using a specially designed abrasive glove.

3. Damaging the epicardium with the help of a bellied scalpel.

In the postoperative period, for 8 hours after the operation, the discharge from the drains into a sterile container was collected. An earlier study was carried out

on the content of endothelial growth factors (VEGF) in various body tissues and fluids of patients with coronary artery disease who underwent surgical myocardial revascularization.

Revealed that the largest amount of VGEF contained in the fluid secreted in the pericardial cavity in the first day after the open heart surgery. The collected fluid was centrifuged to isolate the necessary protein fraction. On the second day after the operation, before removing the drains, the centrifugate was injected into the pericardial cavity. The whole complex of events was named the methodology of YurLeon.

All patients admitted to the clinic initially had a high functional grade (FG) of angina pectoris (III-IV degree, average 3,5±0,08). After 6 months, FG in group I decreased to 1.2 ± 0.15, after 12 months, FG angina pectoris was 0.5 ± 0.01 and after 3 years 0.2 ± 0.01. After 5 and 7 years the FG of angina pectoris did not change anymore. In group II, the mean values of FG angina pectoris before surgery were 3.6 ± 0.3, 6 months after the surgery the FG of angina pectoris decreased to 1.7 ± 0.02, and after 12 months to 1.6 ± 0.01. Indicators after 5 and 7 years were comparable and amounted to 0.8 ± 0.01 and 0.9 ± 0.01, respectively (Table 2).

Table 2

Changes in the functional grade of angina pectoris

Group	Before surgery	3 months	6 months	1 year	5 years	7 years
I Group	3,5±0,08	1,2±0,15	0,9±0,02	0,5±0,01	0,2±0,01	0,2±0,01
II Group	3,6±0,3	1,7±0,2	1,6±0,01	0,9±0,02	0,8±0,01	0,9±0,01

Analysis of the dynamics of angina pectoris FG clearly shows a statistically significant decrease in its long-term period after the operation in the group where the CABG operation was performed in combination with the YurLeon technique ($p < 0.05$).

The results of the 6-minute walk test are presented in table 3.

Table 3

Six-minute walk test

Group	Before surgery	3 months	6 months	1 year	5 years	7 years	Group
I Group	325±12	347±14	398±8	390±15	395±18	400±7	409±14
II Group	303±8	320±16	340±10	345±12	350±9	352±11	349±13

Exercise tolerance during the 6-minute walk test statistically significantly increases in the long-term periods in the group where the CABG operation was performed in combination with the YurLeon technique ($p < 0.05$).

The quality of living was assessed using 36-Item Short Form Health Survey. After 12 months, the QOL: RP statistically significantly improved in all groups: RP, the average increase in the value of the indicator in group I 12 months after surgery was 21.5, in group II 18, and also PF: group I - 30.2, in group II - 28. In group I, the increase in this indicator is more significant due to the reduction of the pain component: the indicator BP (pain intensity) in group I is an increase of 30.5, in II - 23. Indicators of GH, MH, VT, SF, RE in absolute terms increased in both groups studied after 12 months of observation.

After 30 months of observations, compared with the initial state, the indicators of QOL in both groups improve, but more significant dynamics was noted in group I. PF, BP, RE increased by 40, 55 and 33 points in group I, respectively. On the contrary, in group II, there is not a significant increase in these indicators - 28, 26 and 25 points, respectively. The remaining indicators did not change significantly in relation to their growth during the first year.

In the long-term period (48 months or more), a pronounced positive dynamics was revealed in patients with whom myocardial revascularization was supplemented with the YurLeon technique. The most pronounced dynamics can be traced by RF, BP, GH, SF and RE scales. At the same time, negative dynamics was observed in group II in a number of scales: PF, RP, BP, SF, and RE.

When analyzing indicators of segmental myocardial contractility before surgery, 2 weeks after surgery and 6 and 12 months and 3 years after surgery. The CABG operation in combination with the YurLeon method helps to restore dysfunctional, but viable segments.

When analyzing the indicators of local myocardial contractility before surgery in group I, the average number of hypokinesis zones was 1.6 ± 0.2, and akinetic segments 1.8 ± 0.3 After the operation in two weeks, the number of hypokinetic segments slightly decreased to 1.3 ± 0.2, akinetic segments - 1.7 ± 0.2.. Already in 6 months after the operation, we saw a clear continuing decrease in the number of hypokinetic segments - 0.8 ± 0.2, and the akinetic segments became unreliable less - 1.4 ± 0.2.

12 months after surgery, the number of hypokinetic segments decreased to 0.6 ± 0.2, and the number of akinetic segments did not change 1.4 ± 0.2. After 12 months, 3 years, 5 and 7 years, we noted a significant decrease in myocardial hypokinesis zones compared with pre- and postoperative values ($p < 0.05$).

When analyzing the indices of local myocardial contractility in the control group, where isolated CABG was performed, before the surgical intervention the number of hypokinetic segments was 1.25 ± 0.5, and akinetic segments - 2.2 ± 0.3.

After the operation, in two weeks, the number of hypokinetic segments decreased to 1.0 ± 0.3, and the akinetic segments remained at the same level - 1.2 ± 0.8. In 6 months after the operation, we did not see any dynamics towards the improvement or deterioration of myocardial contractility. In group I, patients with

long-term postoperative periods more significantly reduced hypokinesis zones than in the second group ($p < 0.05$). In group II, we did not see any changes in segmental myocardial contractility in the long-term period.

The assessment of a coronary perfusion dynamics in the examined patients before and at various periods after surgery was performed using myocardial scintigraphy with ^{99m}Tc-techetril (in rest and exercise). In the analysis of perfusion, a semi-quantitative analysis was used, in which the following were evaluated: indicators of perfusion disturbance under exercises (SSS); resting perfusion disturbance (SRS) indicators; severity of ischemia (SDS). In general, myocardial perfusion improvement was found in both groups of patients. The most pronounced positive dynamics was recorded under exercises. At the same time, in patients of group I, the SSS indicator, showing the degree of perfusion disturbance under exercises, decreased on average from 17.4 to 8 points ($p < 0.05$), and the SDS indicator, stating the severity of stress-induced ischemia, from 10.1 up to 2 points ($p < 0.05$).

In Group II, the dynamics of these indicators was not so significant: SSS and SDS decreased from 20 to 18 and from 10 to 8 points, respectively ($p > 0.05$).

The SRS index, reflecting the degree of perfusion disturbance at rest, in group I decreased insignificantly, and in patients of group II it even slightly increased from 12.8 to 16.5 points ($p < 0.05$). Such dynamics (albeit insignificant) of this indicator in patients of group I is explained by the size of the area of a true cicatricial lesion and the recovery of an insignificant number of hibernated myocardium in the post-infarction zone. The increase in this indicator in patients of group II may be associated with additional myocardial damage during surgery.

Analysis of synchro-SPECT data on the size of myocardial lesion zones showed that in patients of group I, the total perfusion defect under load decreased by an average of 2 times (51.2%), and in patients of group II, only by 27.5%. These changes also showed a reduction in the zone of stress-induced ischemia in all groups of patients with a more significant effect in patients of that group where surgery was performed in combination with the method of YurLeon. In addition, only in group I there was registered a decrease in perfusion defect at rest (on average by 18.2%), which was associated with the restoration of hibernated myocardium after revascularization.

The increase in myocardial perfusion concerned the sites that were primarily subjected to surgical revascularization or adjacent to them, which led to an improvement in myocardial perfusion and a decrease in transient perfusion defects after 6, 12 months, and after 3 years and 5 and 7 years after the operation. However, in addition, it was found that the zones of cicatricial damage, poor accumulation of the radiopharmaceutical, in which surgical bypass surgery was not performed in group II, did not undergo changes in the immediate and late postoperative period. In group I, improvement of perfusion indices was observed, especially in the late postoperative

period (more than 3 years). Comparing the results of pre- and postoperative scintigrams, it was found that the highest rates of improvement in myocardial perfusion after CABG combined with the YurLeon technique were obtained in areas where prior to the operation, significantly reversible perfusion defects were detected.

Particular attention in the study of long-term results was attracted by a group (198 patients), who underwent coronary artery diffraction in the period from 24 to 48 months after the operation of myocardial revascularization. All these patients noted a significant improvement in the quality of life, as well as an excellent clinical result of the operation. They underwent shunting of the anterior interventricular artery, of the left internal thoracic artery, as well as autovenous shunting the circumflex and right coronary arteries. It was revealed that in 93% of patients (n = 184) the satisfactory functioning of the shunt is determined, the left upper thoracic artery - anterior interventricular vein, in the remaining 7% (n = 14) the shunt did not work. During the audit of autovenous shunts, it was found that 76% of the shunts (n = 150) to the circumflex artery and 83% (n = 164) of the shunts to the right coronary artery do not contrast with the study. Thus, in periods of up to 4 years, occlusion of 7% of autoarterials (left upper thoracic artery) of shunts to the right interventricular vein and 79.5% of autovenous shunts occurred. At the same time, signs of extracardiac myocardial blood supply were found in the form of multiple small vascular networks of the branches of the *arteria thoracica interior sinistra* (ATIS), phrenopericardial branches, the branches of the anterior mediastinal arteries, intercostal arteries, etc. These patients underwent stress tests - bicycle ergometry, stress echoCG, myocardial scintigraphy with exercise. At the same time, neither subjective signs of myocardial ischemia (complaints of chest pain, shortness of breath and weakness during physical exertion), nor objective changes in ECG during bicycle ergometry, impaired myocardial kinetics during stress echoCG, or pathological accumulation of radiopharmaceutical during myocardial scintigraphy with exercise were detected. Thus, not without surprise, a very good state of the operated and very satisfactory indicators of the life quality were found with failed autovenous, and in some cases mammarocoronary shunts in the late postoperative period. With a comprehensive analysis of this phenomenon causes, we can explain such good results only by extracardiac revascularization, which took place in the long-term period, which is confirmed by the data of angiographic studies.

The combination of coronary bypass surgery with the YurLeon technique in patients in whom complete revascularization is not possible leads to improved clinical results with a significant recovery in the quality of patients life in the long-term after surgery. The effectiveness of the technique is determined by the increase in myocardial contractility due to an increase in regional myocardial perfusion. The materials analyzed by us witnessed in favor of the effectiveness and safety of stimulating extracardiac myocardial revascularization according to the method of YurLeon.

References

1. Shevchenko Yu.L., Viller A.G. Extracardiac revascularization in patients with coronary artery disease after coronary artery bypass surgery is an existing factor in the myocardial blood supply. Bulletin of the National Medical-Surgical Center. N.I. Pirogov. 2007; Vol. 2: 9-14.

2. Longest P.W., Kleinstreuer C. Particle-hemodynamics modeling of the distal end-to-side femoral bypass: effects of graft caliber and graft-end cut. Med Eng Phys. 2003 Dec;25(10):843-58.

3. Ghista D.N, Kabinejadian F. Coronary artery bypass grafting hemodynamics and anastomosis design: a biomedical engineering review. Biomed Eng Online. 2013 Dec 13;12:129. doi: 10.1186/1475-925X-12-129. Review. PubMed PMID: 24330653.

4. Keynton R.S., Evancho M.M., Sims R.L., Rittgers S.E. The effect of graft caliber upon wall shear within in vivo distal vascular anastomoses. J Biomech Eng. 1999 Feb;121(1):79-88. PubMed PMID: 10080093.

5. Qiao A., Liu Y. Influence of graft-host diameter ratio on the hemodynamics of CABG. Biomed Mater Eng. 2006;16(3):189-201. PubMed PMID: 16518018.

6. Loukas M., Hanna M., Chen J., Tubbs R.S., Anderson R.H. Extracardiac coronary arterial anastomoses. Clin Anat. 2011 Mar;24(2):137-42. doi: 10.1002/ca.21088. Epub 2010 Nov 30. Review. PubMed PMID: 21322035.

原发性动脉高血压的神经组成。 预防和康复的前景
THE NEUROLOGICAL COMPONENT OF ESSENTIAL ARTERIAL HYPERTENSION. PROSPECTS FOR PREVENTION AND REHABILITATION

Cherkasov Anatoliy Danilovich
Senior Researcher
Research Institute of General Pathology and Pathophysiology
NIIOPP RAMS
Petrova Elena Nikolaevna
Senior Researcher
A.A. Kharkevitch Institute for Information Transmission Problems
RAS IITP

注解。 本文包含对动脉高血压病因的理论分析，描述了3个月观察高血压发展的初始阶段和非药物正常化治疗血压升高的情况。 理论位置和实验数据的分析使我们能够形成关于交感神经系统活动受损的作用的假设，其控制通过肾脏的水运输，在高血压疾病的发展中。

关键词：高血压病，动脉高血压，非药物治疗方法，康复，脊柱，肌肉，肾脏，交感神经系统，体育，体操。

Annotation. *The article contains a theoretical analysis of the arterial hypertension causes, describes a 3-month observation of the initial stage of hypertension development and non-drug normalization treatment of increased blood pressure. The analysis of theoretical positions and experimental data allowed us to form a hypothesis about the role of sympathetic nervous system activity impairment, which controls the water transport through the kidneys, in the development of hypertensive disease.*

Keywords*: hypertension desease, arterial hypertension, non-pharmacological methods of treatment, rehabilitation, spine, muscles, kidneys, sympathetic nervous system, physical culture, gymnastics.*

Introduction.

From the standpoint of official medicine and the WHO Expert Committee in 95% of cases, the causes of the essential hypertension are unknown (Oganov RG, 1997).

Studying the causes of arterial hypertension showed the multifactorial nature of this disease, which requires a systematic approach to studying this problem, taking into account the neural (neural regulation of blood vessel tone), hormonal

(renin-angiotensin regulation of vasculatory tone), hydrostatic (changes in the capacitive properties of the circulatory system due to the vessels elasticity) and hydrodynamic (dynamics of water transport through the circulatory system) components, as well as neurodystrophic processes in the autonomic nervous system and kidneys.

The first who declare that hypertension is not a disease, but a reversible functional impairment of the vasculatory tone regulation, was the Russian doctor G.F. Lang (Lang, G.F., 1946). Back in 1922, the Head of the Leningrad therapeutic science school G.F. Lang, in one of his works, wrote that they should clearly distinguish hypertension as an independent ailment and that hypertension, which appears as a symptom of some other diseases - for example, kidney damage. G.F. Lang regarded hypertonic disease as "vascular neurosis." He saw the cause of the disease in the obvious effect of extreme external stimuli - conflict situations, emotional overloads. As a treatment for hypertension, he proposed sedatives, starting with valerian. If you remove the "vascular neurosis" at the initial stage of the disease, then hypertension will not occur.

Currently, official medicine believes that the cause of essential hypertension is unknown, and hypertension itself, as a disease, is incurable, and the patient must take medication for the rest of his life to prevent dangerous consequences.

Emotional stress and hypertension.

A number of researchers convincingly proved that emotional stress is one of the leading causes of hypertension and cardiovascular diseases (Lang GF, 1946; Chazov EI, 1975). However, as pointed out by academician P.K. Anokhin, “no crazy rhythm of modernity, no acuteness of nervous experiences can cause hypertension, if this is the rhythm, if the periods of greatest tension alternate with moments of rest” (Anokhin PK, Sudakov K.V. 1973).

From this statement it follows that the arterial hypertension develops only in certain conditions. Domestic researchers were the first to provide convincing evidence that in many cases, primary disorders of the central nervous system are the cause of arterial hypertension (Lang GF, 1946; Anokhin PK 1948; Myasnikov AL, 1952).

The vascular baroreceptors have been found to play an initiative role in blood pressure self-regulation, reacting with an impulse activity increase ito the blood pressure raising and informing the overlying vasomotor centers of the medulla oblongata (Anokhin P.K., Shumilina A.I. 1947; Anokhin P.K. 1953; Chernigovsky V.N., 1960). At the same time, the impulse frequency of baroreceptors depends more on the rate of pressure rise than on the basic level of blood pressure. With prolonged pressure increases in chronic hypertension, baroreceptors adapt to increased pressure.

Currently, it is believed that the regulation of pressure is carried out by chang-

ing of blood vessels tone. At the same time, the mechanisms of neural regulation of blood circulation are divided into the group of short-term action (reaction time at intervals of a few seconds), intermediate action (tens of seconds and minutes) and mechanisms of long-acting (tens of minutes and hours).

The short-acting mechanisms are due to signals coming into the hypothalamus from baroreceptors located in the aorta (Kashtanov S.I., 1975, 1976).

Intermediate mechanisms of blood pressure regulation include: 1) changes in transcapillary metabolism; 2) relaxation of the vessel wall tension; 3) renin-angiotensin system. The first two mechanisms are aimed at reducing pressure.

The only pressure increasing mechanism is implemented in the renin-angiotensin system. The renin-angiotensin system plays an important role in the normalization of blood circulation in the event of a pathological decrease in blood pressure and (or) blood volume (blood loss caused by injuries). This mechanism is also not related to the essential hypertension.

The long-term mechanisms of blood pressure regulation include mechanisms that mainly affect the ratio between the intravascular blood volume and the capacity of the vessels. It was shown that a slight (by 2–3%) continuous increase in the volume of fluid in the circulatory system when the sympathetic nervous regulation is turned off, leads to an increase in blood pressure by almost 50%. Normally, an increase in pressure with an increase in the volume of fluid in the circulatory system is compensated by the inclusion of nerve vascular reflex mechanisms of short-term regulation, and excess fluid is excreted by the kidneys before the adaptation of nerve mechanisms to new conditions occurs (Guyton A.C. et al, 1974; Guyton A.C., 1976). Thus, the main mechanism responsible for the long-term increase of blood pressure is the kidneys control of fluid in the vasculatory system.

Nervous vascular mechanisms of blood pressure regulation last less than an hour. Hypertension lasts for years. A natural question arises: in which cases the powerful mechanisms of blood pressure stabilization are violated and, at first transient, and then stable arterial hypertension occurs?

The pioneering work of Russian scientists showed that the nervous mechanisms of blood pressure regulation are implemented in the hypothalamus and, using signals from the aorta baroreceptors, carry out a damping (smoothing) effect on short-term fluctuations in blood pressure. Consequently, the solution to the problem of arterial hypertension should be sought in disorders of the neural mechanisms of regulation of fluid transport through the circulatory system.

Objective of the study:

Search for non-drug methods for normalizing blood pressure by normalizing the transport of fluid through the circulatory system.

Results.

We invite readers to familiarize themselves with the following observation.

This is the very rare case in which under clinical conditions for 3 months we were able to observe the development of arterial hypertension from the very beginning and to use experimental non-drug effects to normalize the arterial pressure level.

Our 60-year-old patient (weight 74 kg, height 174 cm, no chronic kidney disease and any other chronic diseases for more than 20 years), who had been running for 20 years, had a stable pressure of 125/80 until recently. This patient, after prolonged stress, underwent a sympatho-adrenal crisis - the pressure was 193/90 with a pulse of 57–60. When administering drugs that reduce blood pressure, the effect was not observed.

After then the sympatho-adrenal crisis was over, the state of persistent arterial hypertension came - the upper pressure was 160–180, the lower pressure was 110–120 with a pulse of 100–110 at rest. This level of pressure was maintained for more than two weeks before the sensation of pain in the lower back appeared in the area of the 8th - 12th thoracic vertebrae and the 1st - 2nd lumbar vertebrae. The patient was given a massage of a spinal muscular system. An hour after the massage, the pressure dropped from the level of 150/103 to the level of 137/86, and after another 2 hours it was steadily established at the level of 130/83. This level was already normal for the patient.

The state of chronic stress in our patient persisted, and 2 weeks after the massage session, the pressure was again set at 160/100. And again, after stressful situations, 2 massages with blood pressure control were performed. In the first case, after the massage, the pressure decreased from 176/97 to 136/83. In the second case, after the massage, the pressure decreased from 160/97 to 137/88. In the third case, after the massage, the pressure decreased from 159/100 to 144/95. The massage took place in the morning. By the end of a day, the pressure increased slightly again, but did not reach a high initial level.

Three series of experiments were performed with the patient: 1) Tibetan gymnastics for 8 days on the shore of the warm sea; 2) 7 experimental runs: each run in 3 stages of 1650 meters each at a speed of 10 km / h, and performing gymnastic exercises for the spine after each stage;

3) 10 experimental runs of 5 km per day at a speed of 10 km / h with the implementation of exercises of Tibetan gymnastics for the spine after running. Performing each series of experiments resulted in normalization of blood pressure.

1. Relaxation with the conducting of the daily Tibetan gymnastics “Five Tibetan Pearls” gradually led to the normalization of pressure. We give figures of daily monitoring: 160/100 - 100; 154/104 - 96; 158/90 - 94; 150/90 - 93; 152/91 - 93; 144/90 - 73; 134/82 - 75; 133/81 - 65. Indicators were measured at the same time and under the same conditions.

2. Experiments with a combination of running and Tibetan gymnastics turned out to be especially revealing. The average blood pressure at the beginning of the

day for the first three days of the experiment was 141/89 mm Hg, and at the end of the day 123/86 mm Hg. Over the past three days, the average blood pressure at the beginning of the day was 126/83 mm Hg, and at the end of the day - 129/81 mm Hg.

Experimental jogging in 3 stages of 1650 meters each at a speed of 10 km / h and performing gymnastic exercises for the spine after each stage resulted in an average decrease in the upper pressure level from 150 to 135 mm Hg and increase the lower level of pressure from 88 to 91 mm Hg.

When examining the patient before the experiments, it was found that stress caused spastic states of the spinal muscles in the lower thoracic region. The massage eliminated the spastic states in the muscles. After an experimental run and gymnastics, the spastic states of the muscles also disappeared. Thus, it was found that the state of the spinal muscular system influences the regulation of blood pressure. Hypertonus and spastic states of the intervertebral muscles in the region of the lower thoracic spine lead to a persistent increase in blood pressure. The likely mechanism of such an effect is the compression of the sympathetic nerves that control the water transport through the kidneys. The elimination of hypertonus and spastic states of intervertebral muscles with the help of gymnastics for the spine regularly led to the normalization of blood pressure. Thus, long-term arterial hypertension at the initial stage with a high degree of probability is caused by a violation of the state of the sympathetic nerves that control the water transport through the kidneys.

Discussion.

Analysis of the causes of hypertension.

Water transport through the circulatory system.

Every day, up to 10 liters of fluid is absorbed into the circulatory system, which is almost 2 times the volume of blood. The water up to 3 liters is consumed with food, up to 7 liters of digestive juices produced by the stomach (2.5 liters), pancreas (2 liters) and the proximal part of the small intestine (the first half of the small intestine, 2.5 liters). All these 10 liters are absorbed back into the circulatory system in the distal part of the small intestine and along the entire length of the large intestine. The fluid passes through the liver and is injected back into the circulatory system. At the same time, the level of blood pressure remains stable. In fact, in the circulatory system there is a “3rd circle of blood circulation”. And whatever the blood pressure, and whatever the tone of the blood vessels, the “pumps” of the small and large intestines will still “pump” 10 liters of fluid into the bloodstream.

The circulatory system itself will transport this fluid back to the gastrointestinal tract and expel it through the kidneys. In this case, the question arises: which system supports the balance in moving of 10 liters of fluid per day (200% of the volume) through the circulatory system? It is quite obvious that this is the hypothalamic nervous system of the kidneys.

With an increase in pressure of 1 mm Hg water excretion by the kidneys increases by 100%. Water excretion by kidneys can increase 8 times even with a slight increase in blood pressure up to 10 mm. Hg (Guyton, A.C., 1976). It is through this mechanism that the stabilization of blood pressure under the control of the hypothalamus is achieved. Denervated kidneys reduce their "pressure – speed" water transport characteristic of by 6–8 times (Guyton A.C., 1976).

The sympathetic nerves of the kidneys emerge from the spine at the IX, X and XI thoracic vertebrae level. With the appearance of muscle blocks in this section of the spine, compression of sympathetic nerves is possible, which, unlike motor and sensory nerves, do not have a solid myelin sheath. Compression of the sympathetic nerves that control the kidneys is similar to denervation, it translates the kidneys to be controlled by the metasympathetic nervous system, which supports the stabilization of blood pressure at a higher level. In fact, we are dealing with a functional partial denervation of the kidneys. In this we see the main cause of hypertension.

We realize that solitary observation of the development of arterial hypertension with daily monitoring for 5 months does not comply with the principles of evidence-based medicine and cannot be the basis of a theory. At the same time, we consider it sufficient to form a hypothesis that needs to be tested in a clinical setting.

Hypothesis. Persons with persistent arterial hypertension also have stabilized blood pressure, but at a higher level. The pressure level is controlled by the sympathetic nervous system along the chain: baroreceptors, hypothalamus, sympathetic nerve pathways passing inside and out of the spine in the IX-XI vertebrae region, sympathetic fibers of the spinal nerves, neurons of the sympathetic ganglion and metasympathetic nerves kidney system. The fibers of the sympathetic nerves do not have a solid myelin sheath and may be subjected the compression when passing between stiff spasmed muscles. The control of fluid removal from the circulatory system is impaired by compression of the sympathetic nerve fibers of kidneys in the region of IX to XI thoracic vertebrae. The metasympathetic nervous system of the kidneys, which has a higher threshold for regulating the transport of fluid, provides stabilization of the volume of fluid in the circulatory system, but already at a higher blood pressure. This regulation at a higher level of blood pressure is manifested as persistent arterial hypertension.

Rehabilitation activities of sympathetic innervation of the kidneys restoring are aimed at eliminating spastic conditions of intervertebral muscles (massage, gymnastics for the spine and proper rest). They are able to prevent the development of hypertension in its initial stage. At later stages of arterial hypertension development, dystrophic processes in the sympathetic innervation and the metasympathic nervous system of the kidneys are very likely, which will not allow to overcome

the state of arterial hypertension quickly. However, this does not mean that rehabilitation activities will be useless. Massage of the spinal muscular system leads to a prolonged decrease in pressure from 7 to 15 mm Hg. Regular and prolonged exposure to the spine muscular corset leads to a disappearance of muscle blocks and eliminates compression of spinal sympathetic nerves (Cherkasov A.D., 2018).

Findings:

1. The initial stage of hypertension with a high degree of probability is caused by a violation of the kidneys sympathetic innervation.

2. Rehabilitation measures to eliminate spastic conditions in the intervertebral muscles and to restore sympathetic innervation of the kidneys (massage, gymnastics for the spine and proper rest) can prevent the development of hypertension at its initial stage.

3. Primary arterial hypertension is not a disease, but a reversible functional disorder in the sympathetic part of the nervous system that regulates the removal of fluid from the circulatory system through the kidneys.

References

1. Anokhin P.K. Physiological background of understanding the hypertension pathogenesis / Hypertension: Medicine news - Moscow, 1948. - Vol. 7. - №4. - P. 4-5.

2. Anokhin P.K. On the two-phase effect of adrenaline on aortic arch baroreceptors / Nervous regulation of blood circulation and respiration. - Moscow, 1953. - P. 147-155.

3. Anokhin P.K., Sudakov K.V. Emotions and health / The future of science. - 1973. - №6. - p. 190-211.

4. Anokhin P.K., Shumilina A.I. Analysis of afferent function of the aortic nerve under conditions of varying blood pressure / Physiol., Well. THE USSR. - 1947. - V. 33. - № 3. - P. 275-278.

5. Kashtanov S.I. Convergence of somatic and vegetative afferent impulses on individual neurons of the hypothalamic region of the brain. - Moscow, 1975. - p. 113 - 118.

6. Kashtanov S.I. Investigation of afferent functions of hypothalamic neurons in pressor and depressor vascular reactions: Dis. ... Ph.D. Biol. Sciences. - Moscow, 1976.

7. Lang G.F. Hypertonic disease. - Moscow: Medgiz, 1946.

8. Myasnikov A.L. Hypertonic disease. - Moscow: Medgiz., 1952.

9. Oganov R.G. and others. The fight against arterial hypertension. Report of a WHO Expert Committee / Ed. R.G. Oganova, V.V. Kukharchuk and A.N. Britova. - M .: State. SIC prof. med. HM of RF, 1997. - 139 p.

10. Chazov E.I. Emotional stress and cardiovascular diseases / Vestn. Academy of Medical Sciences of the USSR, 1975. - №8. - P. 3-8.

11. Chernigovsky V.N. Interreceptors / V.N. Chernigovsky. - Moscow, 1960.

12. Cherkasov A.D. Strategy of non-drug elimination of articular and backache pains / Materials of the XXVI international conference "Information technologies in medicine, biology, pharmacology and ecology". IT + M & Ec`18. Crimea, Gurzuf, June 01 - 11, 2018 https://elibrary.ru/item.asp?id=35454586.

13. Guyton A.C. Textbook of Medical Physiology, 5th ed, Philadelphia-London, Saunders, 1976.

14. Guyton A.C., Coleman T.G., Cowley A.W., et al. A systems analysis approach to understanding long-range arterial blood pressure control and hypertension / Circulat. Res., 1974. – 159 p.

牙冠修复术后不同时间高血压患者植入物周围组织状态
THE STATE OF TISSUES AROUND THE IMPLANT IN PATIENTS WITH HYPERTENSION AT DIFFERENT TIMES AFTER DENTAL CROWNS PROSTHETICS

Dzgoeva Madina Georgievna
Doctor of Medical Sciences, Head of the Department
Tibilova Fatima Leonidovna
Graduate student
Khetagurov Soslan Kazbekovich
Candidate of Medical Sciences, Associate Professor
North Ossetian State Medical Academy
of the Ministry of Health of the Russian Federation

注解。 在这项研究中，植入后不同时间研究牙种植体周围组织的状况。 该研究的对象是62名年龄在35至40岁之间的人，他们安装了牙科植入物。 患者分为2组。 一个包括高血压患者，第二个患者没有躯体病理。 使用激光多普勒血流计测量植入物周围组织的状况。 微观动力学指标在植入前，之后，2周后，3个月和6个月后进行矫形结构评估。 结果显示，在植入区动脉高压患者的牙周组织中存在许多显着的微循环变化，这些变化在假体后6个月停止。

关键词：激光多普勒血流仪，牙种植，高血压，微流体动力学。

Annotation*. In this study, the condition of the tissues surrounding dental implants was studied at various times after implantation. The object of the study were 62 people aged from 35 to 40 years old, who were installed dental implants. Patients were divided into 2 groups. One included patients with hypertension, the second patients without somatic pathology. The assessment of the condition of the tissues around the implants was performed using laser Doppler flowmetry. Microhemodynamic indicators were assessed before implantation, after it, 2 weeks later, 3 and 6 months after prosthetics with orthopedic structures. It was revealed that in the periodontal tissues in patients with arterial hypertension in the area of the implant there is a number of significant microcirculatory changes, which stop 6 months after prosthetics*

Keywords*: laser Doppler flowmetry, dental implantation, hypertension, microhemodynamics.*

At present, various types of implants have been introduced into clinical practice as supporting elements of supporting structures, which makes it possible to apply removable dentures to a lesser degree or significantly improve their fixation in the oral cavity, as well as to ensure the prevention of deformities of the dental system.

Despite certain advances in the field of dentistry, there are a number of contraindications and limitations in the use of implants.

Changes that occur in the oral cavity may be due to systemic effects of somatic diseases [1, 2]. In particular, in case of arterial hypertension, there is a violation of local and systemic blood flow. In patients with hypertension, changes in the oral mucosa are characterized mainly by vascular, proliferative and atrophic abnormalities. [3, 4]

In the analysis of domestic and foreign literature, it turned out that there is no single point of view on studying this problem [5, 6].

It should also be noted that the results of successful treatment in which the state of microhemodynamics and oxygenation plays a significant role in determining the trophism of the peri-implant tissues largely depend on the functional state and reactive properties of the peri-implant tissues. For successful and high-quality treatment using implants, timely early and objective diagnosis of pathological changes in the tissues surrounding the implant is necessary.

The aim of the study was to establish the state of the peri-implant tissues in patients with arterial hypertension at various times after prosthetics with single crowns.

Material and methods. To identify the functional state of periodontal tissues in the area of implants using the laser Doppler flowmetry LAKK-M, microcirculation was studied in 62 people aged 35-49 years, approximately equally of both sexes. The patients were divided into 2 groups: without somatic pathologies and the second group with arterial hypertension. Microhemodynamic indicators were evaluated before, after, after 2 weeks, after 3 and 6 months after prosthetics with orthopedic structures. According to the results of laser Doppler flowmetry, the following indicators were determined: the level of microhemodynamics, coefficient of variation, and change in the saturation of the hemoglobin fraction. In addition, the dental status of patients was comprehensively evaluated.

Results and discussion

The results of the microhemodynamic study of the peri-implant zone revealed a decrease in microcirculation in the tissues around the implants, this fact is associated with the absence of stress in the implantation area and was characterized by a decrease in the degree of capillary blood flow by 19%, which indicated a decrease in blood gum tissue. The amplitude-frequency characteristics of the LDFgram blood flow were reduced by 11-17%. At the same time, the microvascular

tone increased by 16%. The efficiency of the microcirculation system was lower by 12%, which indicated a violation of the mechanisms of regulation of tissue blood flow. After fixing the orthopedic construction in the gingival tissues, the level of capillary blood flow increased in the area of the implant, the vasomotor activity of the microvessels also increased, indicating a reactive hyperemia in the microcirculatory link. The amplitude-frequency analysis of the LDF-gram showed an increase in high-frequency and pulse fluctuations, which was manifested by a sharp venous stagnation in the microvasculature in response to the implant load after fixing the orthopedic structure. Two weeks after the fixation of the orthopedic construction in the peri-implant tissues, the hyperemia in the microvasculature subsided, as indicated by the normalization of the parameters of tissue blood flow. According to the amplitude-frequency analysis, the stagnation in the microvasculature weakened due to the normalization of the level of rhythmic resistance and the efficiency of microcirculation functioning was significantly improved. Normalization of microcirculation parameters in the area of the implant began by the 6th month after prosthetics.

Thus, in periodontal tissues in patients with arterial hypertension, a number of significant microcirculatory shifts are noted in the implant area (Table 1), which are stopped 6 months after prosthetics, which is much longer than in the control group.

Table 1

Microhemodynamic changes in the peri-implant tissues in patients with arterial hypertension at various times after prosthetics with single crowns

The time of observation	Patients without somatic pathologies			Patients with arterial hypertension		
	М,усл.ед	**Кv,%**	**Σ,усл.ед.**	**М,усл.ед**	**Кv,%**	**Σ,усл.ед.**
Before prosthetics	16,74±1,05	8,01±1,75	2,21±1,35	19,35±1,05	6,31±0,75	2,22±2,35
2 weeks after prosthetics	15,15±1,35	11,21±1,75	3,31±0,15	22,18±1,65	2,21±0,35	4,31±1,25
3 months after prosthetics	17,04±1,75	7,21±0,75	2,31±1,15	20,01±2,05	4,61±0,05	2,31±1,25
6 months after prosthetics	22,79±2,05	11,21±1,05	2,2±1,05	25,79±2,15	3,01±1,05	5,2±2,05

Note: The significance of differences in the studied groups was $p < 0.01$

References

1. Dzgoeva M.G. Features of regional microcirculatory disorders and the possibility of their adequate correction in patients with primary arterial hypotension // Kuban medical messenger. - 2008. - № 3. - p.56-60.

2. Laser Doppler flowmetry of microcirculation of blood: hands. for doctors / ed. A.I. Krupatkina, V.V. Sidorov. - Moscow.: Medicine: Chicot, 2005. - 254 p.

3. Boytsov S.A. The structure of risk factors, lesions of target organs and metabolic changes in patients with arterial hypertension in different age groups / S.A. Boytsov, etc. // Cardiology. -2009. - Vol.49 - №4. - p. 19-24.

4. Clinical and laboratory features of the state of the organs and tissues of the oral cavity in patients with hypertensive disease on the background of combined antihypertensive therapy // Siberian Medical Review. - 2008. - № 2 (50). - p. 50-53.

5. Cardiological patient in dental practice: problems of remineralization of teeth against the background of combined pharmacotherapy // Siberian Medical Review. - 2008. - № 3 (51). - p. 65-68. (et al. Nedoseko V.B., Nikolaev N.A.)

6. Prevention of dental diseases in patients with hypertensive disease: guidelines. - Omsk: Publishing house OmGMA, 2009. - 24 p. (et al. Nedoseko V. B., Nikolaev N. A.)

PARTICULARITIES OF TUBERCULOSIS IN CHILDREN FROM VARIOUS SOCIO-TERRITORIAL ZONES OF THE FAR NORTH REGION OF RUSSIA

Luginova Evdokia Fedorovna
Candidate of Medical Sciences
Deputy Chief Physician for Pediatric Care
State Budgetary Institution of the Republic of Sakha (Yakutia)
"Scientific and Practical Center Phthisiology"

注解。 远北地区个别地区的社会卫生和流行病学因素的差异导致区域发病率不平等，并影响儿童结核病感染的过程。 在北极地区观察到高平均长期发病率（第一期 – 73.3，第二至每10万儿童54.2）和农村地区（53.6和28），低 – 在工业（9.3和4,9），一个复杂的过程 在北极地区的儿童中观察到追逐疾病（24.7%）。

关键词：结核病，儿童人口，远北地区

Annotation. *Differences in socio-hygienic and epidemiological factors in individual territories of the Far North region cause regional morbidity inequality and influence the course of tuberculosis infection in children. High average long-term incidence rates were observed in the Arctic (1st period - 73.3, 2nd - 54.2 per 100,000 children) and Rural zones (53.6 and 28), low - in the Industrial (9.3 and 4,9), a complicated course of chase disease is observed in children from the Arctic zone (24.7%).*

Keywords*: tuberculosis, child population, the Far North*

The relevance of research.

In recent years, an improvement in the epidemiological situation of tuberculosis has been observed in the Russian Federation, due to social processes stabilization in the country, the successful implementation of measures to develop a strategy of tuberculosis prevention (Nechayeva, OB, 2012; Belilovsky, 2015; Vasilieva I.A., 2017).

It is known that the situation of tuberculosis among the child population in a particular region is directly dependent on the overall epidemic situation (Aksenova VA, 2013). It should be noted that in the territories of the Far Eastern Federal District, the incidence of tuberculosis among the child population is 3 times higher than in the Russian Federation (Shilova MV, 2015). Meanwhile, the

existing system of organizing work on the prevention and early detection of tuberculosis among the child population for a long time has not undergone significant changes and does not adequately reduce the incidence (Starshinova AA, 2011; Sevostyanova TA, 2012).

In this regard, a comprehensive study of this problem, taking into account the influence of epidemiological, socio-hygienic factors and territorial characteristics of the Far North, seems to be relevant due to the high prevalence of tuberculosis among the child population.

Objective: to assess the impact of epidemiological and socio-hygienic factors on the dynamics of tuberculosis incidence rate and the course of tuberculosis infection in children in certain socio-territorial zones of the region of the Far North.

Material. The influence of socio-hygienic and epidemiological conditions in the development of the disease in children is assessed in 5 socio-territorial zones of the Republic of Sakha (Yakutia). For this, the Sakha Republic (Yakutia), taking into account climatic and geographical differences of territories, their transport accessibility, distances, population size and its material and living conditions, was divided into 5 socio-territorial zones (Arctic, Mixed, Rural, Industrial, Yakutsk) . Observation time from 1997 to 2016 was divided into 2 periods:

1st - from 1997 to 2006, the socio-economic crisis period;

2nd - from 2007 to 2016, the period of relative stabilization, modernization of health care, the introduction of new methods of tuberculosis diagnosis and treatment.

An estimate of the incidence rate in 5 territorial zones was carried out using the forms of federal statistical observation No. 33 “Information about patients with tuberculosis”, No. 8 “Information about diseases of active tuberculosis”.

Research methods. Statistical data processing was carried out using standard software packages. The significance of differences compared indicators were determined using Student t- criterion. The critical confidence level of the null statistical hypothesis (the absence of significant differences or factorial effects) was taken to be 0.05. The statistical indicator was considered reliable at $p < 0.05$. Statistical data analysis was performed in the IBM SPSS STATISTICS 22 package. Comparison of groups by qualitative characteristics was performed using the four-floor table method with the calculation of the Pearson χ^2 criterion. To analyze the strength and direction of the relationship between the quantitative variables, Spearman’s rank correlation analysis was used.

The results of the study.

An assessment of epidemiological and socio-hygienic factors influence on the tuberculosis incidence dynamics among the child population in 5 socio-territorial zones of the Republic of Sakha (Yakutia) showed that out of the total number of those first identified in 1997-2016 the vast majority of children with tuberculosis were children from the Rural Zone (31.4%) and Yakutsk (43.7%) (Table 1).

Table 1

The allotment of patients by socio-territorial zones in 1997-2016.

Socio-territorial zone	1997-2006 гг.		2007-2016 гг.		Total in 1997-2016 гг.	
	abs.fr.	%	abs.fr.	%	abs.fr.	%
Arctic	124	10,0	74	13,8	198	10,5
Mixed	118	9,4	55	10,2	173	9,8
Rural	394	31,5	177	33,0	571	31,4
Industrial	56	4,4	25	4,6	81	4,6
Yakutsk	560	44,7	206	38,4	766	43,7
Total:	1252	100,0	537	100,0	1789	100,0

Most often, tuberculosis was detected in children of indigenous peoples of the north of the Yakut nationality (73.5%), much less often in children of non-indigenous nationalities of the alien population (26.5%).

In the first observation period (1997–2006), the average long-term incidence rate of tuberculosis among children was the highest in Yakutsk (107.5 per 100,000 children) and the Arctic zone (73.4 per 100,000 children). But the average growth rate was the highest in the Industrial (10.6%) and Arctic (8.3%) zones, while in Yakutsk, on the contrary, there was a decrease (–9.7%). In the 2nd period, the average incidence rate decreased in all zones, but remained high in the Arctic (54.2) zone and in Yakutsk (35.8 per 100,000 children). The average rate of loss was higher in the Industrial (–11%) and Rural zones (–7.7%).

It was found out that in the Republic of Sakha (Yakutia) against the background of a decrease in the number of newly diagnosed children with tuberculosis in the 2nd period, compared with the 1st, there is a high adherence to tuberculosis infection in children from socially unprotected segments of the population. Thus, 72.6% were children living in poor living conditions, in 14.8% of patients parents abused alcohol, more than 40.0 children did not attend organized children's groups, 65.8 were from poor families, 36.4 - from large families, 19.1% from incomplete families.

The influence of socio-hygienic and epidemiological factors on the tuberculosis incidence among the child population is most clearly seen in the Arctic and Rural zones. In this regard, in the RS (Y), in the period of relative epidemic well-being, it is necessary to strengthen preventive tuberculosis work specifically with the poor and socially unprotected segments of the population, especially in the Arctic and Rural zones.

In all socio-territorial zones of the republic, there is an increase in the proportion of children from contacts with patients who emit mycobacterium tuberculosis (MBT) with multidrug-resistant (MDR). In addition, in the 2nd period compared with the 1st, there is an increase in the proportion of children who excreted MBT with MDR from 0.7 to 2.4% among newly diagnosed patients (Table 2).

table 2

Frequency of contacts with MDR MBT and the proportion of children with tuberculosis with MDR MBT in two periods of observation (%)

Socio-territorial zone	Percentage of patients who have contact with patients with MDR MBT among children with newly diagnosed tuberculosis		Percentage of patients with MDR-MBT among children with newly diagnosed tuberculosis	
	1997-2006	2007-2017	1997-2006	2007-2016
Arctic	3,3	27,4	0	1,3
Mixed	7,0	42,1	0,8	-
Rural	7,7	43,9	1,7	5,1
Industrial	0	25,0	0	0
Yakutsk	0,7	23,5	0,2	0,9
RS (YA)	4,7	33,8	0,7	2,4

It is shown that in areas with low population density (Far North), socio-hygienic factors play a significant role in the tuberculosis infection spread among children. In such regions, the formation of a focus with bacterial excretion can be considered as an epidemiologically dangerous territorial infection source, which is most dangerous for socially unprotected segments of the population and children. In individual localities and districts, territorial foci can cause outbreaks of tuberculosis, which ultimately contributes to a sharp increase in the tuberculosis incidence among children.

It was established that the tuberculous process with complications was most often recorded in children from the Arctic (24.7%) and Rural zones (15.7), in the calcification phase from the Arctic (16.1) and Industrial (15.6%) zones (Table 3).

The average long-term dynamics of the frequency of registration of tuberculosis in the calcification phase in the RS (Y) decreased in the 2nd period compared to the 1st period in all zones except Yakutsk, where the growth of this indicator was 17.5%. And the frequency of registration of complications in the 2nd period was higher than in the 1st period, in all social and territorial zones of the republic.

Table 3

The frequency of late detection of tuberculosis in children in 1997-2016, abs.ch. (%)

Socio-territorial zone	Total identified patients	i.e.	
		with complications	in the calcination phase
Arctic	198	49 (24,7)	32 (16,1)
Mixed	173	20 (11,6)	16 (9,2)
Rural	571	90 (15,7)	80 (14,0)
Industrial	81	9 (11,1)	11 (13,6)
Yakutsk	766	68 (8,8)	120 (15,6)
Total:	1789 (100,0)	236 (13,2)	259 (14,5)

In the structure of tuberculosis complications in children in the RS (Y) in 1997-2016 lymphogenous dissemination prevailed (39.4%), pulmonary tissue disintegration (20.8%) and bronchopulmonary lesion (13.1%). Chronic primary tuberculosis is registered in 54 cases, incl. in the 1st period - 40 (74%), in the 2nd period - 14 (26%), $p < 0.01$. Tuberculosis of the central nervous system is noted in 8 cases, equally often in each observation period (4 cases). Such severe forms of tuberculosis were observed more often in children from Yakutsk (36.1%) and the Rural Zone (32%).

Conclusion. The long-term dynamics of the tuberculosis incidence rate among the child population of the region of the Far North - the Sakha Republic (Yakutia) has undergone significant changes and is characterized by a decrease in this indicator in all socio-territorial zones. The decrease in the incidence rate was more pronounced in the 2nd observation period. A significant impact of socio-hygienic and epidemiological factors on the dynamics of the incidence of tuberculosis among children is observed in the Arctic and Rural areas and in Yakutsk. The relatively high frequency of registration in children of a complicated course of tuberculosis in the Arctic (24.7%) and Rural (15.7%) zones is directly related to the timeliness of detection of the disease. The above dictates the need to revise the organization of preventive tuberculosis measures, taking into account socio-territorial characteristics of the Far North region.

References

1. Aksyonova, V.A. [Actual issues of screening children for tuberculosis / V.A. Aksyonova, L.A. Baryshnikova, N.I. Klevno // Tuberculosis and lung diseases. - 2013. - № 6. - p. 7-8.

Vasilyeva, I. A. WHO Global Tuberculosis Reports: Formation and interpretation / I. A. Vasilyeva // Tuberculosis and lung diseases. - 2017. - № 5. - p. 7-15.

3. The incidence of tuberculosis in the Russian Federation / E. Moscow Belilovsky [et al.] // Tuberculosis in the Russian Federation, 2012/2013/2014: analyt,. review stat. indicators used in the Russian Federation and in the world. - Moscow, 2015. - p. 29-74.

4. Nechaeva, O. B. The epidemic situation of tuberculosis and HIV infection in the Russian Federation / O. B. Nechaeva, N. V. Eismont // Social aspects of public health: an electronic journal. - 2012. - №2 (24).

5. Sevostyanova, T. A. The problems of modern tuberculosis vaccination in Russia / T. A. Sevostyanova, V. A. Aksyonova, D. T. Levy // Actual problems and prospects for the development of the tuberculosis service in the Russian Federation: Proceedings of the I Congress of the Association "National TB Association", October 18-20. 2012 - St. Petersburg., 2012. - p. 403-404.

6. Starshinova, A.A. A comprehensive approach in diagnosing tuberculosis of intrathoracic lymph nodes in children using modern diagnostic methods / A. A. Strashinova, N. V. Korneva, I. F. Dovgalyuk // Bulletin of the East Siberian Scientific Center. - 2011. - № 2 (78). - p. 258-259.

7. Shilova, MoscowV. Tuberculosis in the Russian Federation in 2014: monograph. / MoscowV. Shilova. - Moscow, 2015. - 240 p.

肾综合征出血热（HFRS）药物对汉坦病毒RNA检测结果的影响
THE TRANSMISSION FACTORS OF HEMORRHAGIC FEVER WITH RENAL SYNDROME (HFRS) AGENTS ON RESULTS OF DETECTION OF HANTAVIRUS RNA

Kushnareva Tatyana Valerevna
Candidate of Biological Sciences, Associate Professor
Vladivostok State Medical University of Ministry of Health of the Russian Federation

注解。 每年在Primorsky Krai（俄罗斯远东地区南部）的森林（Apodemus peninsulae感染源）和森林草原（Apodemus agrarius感染源）景观区中记录每年发病率季节性上升的HFRS的散发病例。 在HFRS组发生的情况下，使用分子遗传学研究方法检测作为人类感染源的样品中的特定RNA，允许在由汉坦病毒感染聚焦的区域中鉴定人类病原体传播的几种因素。

关键词：汉坦病毒，啮齿动物，肾综合征出血热，HFRS。

Annotation. *Sporadic cases of HFRS with a seasonal rise in the incidence rate are recorded annually in forest (source of infection Apodemus peninsulae) and forest-steppe (source of infection Apodemus agrarius) landscape zones of Primorsky Krai (south of the Russian Far East). The use of molecular genetic research methods for the detection of specific RNA in samples intended as sources of human infection in case of group HFRS incidence allowed identifying several factors of human pathogen transmission in areas focalized by hantavirus infection.*

Key words: *hantaviruses, rodents, hemorrhagic fever with renal syndrome, HFRS.*

Introduction. In the south of the Russian Far East, in natural foci of hemorrhagic fever with renal syndrome (HFRS), the circulation of pathogenic Hantaviruses Amur and Hantaan is provided by the Asian forest mouse (Apodemus peninsulae) and the field mouse (Apodemus agrarius), respectively [1].

In Primorsky Krai, sporadic cases of HFRS are recorded annually and have a seasonal increase in the incidence rate in focal areas [2]. In forest landscaped areas, A. peninsulae is the source of human infection, and in forest-steppe zones, A. agrarius. Previously, epidemiological data on the alleged transmission factors for hantaviruses to patients with HFRS were not confirmed by laboratory studies.

The aim of the work is to determine the pathogenic hantaviruses transmission

factors to humans in the mass HFRS incidence areas using molecular genetic research methods.

Materials and methods. The material was collected in three focal areas with reported cases of group HFRS incidence. In the places of human infection, 116 rodent carriers of hantaviruses were captured (508 organs samples were taken from them) and 44 samples of the environmental substrate were collected (soil with plant litter, hay, straw, fodder with traces of mouse droppings, household garbage, etc.).

The allocation of total RNA was performed with reagent kits using the kit for the first step of extracting RNA from biological material, and then the reagent kit for the second step of extracting RNA / DNA from clinical material. Hantavirus was detected in the test samples using a reagent kit for detecting RNA (Hantavirus) of the HFRS complex of Hantavirus (Puumala, Dobrava, Hantaan, Seoul, Tula) [3] using the methods of reverse transcription and PCR. Electrophoretic detection of amplification products was performed on an agarose gel. Identification of the hantavirus antigen in the rodents organs suspension was performed by ELISA analysis. Specific antibodies in the blood serum from patients with HFRS and from rodents were detected using an indirect method of immunofluorescence and hemagglutination inhibition reaction (rtga). Hemagglutinin antigens for the production of cross-rtga were prepared according to our proposed method. A marker of acute hantavirus infection in animals was the presence of virus antigen / RNA in samples of the lungs and secretion and excretion organs.

Research results. In the forest landscape zone, one case of group HFRS incidence was registered among the employees of the "National Park" in late May - early June. It is assumed that the infection of people occurred during the collection of firewood for heating the living space from the remains of a woodpile, harvested the previous day in the autumn. At that time, it was inhabited by mouse-like rodents. According to the results of laboratory studies of blood sera by the etiological agent of patients with HFRS, the Amur virus was detected. An assessment of the epizootic situation in the adjacent territory determined the dominance of A. peninsula - the natural host and reservoir of the Amur virus — among all rodents captured and infected. According to virological and molecular genetic studies, 80% of those infected with A. peninsula had an acute hantavirus infection stage, in which the virus is actively released into the external environment from the host organism. Examination of samples (n = 18) of environmental substrates (soil, plant litter, debris, etc.) using RT-PCR allowed us to detect the presence of Hantavirus RNA in 4 samples of substrates taken two weeks after laboratory confirmation of HFRS cases. In the forest-steppe landscape zone, several cases of group HFRS incidence were observed during the observation period. One of them was registered in June among military personnel (one fatal outcome), temporarily living in a tent

camp during the exercise. According to the results of laboratory diagnostics, the Hantaan virus was stated as an etiological agent. Based on our epizootological studies and the assessment of the epizootic situation in this focal area, we conclude A. agrarius, the natural host and reservoir of the Hantaan virus, dominate among the rodents captured and infected with hantavirus. With a high epizootic activity in populations of this species of rodent carrier, acute hantavirus infection was detected in 60% of infected field mice. In order to identify possible factors of pathogenic hantavirus transmission, samples of substrates (n = 12) of the external environment (soil, plant litter, dry grass, leaves, etc.) were taken at the temporary location of tents a month after the first patient was registered. Molecular genetic research revealed Hantavirus RNA in samples of plant litter and dry leaves taken from the dry branches under one of the tents.

Another case of people group infection with the Hantaan virus (also with a single fatal outcome) occurred in January among workers in a pig farm. To determine the transmission factors of the HFRS pathogen to working people, samples (n = 14) of forage, hay, straw, household garbage, bedding, soil, etc. were examined. It is important to note that hay and fodder were harvested in summer and autumn and at the time of infection people were inhabited with field mice.

The presence of specific RNA was detected in samples of hay (n = 2) and fodder (n = 2) taken three weeks after the registration of cases of the disease.

Conclusion Long-term epizootic and epidemiological observations in the focal territories of the region revealed a link between the epizootic process in the populations of A.agrarius and A.peninsulae and the epidemic process in HFRS [2]. As noted by a number of researchers, the group incidence of HFRS is more often recorded during periods of increased population numbers of Hantavirus-bearing rodents. In the above cases, a relatively low number of rodents carrying hantaviruses ($\leq$10 animals per 100 trap / day) was noted, with one of the species of mice of the genus Apodemus highly infected ($\geq$3 animals per 100 trap / day). At the same time, more than 60% of infected mice had an acute infection, actively excreted hantavirus into the environment of a natural forest or forest-steppe type focus.

The use of molecular genetic research methods for the specific RNA detection in samples intended as sources of human infection allowed identifying several factors of pathogen transmission to human in focalized by hantavirus infection areas.

References

1. Kushnareva T.V., Slonova R.A. The Natural Host Range of Hantaviruses and Their Reservoir Potential in the Dynamic of the Epizootic Process within the Ecosystems of Primorskii Krai // Contemporary Problems of Ecology. – 2014. – Vol. 7, Iss. 1. – P. 19-25. DOI: 10.1134/S1995425514010090 (http: //link.springer.com/article/10.1134/S1995425514010090)

2. Maxema I.G. Characteristics of the incidence of hemorrhagic fever with renal syndrome in the Primorye Territory in 1999–2008 / I.G. Maxema, G.G. Kompanets, O.V. Iunikhina, T.V. Kushnareva, R.A. Slonova // Pacific Medical Journal. - 2010. - № 3. - p. 43-45.

3. T. Dzagurova Hemorrhagic fever with renal syndrome (etiology, specific laboratory diagnostics, development of diagnostic and vaccine preparations): author. dis. ... Dr. med Sciences / T.K. Dzagurova. - Moscow, 2014. - 47 p.

类风湿性关节炎患者心血管危险指标
INDICATORS OF CARDIOVASCULAR RISK IN PATIENTS WITH RHEUMATOID ARTHRITIS

Kamilova Umida Kabirovna
Saidova M.M., Yusupaliev B.K.
RSNPMTS therapy and medical rehabilitation,
Bukhara State Medical Institute, Tashkent, Bukhara, Uzbekistan

Cardiovascular morbidity and mortality in patients with rheumatoid arthritis (RA) is higher than in the general population [1]. The results of a multicenter study showed that the increase in mortality in patients with RA is associated with the development of adverse cardiovascular events, including myocardial infarction and sudden coronary death [2,3]. The basis of the early development of atherosclerosis in RA patients, according to most researchers, are common immune-inflammatory mechanisms in the development of RA and atherosclerosis [4,5]. The concept of risk factors (RF) for atherosclerosis, developed on the example of cardiovascular pathology, has found its application in patients with rheumatic diseases. Arterial hypertension (AH) is the most important risk factor for cardiovascular complications, however, in patients with RA, there is a wide variation in the values of the prevalence of AH (from 16% to 76%), which is due to underreporting of the clinical characteristics of patients and the characteristics of antirheumatic therapy [6,7] . The role of endothelium, indicators of hardening of arteries, heart rate variability in the development of cardiovascular pathology is widely studied [8,9]. The development of cardiovascular complications in patients with RA is associated both with the influence of traditional risk factors, systemic inflammation, and the side effects of nonsteroidal anti-inflammatory drugs (NSAIDs) taken [10,11]. NSAIDs by suppressing cyclooxygenase (COX) activity can lead to a decrease in systemic and renal synthesis of vasodilator prostaglandins, which causes an increase in vascular tone and fluid retention, accompanied by an increase in blood pressure (BP) and decompensation of chronic heart failure (CHF) [12,13]. Without assessing the severity of these disorders in RA patients, clarifying the characteristics of the functioning of the cardiovascular system in conditions of chronic systemic inflammation, it is impossible to understand the role of these factors in the development of cardiovascular pathology in RA.

Цель. Изучить структуру и частоту кардиоваскулярных коморбидных заболеваний у больных ревматоидным артритом и определить суммарный сердечно-сосудистый риск у больных ревматоидным артритом (РА) по шкале mSCORE.

Research methods. A retrospective study included 1190 patients with RA who were treated in the clinic of the department of the Bukhara State Medical Institute. Of these, 931 (78.2%) were men and 259 (21.8%) were women. 458 patients were aged 35-49 years and 732 aged 50-60 years. The diagnosis of RA was established using the ACR (1987) and ACR / EULAR (2010) criteria. The frequency of occurrence of risk factors for cardiovascular diseases was assessed: heredity, smoking, hypercholesterolemia, abdominal obesity, physical inactivity, C-reactive protein (CRP), and also the frequency of occurrence of arterial hypertension (AH), coronary heart disease (CHD), and diabetes mellitus in patients Ra. Prediction of cardiovascular risk over 10 years was carried out using the mSCORE scale. The control group consisted of 35 healthy individuals.

Results and discussion. A retrospective analysis showed that 806 (67.7%) patients were seropositive for the rheumatoid factor and 384 (32.3%) patients with seronegative. An analysis of the main risk factors for cardiovascular diseases revealed that heredity was aggravated in 359 (30.2%) patients, smoking was found in 141 patients (11.8%). Hypercholesterolemia (GHS) was detected in 306 (25.7%) patients. At the same time, GHS was significantly more common in men - 39% of cases versus 22% in women. Obesity was reported in 430 (36.6%) patients. Obesity occurred 3 times more often in patients aged 50-60 years and 2 times more often in men. Hypertension occurred in 819 patients, which was 68.8%, while in patients aged 50–60 years hypertension occurred 5 times more often than in patients aged 35–49 years. IHD occurred in 125 (10.5%) patients: at the age of 35-49 years in 3 (0.65%) and in the age of 50-60 years in 122 (16.7%). Diabetes mellitus was in 54 (4.5%) patients, while in 11 (2.4%) patients aged 39–49 years and 43 (5.9%) aged 50–60 years. According to the literature, the importance of the presence of risk factors for atherosclerosis (smoking, obesity, arterial hypertension, hypercholesterolemia, diabetes mellitus, etc.) in the development of CVD in RA patients, a higher incidence of individual RF in RA compared with other rheumatic diseases [14,15] .

The results of the study of the total cardiovascular risk on the mSCORE scale in patients with RA showed that the cardiovascular risk was low at 38.7%, moderate at 48.7%, high at 7.2%, and very high at 5.4%. When analyzing these indicators depending on age, a low cardiovascular risk was found at the age of 35-49 years old, 83.2%, whereas in patients aged 50-60 years old - 5.4%, the average risk was 14.1% at the age of 35 -49 years and 74.5% at the age of 50-60 years. A high risk <10% occurred 5 times more in the group of patients aged 50–60 years and a very

high risk> 10% was found only in patients aged 50–60 years. Increased risk of mortality from cardiovascular diseases is associated with age and the presence of additional risk factors. Coronary atherosclerosis and related complications largely determine the clinical course and outcomes of a number of rheumatic diseases. In this regard, the assessment of the risk factor of CVD, the total cardiovascular risk and its reduction due to the modification of all existing risk factors is of great importance. It is also important to maintain a low risk in individuals with a low probability of developing the disease and early diagnosis of CVD [16,17].

Conclusions. In patients with RA, the determination of the total cardiovascular risk in patients with rheumatoid arthritis (RA) on the mSCORE scale has an important prognostic value.

References

1. Agca R, Heslinga SC, Rollefstad S, et al. The recommendations of cardiovascular disease risk management in patients with rheumatoid arthritis and other forms of inflammatory joint disorders: 2015/2016 update // Ann Rheum Dis. –2017, №76 (1). –P.17-28.

2. Cynthia S Crowson, Sherine E Gabriel, Anne Grete Semb, et al. Rheumatoid cardiac arthritis-specific cardiovascular risk scores: Swiss Med Wkly. –2018, №22. –P.148.

3. Gasparyan A.A., Menshikova I.V., Kanevskaya M.Z. Comorbidity in rheumatoid arthritis: features of the course of cardiovascular diseases // Clinical medicine. - 2016, №10. - P.745-753.

4. Arida A, Protogerou AD, Kitas GD, Sfikakis PP. Systemic Inflammatory Response and Atherosclerosis: The Paradigm of Chronic Inflammatory Rheumatic Diseases // Int J Mol Sci. –2018, №19 (7). - P.1890.

5. Carbone F, Bonaventura A, Liberale L, et al. Atherosclerosis in Rheumatoid Arthritis: Promoters and Opponents // Clin Rev Allergy Immunol. –2018, # s1. - P.2016-2018.

6. Nasonov EL, Popkova TV, Novikova D.S. Modern ideas about the pathogenesis and features of the treatment of arterial hypertension in rheumatoid arthritis (Review) // Therapeutic archive. –2011, №5. - P.24-33.

7. Bartoloni E, Alunno A, Gerli R. Hypertension as a result of a cardiovascular risk in autoimmune rheumatic diseases // Nat Rev Cardiol. –2018, №15 (1). - P.33-44.

8. Kropotina T.V., Morova N.A., Gudinova Z.V., Kokukhina N.S. Risk factors and progression of cardiovascular diseases in patients with rheumatoid arthritis // Siberian Medical Journal. –2013, №3. - P.72-76.

9. Charles-Schoeman C. Cardiovascular disease and rheumatoid arthritis: an Update // Curr Rheumatol Rep. –2012, №14 (5). - P.455-62.

10. Ajeganova S, Andersson M. L, Hafström I; BARFOT Study Group. Association of obesity with a disease severity in rheumatoid arthritis as well as with comorbidities: a long term followup from disease onset // Arthritis Care Res (Hoboken). - 2013, №65 (1). - P.78-87.

11. Gómez-Vaquero C, Robustillo M, Narváez J, et al. Assessment of cardiovascular risk in rheumatoid arthritis: Impact of cardiovascular risk index and cardiovascular risk index // Swiss Med Wkly. –R 2018, No. 22. –P.148.

12. Daïen CI, Fesler P. Rheumatoid arthritis: a cardiovascular disease? // Ann Cardiol Angeiol (Paris). - 2012, № 61 (2). –P.111-117.

13. England BR, Thiele GM, Anderson DR, Mikuls TR. Increased cardiovascular risk in rheumatoid arthritis: mechanisms and implications //BMJ.–2018, No. 23. – P.361

14. Nasonov EL, Popkova TV, Novikova D.S. Prevention of cardiovascular diseases in rheumatoid arthritis // Therapeutic archive. –2009, №5. - P.88-96.

15. Starodubtseva, IA, Vasiliev, L.V. Assessment of risk factors for the development of cardiovascular disease in patients with rheumatoid arthritis // Russian Journal of Cardiology. –2016, №2. - P.71-74.

16. Boytsov S.A., Oganov R.G. From preventive cardiology to the prevention of noncommunicable diseases in Russia // Russian Journal of Cardiology. - 2013, №4. - p.6-13.

17. European recommendations for the prevention of cardiovascular diseases in clinical practice (2016 revision) // Russian Journal of Cardiology. - 2017, No. 6. - P.34-35.

检测一些RNA病毒基因组中核苷酸取代发生的相关性
DETECTION OF CORRELATIONS IN THE OCCURRENCE OF NUCLEOTIDE SUBSTITUTIONS IN THE GENOME OF SOME RNA VIRUSES

Tyulko Zhanna Sergeevna
Candidate of Biological Sciences
Associate Professor
at the Department of Physics, Mathematics, Medical Informatics
Omsk State Medical University;
Senior Research Officer
Omsk Research Institute of Natural Focal Infections,
Jakimenko Valerij Viktorovich
Doctor of Biological Sciences
Head of the Laboratory of Arbovirus Infections
Omsk Scientific Research Institute of Natural Focal Infections,

注解。为了鉴定在黄病毒和汉坦病毒的基因组的一级序列中的核苷酸取代的情况下的相关性，使用基于计数互信息搜索符号序列中的相关变化的方法。在一些汉坦病毒和黄病毒中，在基因组的远端部分揭示了核苷酸取代事件的统计学显着相关性（同义和非同义）。在位于汉坦病毒基因组的不同区段中的核苷酸取代中也发现了相关性。在核苷酸取代的情况下，比较病毒RNA的结构元件的排列与获得的相关性方案。比较显示，观察到的相关性通常对应于病毒RNA的发夹结构的茎的单链部分中核苷酸取代的发生。

关键词：黄病毒，汉坦病毒，核苷酸取代，RNA的三级结构，RNA病毒的进化。

Annotation. *To identify correlations in the event of nucleotide substitutions in the primary sequences of the genomes of flaviviruses and hantaviruses, a method of searching for related changes in symbolic sequences based on counting mutual information was used. Statistically significant correlations in the event of nucleotide substitutions were revealed (both synonymous and nonsynonymous) at distant parts of the genome in some hantaviruses and flaviviruses. Correlations were also found in nucleotide substitutions located in different segments of the hantavirus genome. A comparison of the arrangement of the structural elements of viral RNA with the obtained correlation scheme in the event of nucleotide substitutions was made. The comparison showed that the observed correlations often correspond to*

the occurrence of nucleotide substitutions in the single-stranded portions of the stems of the hairpin structures of viral RNA.

Key words: *flaviviruses, hantaviruses, nucleotide substitutions, tertiary structure of RNA, evolution of RNA viruses.*

Introduction. Many flaviviruses and hantaviruses are the causative agents of dangerous diseases found throughout the world [1,2], which makes it necessary to carefully study the patterns of the structure and evolution of these viruses. Hantaviruses (Hantavirus) is a genus of Bunyaviridae family of viruses. The natural reservoir and carriers of hantaviruses are rodents of the mouse (Muridae) and hamster (Cricetidae) families. Hantavirus genome consists of three single-stranded negative RNA segments: L – large, M – medium, S – small, which are enclosed in three internal nucleocapsids surrounded by a lipid membrane. [1].

Flaviviruses (Flavivirus) - a genus of arboviruses of the Flaviviridae family of viruses, that are transmitted by arthropods and mosquitoes, and cause tick-borne encephalitis (TBEV), West Nile fevers (WNV), Dengue and etc. The single genomic RNA of flaviviruses encodes three structural (C, M, and E) and seven non-structural proteins (NS1, NS2A, NS2B, NS3, NS4A, NS4B, NS5) that are sequentially read in a single reading frame and are needed for successful virus propagation in host cells [2].

The secondary structure of RNA viruses is sensitive to the occurrence of mutations. The effects caused by the appearance of synonymous and non-synonymous nucleotide substitutions are determined by the place of their occurrence [2,3]. The importance of studying the possible links between individual point mutations in different parts of the genome has already been shown previously [4,5]. Further study of such connections, comparison of their location in viral RNA with the position of known conservative RNA structures, will help to get an idea of the interactions of these structures with each other and their role in the viral genome.

Objective: to detect correlations at the event of nucleotide substitutions in the coding sequences of viral RNA and the subsequent analysis of the location of sites in which the associated nucleotide substitutions are observed.

Materials and methods. The samples of full-length coding sequences of flaviviruses (TBEV, WNV, Dengue virus) and hantaviruses (M- and S-segments of the viruses Tula, Puumala, Hantaan, Dobrava-Belgrade, Seoul were used; since the number of available sequences of their L-segments is not sufficient for analysis) available in GenBank. Both artificial sequences and those containing IUPAC codes with ambiguous coding were excluded from consideration. To identify correlations in the event of nucleotide substitutions, a method based on counting mutual information (MJ) when comparing two symbolic sequences, which were columns with different coordinates i and j from an array of aligned nucleotide sequences was used (Fig. 1) [4].

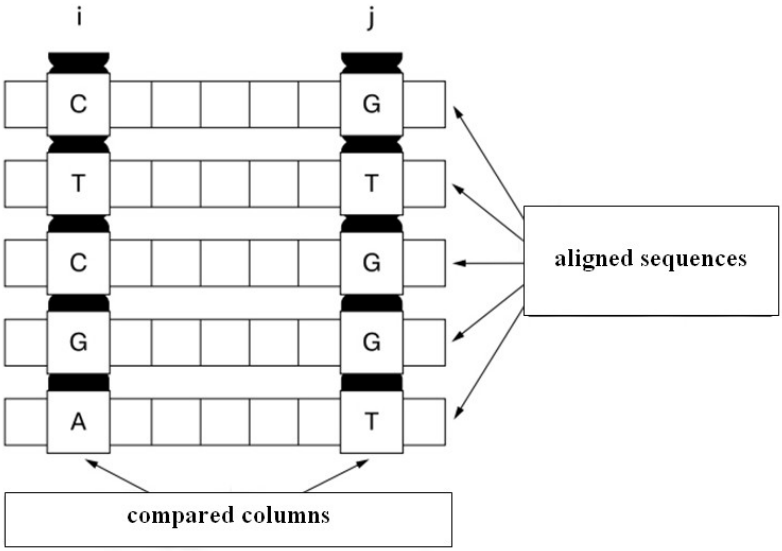


Figure 1. *Scheme for finding correlations in aligned nucleotide sequence columns when analyzing nucleotide substitutions*

The value of MJ served as a measure of the similarity of character sequences, since it allows to estimate the probability of a random relationship of two compared sequences. For this, in each case, the minimum value of Mj_{min} is initially determined, depending on the number of aligned sequences (length of columns) and ensuring the detection of a statistically significant relationship of symbol sequences with a given error probability $p < 0.05$ [5]. Correlation detection cases were considered significant for which the calculated value was $MJ \geq Mj_{min}$. When identifying correlations between sites located in different segments of hantaviruses, only the nucleotide sequences of the S and M segments of the same strains were used, located after alignment in the same order.

Alignments were performed by CLUSTALW and Kalign computer programs (https://www.ebi.ac.uk/Tools/msa/kalign/). The secondary structures of RNA are calculated using the Mfold program (The UNAFold Web Server – http://unafold.rna.albany.edu/?q=mfold). Mutual information values MJ and Mj_{min} were calculated in R software package.

Results. In case of Hantaan genotype hantaviruses, when analyzing the primary structure of S and M-segments of the genome, the resulting pattern of arrangement of interconnected nucleotide substitutions is shown in Fig. 2

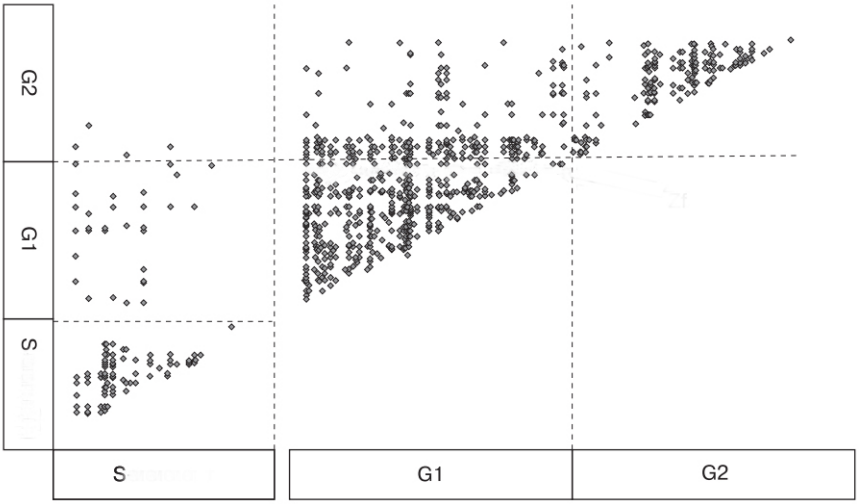


Figure 2. *Distribution of detected correlations along the nucleotide sequences of segments. The markers in the figure indicate the presence of significant correlations in the event of substitutions in the columns of aligned nucleotide sequences, the coordinates of which are deposited along the horizontal and vertical axes, respectively. The rectangles on the axes indicate the areas corresponding to the S-segment, as well as the sections of the M-segment encoding glycoproteins G1 and G2.*

Statistically significant connections in the event of the nucleotide substitutions were found both within the boundaries of the same segment, and if the compared sites were located in different segments. Within the M-segment, correlations between substitutions localized within the nucleotide sequence encoding G1 and substitutions occurring within the nucleotide sequence encoding glycoprotein G2 are also noted (Fig. 2). Among identified related substitutions, synonyms prevailed. But "nodal" sites, i.e. those for which the greatest number of correlations in the Tula and Dobrava / Belgrade viruses were observed contained non-synonymous substitutions. For the Puumala and Huntaan viruses, both synonymous and non-synonymous substitutions corresponded to such sites. For the Seoul virus, they were not detected.

Analysis of the TBEV genome full-length coding sequences also revealed numerous significant correlations in the occurrence of synonymous and nonsynonymous nucleotide substitutions (more than 800 cases). The coordinates of sites with the correlation cases are distributed unevenly along the sequence and affect parts of the genome distant from each other that encode different proteins (Fig. 3).

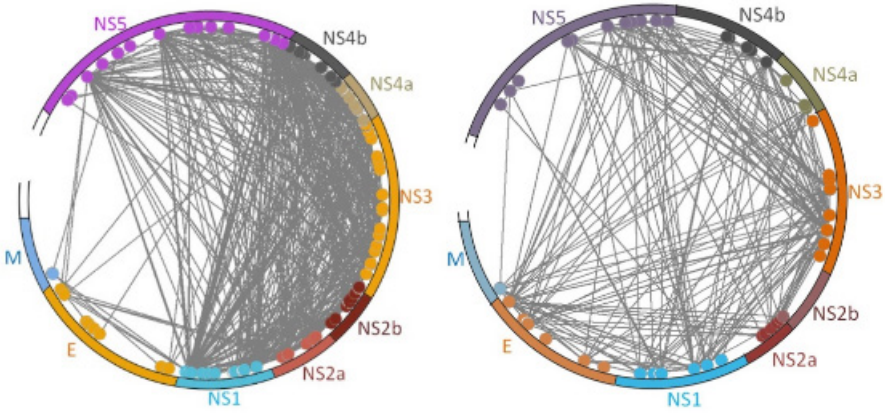


Figure 3. *Diagram of significant correlations:(a) for TBEV (MJ > 144); (b) for WNV (MJ>110).*

The largest number of cases of correlation in both TBEV and WNV was detected for the part of RNA encoding nonstructural proteins. Correlations with the highest values MJ> 150 predominantly bind sites located in the regions encoding different genes. The resulting correlation scheme, as in the case of hantaviruses, reveals the presence of "nodal" points, I.e. positions for which there is the greatest number of correlations with other nucleotide substitutions in the sequence (Fig. 3). Most of the nucleotide substitutions corresponding to the "nodal" points are synonymous, but ≈ 16% of them are localized at the places where nonsynonymous substitutions appear. As an example, the coordinates of the sites of nonsynonymous nucleotide substitutions located on single-stranded RNA segments can be cited (coordinates are indicated by the coding sequence with access code AM600965): 1565, 2858, 3640, 4954.

Unfortunately, the existing descriptions of the secondary structure of the RNA of TBEV viruses are not enough to unambiguously explain the obtained correlation scheme, and software modeling of secondary structures does not always give unambiguous results.

Conclusions. The possibility of consistent changes in the S- and M-segments of the hantavirus genome, identified as correlations observed in the event of nucleotide substitutions, can explain the same rate of accumulation of nucleotide substitutions attributed to these segments [2]. The data on the secondary structure

of some sites, correlated with the coordinates of nucleotide substitutions for which correlations were found, showed that the position of many sites where associated substitutions are observed corresponds to single-stranded (unpaired) segments of RNA hairpin stems. These data, as well as data on the location of bound nucleotide substitutions in hantavirus RNA [4], allow to suggest that the revealed correlations reflect the pattern of interactions occurring between individual parts of hantavirus RNA during the formation of its tertiary structure.

In the case of flaviviruses, it is interesting that the correlation schemes for TBEV and WNV viruses (Fig. 3) are very similar, although not identical, as in the case of the Dengue virus (data not shown). The large distance between some parts of the sequence involved in the correlation scheme (Fig. 3) let us to make a plausible assumption about the direct tertiary interaction of RNA hairpin structures or the presence of an indirect selection mechanism that makes it possible to fix RNA in the viral population with certain forms of secondary structures that are necessary for successful virus life activity. In support of this, we can give examples of the mutational stability of RNA viruses, which, by means of compensatory substitutions, are able to restore the desired interaction of RNA hairpin structures [7]. And also the fact that a multitude of identified correlations occurs between nucleotides located in single-stranded portions of the hairpin structures (the results of simulating RNA-structures are not shown) or on the border of a double-stranded and single-stranded portion, i.e. replacement may result in either disruption of tertiary interactions, or a change in the shape of the stem of the hairpin, or a change in the length of the single-stranded portion. The emergence of mutations in these sites or in the sites associated with them by the correlation scheme can deform the stem of the hairpin structure of viral RNA and change the pattern of tertiary interactions. This, in turn, may affect the adaptation of the virus and the results of selection in the adaptation process and, as a result, pathogenicity and fitness. So in experiments with the adaptation of tick-borne encephalitis virus to VNK-21 cells, the occurrence of both non-synonymous and synonymous substitutions was noted, which changed only the secondary structure of RNA [2]. Using such an idea of the nature of the revealed correlations and the obtained scheme of localization of related substitutions in the RNA sequence, the occurrence of some group-specific mutations in TBEV can also be explained[8].

An increase in the number of full-length nucleotide sequences of RNA viruses in the data banks will make it possible in the future to clarify the correlation pattern in the event of nucleotide substitutions, to identify portions of the sequences involved in tertiary interactions and to differentiate the types of such interactions. This approach can help in the selection of possible variants of the tertiary structure of viral RNA, the modeling of which is a complex task of dynamic programming and requires the simultaneous consideration of many factors.

References

1. Souza, W. M., Bello G., Amarilla A. A., Alfonso H. L., Aquino V. H., Figueiredo L. T. Phylogeography and evolutionary history of rodent-borne hantaviruses // Infect Genet Evol. - 2014, No. 21. –P.198-204.

2. Votyakov, V.I. Tick-borne encephalitis of Eurasia (questions of ecology, molecular epidemiology, nosoology, evolution) / V.I.Votyakov, V.I.Zlobin, N.P.Mishaeva. - Novosibirsk: Nauka, 2002. - 438 p.

3. De Leonardis E. Direct-Coupling Analysis of the nucleotide coevolution facilitates RNA secondary and tertiary structure Prediction / E. De Leonardis, B. Lutz, S. Ratz, S. Cocco, R. Monasson, A. Schug, M. Weigt / / Nucleic Acids Research. -2015. -V. 43, No. 21. - P. 10444– 10455.

4. Tyulko Z.S., Yakimenko V.V. Correlation of changes that occur in certain parts of the genome segments of hantaviruses // Questions of Virology. - 2012. - Vol. 57, No. 4. P. 31-35.

5. Occurrence of linked nucleotide substitutions in the genome of TBEV, determined by the structure of the viral genome as a result of the action of adaptation mechanisms // National Priorities of Russia. Publisher: Publishing Center "Omsk Scientific Herald" LLC-Omsk: -2016. №4 (22). - p.103-108.

6. Kulbak S. Information Theory and Statistics. - Moscow: Nauka, 1967. 220 p.

7. Agol V.I., Gmyl A.P. Emergency services of viral rnas: repair and remodeling // Microbiology and molecular biology reviews. -2018. -V.82, No. 2 –P. e00067.

8. Demina T.V. Questions of genotyping and analysis of genetic variability of tick-borne encephalitis virus: dissertation's abstract. - Irkutsk, 2013. 46 p.

生物膜在电场中的绝热可压缩性
ADIABATIC COMPRESSIBILITY OF BIOLOGICAL MEMBRANES IN AN ELECTRIC FIELD

Varekhov Aleksey Grigorievich
Candidate of Engineering Sciences, Associate Professor,
Saint Petersburg State University of Aerospace Instrumentation

注解。 该文章的内容涉及电磁场对生物膜水合蛋白的影响的分析。 通过类比气体的绝热可压缩性，该文章提出使用与膜材料的电场强度和极化率相关的类似热力学参数。 热力学分析基于在恒定电场强度和恒定场感应下使用热容C_E和C_D，以及介电常数ε（T）的温度依赖性。 已经表明，水合膜蛋白在结合水的电磁场中的熔化不仅导致介电常数的快速增加，而且导致可压缩性的快速增加，并因此导致膜结构的可能破坏。

关键词：电场，膜，蛋白质熔化，压缩性，机械稳定性。

Annotation. *The content of the article relates to the analysis of the effects of the electromagnetic field on the hydrated proteins of biological membranes. By analogy with the adiabatic compressibility of gases, the article proposes the use of a similar thermodynamic parameter relating the electric field strength and the polarizability of the membrane material. Thermodynamic analysis is based on the use of heat capacities C_E and C_D at a constant electric field strength and at a constant field induction, as well as on the temperature dependence of the dielectric constantε(T). It has been shown that melting of hydrated membrane proteins in the electromagnetic field of bound water leads not only to a rapid increase in the dielectric constant, but also to a rapid increase in compressibility and, accordingly, to a possible destruction of membrane structures.*

Keywords*: electric field, membrane, protein melting, compressibility, mechanical stability.*

The adiabatic compressibility of lipid biological membranes is an integral parameter that determines the mechanical properties of membrane proteins in combination with hydrated (structured) water [1-5]. The interaction of the solvent (two-phase water) and large organic molecules, primarily proteins, has been studied for a very long time. Traditionally, in the Debye-Hückel theory [6], it is assumed that the hydration shell is incompressible. This turns out

to be true for aqueous colloids, but unfair for hydrated membrane proteins, when bound water performs the function of structuring and maintaining protein operability. In this case, the protein, together with its environment, is a multicomponent elastic system that collectively perceives a deforming effect. The adiabatic compressibility of gases is recorded for the relative volume change in the following form

$$\beta_S = -\frac{1}{V}\left(\frac{\partial V}{\partial p}\right)_S$$

where $p, V -$ is pressure and volume of gas. Physical dimension β_S is expressed by the relation $\left[m^3 / J\right]$, that is, a change in the volume of gas per unit of work produced by the volume compression of gas.

We can write, using the methods of electromechanical analogies, the expression for the adiabatic compressibility of membranes in a similar form,

$$\beta_S = -\frac{1}{P}\left(\frac{\partial P}{\partial E}\right)_S$$

reflecting the relative change in the polarization of the membrane with an adiabatic (pulsed) change in the field E and unchanged structure (entropy). The physical dimension of value β_S is now expressed by the relation $\left[P / J\right]$, that is, the change in the dipole moment (polarization) of the medium per unit energy of the electric field spent on polarization.

Replacing the generalized force p (mechanical pressure) with the generalized force E (electric field strength) and the generalized coordinate V (volume) with the generalized coordinate P (polarization) gives the adiabatic compressibility record form used here. This parameter can be formally justified as follows.

Let the field jump affect the considered area of the polar dielectric (membrane) $E(t)$. Then the polarization of the volume can be expressed in an integral form by the relation:

$$P(t) = P(0) + \int_0^t \left(\frac{\partial P}{\partial E}\right)_S dE .$$

The condition $S = const$ in the integrand means that the duration of the jump in the field strength is much less than the duration of the transients of the structural rearrangements of all the links of the polarized substance. The isentropic derivative $\left(\partial P / \partial E\right)_S$, as will be shown below, can be reduced to the isothermal derivative $\left(\partial P / \partial E\right)_T$ and, further, to the temperature dependence of the dielectric constant $\varepsilon(T)$ of the membrane.

We can write the balance equation of thermodynamic components for a membrane in an electric field in a form close to the Gibbs thermodynamic potential

$$\Delta G = \Delta Q + \Delta A + E \cdot \Delta P + P \cdot \Delta E - T \cdot \Delta S - S \cdot \Delta T .$$

We will further assume that heat release ΔQ is the only source of increasing free energy and therefore $\Delta G = \Delta Q$. We will also assume that the only result of the operation ΔA of an external electric field is the polarization of the membrane material, that is $\Delta A + E \cdot \Delta P = 0$ or $\Delta A = -E \cdot \Delta P$. Finally, in an isothermal process $S \cdot \Delta T = 0$. Thus, the equality remains $\Delta S \cdot T = P \cdot \Delta E$, showing that the jump in the field strength corresponds to the jump in entropy.

We can further write down the necessary relations known for analysis [6]: polarization $P = \varepsilon_0 (\varepsilon - 1) E$; internal energy $U = (1/2)\varepsilon_0 \varepsilon E^2$, that is the electrical energy of the membrane capacitor; electric field induction $D = E + (P/\varepsilon_0) = \varepsilon E$. We can use for analysis the previously obtained [7] expressions for heat capacity C_D and C_E:

$$C_E = -\frac{1}{2}\varepsilon_0 E^2 \left(\frac{\partial \varepsilon}{\partial T}\right); C_D = -\frac{1}{2}\varepsilon_0 E^2 \left(\frac{\partial \varepsilon}{\partial T}\right) - \varepsilon_0 \frac{E^2}{\varepsilon}\left(\frac{\partial \varepsilon}{\partial T}\right)\left[T\left(\frac{\partial \varepsilon}{\partial T}\right) - 1\right]$$

We can write the relation of heat capacities in the following form:

$$\frac{C_D}{C_E} = \frac{-(1/2)\varepsilon_0 E^2 \frac{\partial \varepsilon}{\partial T} - \frac{\varepsilon_0 E^2}{\varepsilon} \cdot \frac{\partial \varepsilon}{\partial T}\left(T \frac{\partial \varepsilon}{\partial T} - 1\right)}{-(1/2)\varepsilon_0 E^2 \frac{\partial \varepsilon}{\partial T}} = \frac{\varepsilon + 2\lambda(T)}{\varepsilon},$$

where $\lambda(T) = T(\partial \varepsilon / \partial T) - 1$.

Let us now express the relation of heat capacities, using once more the formal analogy of the processes of adiabatic compressibility of gas and membrane dielectric:

$$\frac{C_p}{C_V} = \frac{(\partial V/\partial p)_T}{(\partial V/\partial p)_S}, \text{ that is } \frac{C_E}{C_P} = \frac{(\partial P/\partial E)_T}{(\partial P/\partial E)_S}.$$

To transform the relation C_E/C_P to the form C_E/C_D, it is also necessary to find the relation of the differentials $d_P S$ and $d_D S$. From the record of the first law of thermodynamics in the following form $dU = TdS + EdP$, it follows that with $P = const$ we get $dU = -(1/2)\varepsilon_0 E^2 d\varepsilon$ and $d_P S = -(1/2T)\varepsilon_0 E^2 d\varepsilon$. In the same way $D = const$, with equalities $D = E + (P/\varepsilon_0) = \varepsilon E$, we have an expression $EdP = -\varepsilon_0 EdE$ and therefore $d_D S = -(1/2T)\varepsilon_0 E^2 d\varepsilon - (1/\varepsilon T)\varepsilon_0 E^2 d\varepsilon = -\varepsilon_0 [(\varepsilon + 2)/2\varepsilon T] E^2 d\varepsilon$.

Thus, the equality $d_P S = \left[\varepsilon/(\varepsilon+2)\right] d_D S$ is fulfilled, and the heat capacity relation is equal to $\frac{C_E}{C_D} = \frac{(\partial P/\partial E)_T}{(\partial P/\partial E)_S}\frac{\varepsilon}{\varepsilon+2}$ or $\frac{C_D}{C_E} = \frac{(\partial P/\partial E)_S}{(\partial P/\partial E)_T}\frac{\varepsilon+2}{\varepsilon}$.

Comparing both expressions for the heat capacity ratio

$$\frac{(\partial P/\partial E)_S}{(\partial P/\partial E)_T}\frac{\varepsilon+2}{\varepsilon} = \frac{\varepsilon+2\lambda(T)}{\varepsilon},$$

first we find the expression for the derivative

$$(\partial P/\partial E)_S = (\partial P/\partial E)_T\left[(\varepsilon+2\lambda(T))/(\varepsilon+2)\right],$$

and then, after finding the derivative $(\partial P/\partial E)_T = \varepsilon_0(\varepsilon-1)$, we obtain the expression for adiabatic compressibility :

$$\beta_S = -\frac{1}{E}\frac{\varepsilon+2\lambda(T)}{\varepsilon+2}.$$

The direct calculation of the dimensionless parameter $\beta_S E = \left[\varepsilon+2\lambda(T)\right]/(\varepsilon+2)$, independent of the field strength, was carried out for the temperature dependence of the dielectric constant of water at a frequency of $52MHz$ [9]. The calculation results are presented by the following data:

1. $t \le -5°C; \varepsilon \cong 3; \partial\varepsilon/\partial T \cong 0; \beta_S E \cong -0,2$
2. $-5°C \le t \le 0°C; 3 \le \varepsilon \le 88; \partial\varepsilon/\partial T \cong 17/grad; \beta_S E \cong -104$
3. $t \ge 0°C; \varepsilon < 88; \partial\varepsilon/\partial T \cong -0,36/grad; \beta_S E \cong +1,2$

It is assumed that the external field remains constant during the entire melting process, and the dielectric constant with the rise of temperature from $-5°C$ to $0°C$ increases from $\varepsilon = 3$ at the beginning of the process to $\varepsilon = 88$ at the end. Thus, the onset of polarization changes, which for bound water should be considered the beginning of melting, corresponds to an increase in the dimensionless value $\beta_S E$ of approximately 500 times. The melting process can be initiated by local heating (8). When $\varepsilon = const$ the value β_S is changed the same way as the product of $\beta_S E$.

Since adiabatic compressibility $\beta_S = -(1/P)(\partial P/\partial E)_S$ characterizes the relative change of polarization (dP/P) with a change in the field, this means that the polarization should increase with E the application of the field . This is exactly the case if we assume that the application of the field is accompanied by the melt-

ing of membrane water, the content of which in the membranes can reach up to $0,2 \div 0,3$. Squeezing water from the bilayer onto its external surfaces should increase the polarization of near-membrane areas due to the influx of well-polarized material. It is well known that as the membrane bilayer dehydrates, its thickness increases. This is explained by the fact that water displaced from the bilayer neutralizes the charge of the plates of the membrane capacitor, the attraction between them decreases and the thickness of the membrane increases. This leads, under the condition of incompressibility of the bilayer, to a contraction of the surface and to possible ruptures. The incompressibility of the bilayer relates mainly to the lipid part of the membrane, but not to the inserted proteins, with which adiabatic compressibility is associated. Although most membranes consist of about 40% of lipid and 60% of protein, deviations are possible. For example, the myelin membranes of Schwann cells contain up to 80% of lipids, and the content of proteins in erythrocyte membranes reaches to 50% (the rest is lipids and carbohydrates). A reduction in the surface of the membranes can lead to an increase in surface tension and an increase in the free energy of the surface. This can be significant, for example, for erythrocytes prone to hemolysis under extreme conditions. The sensitivity of erythrocytes to an increase in the osmotic pressure of the surrounding fluid and their swelling or volume reduction with changes in osmotic pressure is well known. There is a common [9] procedure for the preparation of erythrocyte shadows, based on the effect on the erythrocyte suspension by electrical pulses with duration of $20 \div 30 \mu s$ and amplitude of the field strength to $16 kV / cm$.

Under the action of such pulses on erythrocytes in an isotonic solution with $10 mM$ of EDTA (ethylene diamine tetraacetate), the erythrocyte membranes dissolved and completely lost hemoglobin.

Studies of the adiabatic compressibility of cell membranes, that is, ultimately, changes in cell's size or shape, as well as measurements of the surface charge density, transmembrane and electrokinetic potentials of cells are the most important problems of practical cytology.

References

1.Grant E.H. Determination of bound water in biological materials. Proc. Workshop Physical bases of electromagnetic interactions with biological systems. Univ.of Maryland, 1979, p.113;

2. Heimburg Th. Mechanical aspects of membrane thermodynamics. Estimation of the mechanical properties of lipid membranes close to the chain melting transition from calorimetry. Biochimica et Biophysica Acta, 1415 (1998) 147-162;

3. Hianik T., Rybar P., Bernhardt I. Adiabatic compressibility of red blood cell membrane. Bioelectrochemistry, 2000, 52(2):197-201; DOI:10.1016/S0302-4598(00)00102-1.

4.Artmann G.M., Kelemen C., Porst D., Buldt G., Chien S., Temperature transitions of protein properties in human red blood cells, Biophys. J., 1998,75,3179.

5.Kupershtokh A.L., Medvedev D.A. Anisotropic instability of a dielectric liquid in a strong uniform electric field: Decay into a two-phase system of vapor filaments in a liquid. Physical Review E, 2006, vol. 74, ¹ 2, P. 021505 (5)

6.Landau L.D., Lifshitz E.M. Statistical Physics. Vol.5, 3rd ed., Butterworth-Heinemann, 1980;

7.Varekhov A.G. Phase transitions of membrane water induced by electromagnetic field. The present digest.

8.Devyatkov N.D. Influence of millimeter-band electromagnetic radiation on biological objects. Sov. Phys. Uspekhi, 1974, vol.16, pp.568-579;

9.Green D.E. Mechanism of energy transduction in biological systems. Science, 1974. vol.181, pp.583-584;

电磁场诱导膜水相变
PHASE TRANSITIONS OF MEMBRANE WATER INDUCED BY ELECTROMAGNETIC FIELD

Varekhov Aleksey Grigorievich
Candidate of Engineering Sciences, Associate Professor,
Saint Petersburg State University of Aerospace Instrumentation

注释本文提供了电磁场对细胞生物膜影响的热力学分析。 结果表明，膜水合蛋白的结构在热力学上是不稳定的，因为在生理温度下它们在冰的熔点固体上方形成过热。 电磁场引发膜中冰状结合水的熔化和膜材料的介电常数的突然增加。 热力学分析基于介电常数的温度依赖性。 对于线粒体膜和细菌需氧细胞显示，与活动呼吸状态相比，处于呼吸控制状态的膜结构对电场效应不太敏感。

Annotation *The article provides a thermodynamic analysis of the effects of an electromagnetic field on cellular biological membranes. It is shown that the structure of membrane hydrated proteins is thermodynamically unstable, since at physiological temperature they form an overheated above the melting point solid body that is ice. The electromagnetic field initiates the melting of ice-like bound water in the membranes and an abrupt increase in the dielectric constant of the membrane material. Thermodynamic analysis is based on the temperature dependence of the dielectric constant. It is shown for mitochondrial membranes and bacterial aerobic cells that membrane structures in the state of respiratory control are less sensitive to electric field effects compared to the state of active respiration.*

The effects of electromagnetic waves on biological structures are usually divided into non-specific (thermal) and relatively specific [1]. In the latter case, the impact is not directly related to the absorption of heat, but is accompanied by structural (entropic) changes. For example, the native structure of cytochrome c, like many other large molecules, is stabilized mainly by entropy factors. This means that a cytochrome molecule containing a large amount of weak bonds is plastic and a change in its conformation may require minimal energy expenditure. On the other hand, conformational rearrangements of proteins, which themselves are important for the assessment of any impact, are individual for each protein and are difficult to access for analysis due to the high co-operation of molecular bonds. Therefore, in heterogeneous membrane structures, it is possible to consider

as an object of action not proteins, but relatively low molecular weight components, whose structural (thermodynamic) transformations are much simpler. Such components can be membrane lipids and water, which properties in membranes, in particular, aqueous transmembrane metabolism and the very properties of membrane water, have been studied for a long time [2–5]. In this article, the membrane water and its dielectric properties will be considered as the object of impact. The main thesis statement expresses the idea that at physiological temperature the bound ice-like water of membranes is thermodynamically unstable, however, the melting of such water in an electromagnetic field can lead to an abrupt increase in dielectric constant and extremely high polarizability of the membrane material.

We can note for comparison that the melting of fatty acids, for example, stearic and palmitic, occurs at higher temperatures ($60 \div 70°C$) and is accompanied by minor changes in the dielectric constant. The interest in the study of water biological membranes, the content of which is $0,2 \div 0,3$, stimulated a huge amount of research and instrumental methods of these studies [6].

For analysis, we use specific heat capacities C_E and C_D at constant electric field strength and constant field induction. Both heat capacities formally bind thermal and electrostatic energies. In thermodynamics, the entropy term of free energy TS combines both thermal effects while preserving the structure (SdT) and isothermal structural changes (TdS). From a more general point of view, the values of heat capacities reflect, first of all, the process of energy conversion of the electric field effect. Let us further consider the biological membrane for two modes, that is, for given values of the transmembrane potential and the level of polarization of the membrane material.

1. At a given transmembrane potential difference, that is under conditions $\Delta\varphi_m = const\left(E = const\right)$, the conjugating membrane is an actively working system that performs the functions of respiration and phosphorylation. Thus, there is some excess of the starting materials for phosphorylation (adenosine diphosphate and inorganic phosphorus), as well as oxygen and the respiratory substrate (electron donor for the respiratory conveyor). In this case, the electron transfer chain is closed, that is, on the inner lining of the membrane capacitor (for mitochondria - at the boundary between the membrane and the inner water matrix) electrons are transferred to oxygen against the electric field of the membrane, and on the outer lining protons are released into the external environment and also against the field. In addition, all the simport systems function permanently, first of all $Na^+, K^+ - ATPase$. The external effect is reduced to the polarization of the membrane material, and the work on the polarization of the membrane is performed by the transmembrane potential difference. The external source circuit $\Delta\varphi_m$ is also closed. The flow of current in the external circuit means an increase in the capacity of the membrane compared to its passive

(static) value and, consequently, an increase in the dielectric constant. With an oscillatory effect, that is, with a alternating polarizing electric field, the polarization of the membrane changes due to the work performed by an external relative to the membrane source $\Delta\varphi_m$. Changes in the internal energy of the membrane $\Delta U > 0$, the work $\Delta A > 0$ of the environment performed on the membrane, and thermal energy $T\Delta S > 0$ are related as follows $\Delta U = \Delta A - T\Delta S$. The polarization of the membrane [7] is determined by the inflow of charges on the membrane capacitor plates; however, performed specific (per unit area of the membrane) work is equal to

$$dA = \Delta\varphi_m \cdot dq = C_{m1}^0 \cdot \Delta\varphi_m^2 \cdot d\varepsilon > 0,$$

where $C_{m1}^0 = \varepsilon_0 / d_m -$ is the specific capacity of the membrane at $\varepsilon = 1$ (i.e. with a vacuum dielectric). If $E = const$ the specific work can also be recorded depending on the surface charge density σ (or bulk density of the dipole moment) in the following form $dA = \Delta\varphi_m \cdot dq = E \cdot d_m \cdot d\sigma \cdot s$ (d_m –membrane thickness; s – unit surface area). Then the change of field induction $D = E + \left(P/\varepsilon_0\right) = \sigma/\varepsilon_0$ if $E = const$ is determined only by the polarization of the membrane, whence the equality $dP = d\sigma$ follows and the expression in differential form for the specific work is written in the following form $dA = E \cdot dP$. Based on the same considerations, we can define the increase in internal energy by the expression:

$$dU = \frac{1}{2} C_{m1}^0 \cdot \Delta\varphi_m^2 \cdot d\varepsilon > 0.$$

Accordingly, the increase in specific entropy is determined by the expression:

$$d_E S = \frac{dQ}{T} = \frac{dA - dU}{T} = \frac{d\varepsilon}{2T} \cdot C_{m1}^0 \cdot \Delta\varphi_m^2 > 0.$$

The increase in entropy can be understood, in particular, as the formation of channels in the membrane, the transport of water into the internal volume of cells or organelles, and, consequently, the swelling of cells as a general, non-specific mechanism of action.

2. The second case $D = const\left(q = const\right)$, that is $dq = 0$ and $dA = 0$, probably, corresponds to mitochondria or aerobic bacterial cells to respiratory control or state of rest of the membrane, which in this case should be considered as an open charged capacitor, the plates of which are fixed charge matrices. It is well known that the state of respiratory control is determined, first of all, by low concentrations of ADP and P_{inorg}, but also by moderate concentrations of the terminal oxygen electron acceptor and the electron donor of the respiratory chain. These conditions are characteristic of damaged (for example, during preparative procedures) mitochondria and, especially, for intact mitochondria. An external impact on such a structure should collapse the natural polarization of the membrane, that is, reduce its capacity and dielectric constant. Under oscillatory (electromagnetic)

effects, the alternating dipole moment is generated in the membrane volume, however, with a constant charge of the membrane capacitor plates ($q = const$), this process will be expressed in an increase in the membrane's internal energy and entropy; in this case $dA = 0$, that is, the work of external forces in relation to the membrane is zero. Accordingly, both the intramembrane and the external current flow circuits that are closed through the internal and external to the membrane water matrices are open.

Changes in the internal energy and specific entropy for the second case are given by the expressions:

$$dU = \frac{q^2 d\varepsilon}{2C_{m1}^0 \varepsilon^2} > 0; d_D S = \frac{q^2 d\varepsilon}{2T\varepsilon^2 C_{m1}^0} > 0.$$

Positive increments of internal energy (heat) and entropy mean melting of membrane structured water or a second-order phase transition. Both limiting cases $\Delta\varphi_m = const$ and $D = const$ should be understood, respectively, as the state of excitation and the state of rest of the membrane. We can now obtain expressions for heat capacities $C_E\left(dE = 0\right)$ and $C_D\left(dA = EdP = 0\right)$. Let us write the initial expressions for the total differentials of internal energy, entropy and polarization:

$$dU = \left(\frac{\partial U}{\partial T}\right)_E dT + \left(\frac{\partial U}{\partial E}\right)_T dE; dS = \left(\frac{\partial S}{\partial T}\right)_E dT + \left(\frac{\partial S}{\partial E}\right)_T dE; dP = \left(\frac{\partial P}{\partial T}\right)_E dT + \left(\frac{\partial P}{\partial E}\right)_T dE$$

Based on the equations $TdS = dU - dA$ and $dA = EdP$ we can write for dS the following expression:

$$dS = \frac{1}{T}\left[\left(\frac{\partial U}{\partial T}\right)_E dT + \left(\frac{\partial U}{\partial E}\right)_T dE\right] - \frac{E}{T}\left[\left(\frac{\partial P}{\partial T}\right)_E dT + \left(\frac{\partial P}{\partial E}\right)_T dE\right],$$

from which follow the equations:

$$\left(\frac{\partial S}{\partial T}\right)_E = \frac{1}{T}\left(\frac{\partial U}{\partial T}\right)_E - \frac{E}{T}\left(\frac{\partial P}{\partial T}\right)_E \text{ and } \left(\frac{\partial S}{\partial E}\right)_T = \frac{1}{T}\left(\frac{\partial U}{\partial E}\right)_T - \frac{E}{T}\left(\frac{\partial P}{\partial E}\right)_T.$$

From equation of mixed derivatives

$$\frac{\partial^2 S}{\partial T \partial E} = \frac{\partial^2 S}{\partial E \partial T}$$

we get an expression

$$\left(\frac{\partial U}{\partial E}\right)_T = E\left(\frac{\partial P}{\partial E}\right)_T + T\left(\frac{\partial P}{\partial T}\right)_E.$$

Substituting this last relation into the expression for the differential dU, we get further

$$dU = \left(\frac{\partial U}{\partial T}\right)_E dT + \left[E\left(\frac{\partial P}{\partial E}\right)_T + T\left(\frac{\partial P}{\partial T}\right)_E\right] dE.$$

Finally, for heat $dQ = dU - dA$, taking equation $dA = EdP$ into account, we get

$$dQ = \left(\frac{\partial U}{\partial T}\right)_E dT + \left[E\left(\frac{\partial P}{\partial E}\right)_T + T\left(\frac{\partial P}{\partial T}\right)_E\right] dE - E\left[\left(\frac{\partial P}{\partial T}\right)_E dT + \left(\frac{\partial P}{\partial E}\right)_T dE\right]$$

Thus, both heat capacities are written in the following form:

$$C_E = \left(\frac{\partial Q}{\partial T}\right)_E = \left(\frac{\partial U}{\partial T}\right)_E - E\left(\frac{\partial P}{\partial T}\right)_E$$

$$C_D = \left(\frac{\partial Q}{\partial T}\right)_D = \left(\frac{\partial U}{\partial T}\right)_E + \left[E\left(\frac{\partial P}{\partial E}\right)_T + T\left(\frac{\partial P}{\partial T}\right)_E\right]\left(\frac{\partial E}{\partial T}\right)_D$$

Using equations $U = (1/2)\varepsilon_0 \varepsilon E^2; P = \varepsilon_0 (\varepsilon - 1) E; D = \varepsilon E$, we can find the derivatives

$$\left(\frac{\partial U}{\partial T}\right)_E = \frac{1}{2}\varepsilon_0 E^2 \frac{\partial \varepsilon}{\partial T}; \left(\frac{\partial P}{\partial E}\right) = \varepsilon_0 (\varepsilon - 1);$$

$$\left(\frac{\partial P}{\partial T}\right)_E = \varepsilon_0 E \frac{\partial \varepsilon}{\partial T}; \left(\frac{\partial E}{\partial T}\right)_D = D\frac{\partial (1/\varepsilon)}{\partial \varepsilon} \cdot \frac{\partial \varepsilon}{\partial T} = -\frac{E}{\varepsilon} \cdot \frac{\partial \varepsilon}{\partial T}.$$

For heat capacities, we finally get the expressions:

$$C_E = -\frac{1}{2}\varepsilon_0 E^2 \left(\frac{\partial \varepsilon}{\partial T}\right); C_D = -\frac{1}{2}\varepsilon_0 E^2 \left(\frac{\partial \varepsilon}{\partial T}\right) - \varepsilon_0 \frac{E^2}{\varepsilon}\left(\frac{\partial \varepsilon}{\partial T}\right)\left[T\left(\frac{\partial \varepsilon}{\partial T}\right) - 1\right]$$

We can also write the expression for the difference in heat capacities, since this difference probably determines the effect of an electric field:

$$C_E - C_D = \varepsilon_0 \frac{E^2}{\varepsilon}\left(\frac{\partial \varepsilon}{\partial T}\right)\left[T\left(\frac{\partial \varepsilon}{\partial T}\right) - 1\right].$$

The above relations show that, firstly, it is the temperature dependence of the dielectric constant that generates both heat capacities C_E and C_D, secondly, this dependence determines the response of the biological material of the membranes to an electric field.

It is believed [8], that the external electric field reduces the entropy of dipole liquids (water), for which the dielectric constant decreases with increasing temperature, but increases the entropy of dipole solids (ice), for which the dielectric constant increases with temperature growth. For water in the ice melting area, a second-order phase transition, that is, a change in the dielectric constant in the temperature range $268 \div 273K$, has been studied in detail.

The dependence $\varepsilon(T)$ measured at frequency $52MHz$ [9] was used to calculate the heat of fusion of membrane water in the form of ice under the action of an electromagnetic field with density $E = 10^6 V/m$, sometimes considered boundary for the appearance of direct effects, for example, for «helix-coil» transitions in proteins [10]. Numerical integration of the dependence $\varepsilon(T)$ was performed for the temperature range $\Delta T = 268 \div 273K$ and showed values of the heat of fusion equal to $\Delta Q_D = 1,5 \cdot 10^5 J/m^3$ and $\Delta Q_E = 3,8 \cdot 10^2 J/m^3$, that is $\Delta Q_D \gg \Delta Q_E$. From this comparison, a cautious conclusion can be made that the membrane at rest is less sensitive to the electric field effect than the actively working membrane.

In addition, we should note that the heat value $\Delta Q_D = 1,5 \cdot 10^5 J/m^3$ turns out to be, at least, commensurate with the change in the free energy of cytochrome c during denaturation $\Delta G = 5,3 \cdot 10^6 J/m^3$.

Conclusion: membrane bound water in the structure of ice is thermodynamically unstable, since at physiological temperature it is an overheated above the melting point solid body[11]. The acting electromagnetic field should be considered as a factor triggering a spontaneous phase transition of the second kind, that is, melting of bound water.

References

1. Devyatkov N.D. Influence of millimeter-band electromagnetic radiation on biological objects // Sov. Phys. Uspekhi, 1974, vol.16, pp.568-579.

2. Eisenberg D., Kauzmann W. The structure and properties of water. Oxford University Press. 1969.

3. Aragones J.L., MacDowell L.J., Vega C. Dielectric constant of ices and water. A lesson about water interactions. J. Phys. Chem. A, 2011, vol.115, pp.5745-5758.

4. Artemov V.G., Volkov A.A. Water and ice dielectric spectra scaling at 0°C. Ferroelectric, 2014, vol.466, pp.158-165.

5. Agre P. Aquaporin water channels. Proc.Am.Thoracic.Soc.,2006, vol.3, issue1, pp.5-13;

6. Pershin S. Two liquid water. Physics of wave phenomena, 2005, vol.16, issue 1, pp.15-25;

7. Gubkin A.N. Physics of dielectrics. Textbook for high schools. Moscow, Publ. house the higher school (URSS), 1971. – 272p.;

8. Froehlich H. Theory of dielectrics: dielectric constant and dielectric loss. Clarendon Press, Oxford, 1949;

9. Akhadov Y.Y. Dielectric parameters of pure liquids. A Handbook (in Russian). Publ.of Standarts, Moscow, 1972. – 410p.;

10. Bean C.P., Bennet A.J. Conformational changes of polypeptides in intense electric fields. Biopolymers, 1973, vol.12, pp.817-824;

感染结节形成细菌的豆科植物的免疫特征
IMMUNE FEATURES OF LEGUMES INFECTED WITH NODULE-FORMING BACTERIA

Glyan'ko Anatoliy Konstantinovich
Chief Researcher
Siberian Institute of Plant Physiology and Biochemistry of the Siberian Branch of the Russian Academy of Sciences,
Irkutsk, Russia

In recent decades, significant progress has been made in studying the initial stages of legume-rhizobial symbiosis (LRS) including mutual recognition of partners, spread of rhizobial infection within plant cells, formation of nodule primordium and its organogenesis [1,2]. An important aspect in studying the problem of LRS is overcoming of the macrosymbiont defense system by rhizobia and their localization in the cells of plant roots [3,4]. It seems clear that rhizobia are virulent microorganisms that relatively easily overcome host plant defense systems and ensure their "safety" in nodules when fixing N_2 [5]. That is, during a successful rhizobial infection, plant defense reactions do not initiate. However, the "failures" of internal and external character during the LRS are often accompanied by the initiation of protective reactions of a host plant, similar to those observed during invasion of pathogens [6]. On the other hand, numerous data suggest that in the early stages of an infection, a legume plant "encounters" rhizobia as pathogens starting defensive responses, which are then blocked [**7].** The functioning of defense reactions is also observed during the symbiotic interaction [8]. Analyzing the data on the protective system of a legume plant, it is worthwhile to note the specificity of the LRS formation: biochemical correspondence of rhizobial lipohitooligosaccharides (Nod-factors, NFs) to host plant membrane receptors (LysM, LRR-kinase receptors) [9]. The interaction of these compounds causes a cascade of reactions leading to the initiation of an infectious process, nodule organogenesis and blocking of defense reactions [10]. Specific NFs are obviously microbial MAMPs-compounds (Microbial-associated Molecular Patterns), perceived by transmembrane plant receptors PRRs (Patern Recognition Receptors). These compounds belong to the non-specific immune system of plant cells MTI (MAMP-triggered immunity). The MTI system is present in all plants

and responds to the invasion of any bacteria by starting protective reactions [11]. The second innate immune system of plants, ETI (Effector-triggered Immunity), is intracellular. It operates with the participation of NB-LRR – protein products of plant *R*-genes and pathogenic effectors – products of *Avr*- genes. MTI and ETI immune systems can act against rhizobia but can be blocked by rhizobia in the case of successful infections. Rhizobia act as pathogens at the earliest stages of invasion and, apparently, to prevent infection of other plant organs (for example, pea epicotyls) when plant defense systems are activated [12]. It should also be noted that not the entire root is equally susceptible to rhizobial infection [13]. Therefore, it can be assumed that the plant protection system against rhizobia is weakened only in the root zone, the most sensitive to rhizobia, and does not lose its effectiveness in other parts of the root and plant organs (for example, in epicotyls). Consequently, it is possible to speak of the local and systemic resistance of the host plant to rhizobial infection. In the case of a local infection, rhizobia suppress the host plant's protective reactions by means of various mechanisms including those characteristic of phytopathogens, for example, surface exopolysaccharides and NFs [14**]**. When it comes to systemic resistance, some rhizobia, like phytopathogens, use T3SS or T4SS secretion systems to deliver effector proteins and other compounds into plant cells. These proteins can be recognized by the intracellular domains of membrane receptor-like kinases (RLK) causing the initiation of ETI defense system that is transmitted cell-to-cell and increases cells resistance to rhizobia invasion. NopL (Nodulation outer protein L) is one of the effector proteins, which is delivered to the plant cell by the T3SS secretion system and blocks defense reactions [**7**]. The involvement of MTI in the suppression of symbiosis has been proven in experiments using bacterial MAMP-flagellin (flg22) [15]. Treatment with flg22 – an active MAMP epitope – reduces the response of *Lotus japonicus* to NFs and significantly reduces nodulation relative to the control. These results indicate a decrease in the ability of rhizobia to withstand resistance associated with bacterial flagellin. It is generally recognized that rhizobial NFs are necessary compounds for triggering a signaling cascade during LRS formation [16]. However, some strains of rhizobia (*Bradyrhizobium*) do not have canonical *nodABC*-genes, which are required for NFs synthesis, but they are capable of forming nodules with plants of the genus *Aeschynomene* [17].The fact that NFs are perceived by non-legume plants – arabidopsis, wheat, tomatoes – is surprising [18]. It has been shown that suppression with MAMP-associated plant immunity is observed in this case. It is concluded that the innate immune system of a legume plant, represented by MTI and ETI, is activated during the earliest stages of rhizobial infection and is actively involved in the intracellular stages of symbiosis. The counter factors are rhizobial NFs, which trigger a cascade of symbiotic reactions and inhibit the activity of host plant defense systems.

References

1. Oldroud, G.E.D., Murray, J.D. & Downie, J.A. (2011) Annu. Rev. Genet. 45: 119-144.

2. Glyan'ko, A.K. (2015) Applied Biochem. Microbiol. 51: 494-504.

3. Glyan'ko, A.K. (2016) Bulletin Kharkiv Nat. Agrarian University. Ser. Biology. 1 (37): 63-77 (In Ukraine).

4. Yu, H., Xiao, A., Dong, R., Fan, Y. et al. (2018) New Phytol. 220: 425-434.

5. Berrabah ,F., Ratet, P., Gourion, B. J. (2015) Exp. Bot. 66: 1977-1985.

6. Lohar, D.P., Sharapova, N., Endre, G. et al. (2006) Plant Physiol. 140: 221-234.

7. Okazaki S., Kaneko T., Sato S. (2013) Proc. Natl. Acad. Sci. USA 110: 17131-17136.

8. Saeki, K. (2011) Cellular Mol. Life Sci. 68: 1327-1339.

9. Denarie,J., Debelle, F. (1996) Annu. Rev. Biochem. 65: 503-535.

10. Nakagava, T., Kaku, H., Shimoda, Y. et al. (2011) Plant J. 65: 169-180.

11. Shafikova, T.N., Omelichkina, Yu. V. (2015) Russian J. Plant Physiol. 62: 611-627.

12. Vasilyeva, G.G. (2004) Abstract of Thesis Dissertation of PhD in Biology. Irkutsk (Russian), 24 c.

13. Sokolova, M.U. (2001) Abstract of Thesis Dissertation of PhD in Biology. Irkutsk (Russian), 21 c.

14. Lehman, A.P., Long ,S.R. (2013) J. Bacteriol. 195: 5362-5369.

15. Lopez-Gomez , M., Sandal, N., Stougaard , J., Boller, T. J. (2012) Exp. Bot. 63: 393-401.

16. Giraud, E., Moulin, L., Vallenet, D. et al. (2007) Science 316: 186-194.

17. Bonaldi, K., Gargani, D., Prin, Y. et al. (2011) Mol. Plant-Microbe Interac. 24: 1359-1371.

18. Liang ,Y., Cao, Y., Tanaka K., Thibivilliers, S. et al. (2013) Science 341, 1384-1387.

基于落叶松提取物的有效兽用制剂的急性毒性的开发和测定
DEVELOPMENT AND DETERMINATION OF THE ACUTE TOXICITY OF AN EFFECTIVE VETERINARY PREPARATION BASED ON EXTRACTIVE SUBSTANCES OF LARCH

Babkin Vasilii Anatol'evich
Doctor of Chemical Sciences, Head of Laboratory,
Chief Research Officer
Irkutsk A.E. Favorsky Institute of Chemistry Siberian Branch
of the Russian Academy of Sciences
Neverova Nadezhda Anatolyevna
Candidate of Chemical Sciences, Research Officer
Irkutsk A.E. Favorsky Institute of Chemistry Siberian Branch
of the Russian Academy of Sciences
Nikiforov Sergey Borisovich
Doctor of Medical Sciences, Department Head
Senior Research Officer
Department of Experimental Surgery with Vivarium
of the Irkutsk Scientific Centre of Surgery and Traumatology

注解。 作为使用机械化学合成的研究的结果，开发了基于阿拉伯半乳聚糖的有希望的兽药和含有大量提取树脂物质（包括萜烯化合物）的二氢槲皮素原料的物质，并通过物理化学方法进行了研究。 正在开发的药物的急性毒性是通过实验确定的。 研究的兽药可归因于IV类危险。 开发出一种富含黄酮类化合物和萜类化合物的兽药，可用于治疗和预防年轻农场动物的胃肠道，支气管肺病和其他疾病。

关键词：阿拉伯半乳聚糖，二氢槲皮素，兽药，急性毒性。

Annotation. *As a result of studies using mechanochemical synthesis, the substance of a promising veterinary drug based on arabinogalactan and raw dihydroquercetin raw material containing a significant amount of extractive resin substances (including terpene compounds) was developed and investigated by physicochemical methods. The acute toxicity of the drug being developed is experimentally determined. The studied veterinary drug can be attributed to the IV class of danger. A developed veterinary drug enriched with flavanoids and terpene compounds can be recommended for the treatment and prevention of gastrointestinal, broncho-pulmonary and other diseases of young farm animals.*

Key words: *arabinogalactan, raw dihydroquercetin, veterinary drug, acute toxicity.*

In the manufacture of dietary and therapeutic products, animal raw materials obtained with the use of artificial feed additives, growth stimulants, certain types of antibiotics, pesticides and other substances hazardous to human health are not allowed [1].

Intensification and increase in the production of livestock products should be carried out primarily by increasing the productivity of farm animals through the prevention of non-communicable diseases, as well as providing them with a sufficient number of high-quality feeds and organizing biologically complete feeding. The highest morbidity and mortality of animals is observed in the period of dairy nutrition. For the prevention and treatment of diseases of young farm animals and the production of environmentally safe livestock products, the use of biologically active substances (BAS) of natural origin is promising, which have a complex effect on animals, while affecting their productivity and non-specific resistance [2]. The main advantages of these BAS over synthetic drugs - low toxicity, versatility and mild effects on the body and, consequently, good tolerability during prolonged use. The main factors influencing the choice of natural biologically active substances for the creation of veterinary drugs are their effectiveness and practical availability. From this point of view, extractive substances of larch wood are the most competitive.

For a number of years, the Laboratory of Wood Chemistry, IrICh, Siberian Branch of the Russian Academy of Sciences, in collaboration with IrSAU (Irkutsk State Agrarian University), has been working to create inexpensive, effective feed additives based on extractive substances from Siberian larch wood. Within the framework of the State Contracts with the administration of the Irkutsk Region, agricultural and industrial enterprises of the region carried out research and production tests of arabinogalactan (AG) isolated from larch biomass using various methods (Table 1).

Table 1 - *Economic efficiency of the use of AG in farms of the Irkutsk region*

Drug Name	FSBEI SPE "Irkutsk Agricultural Technical School"			AF "Angara", AG Extract, 90 ºC	APC "Okinsky" AG Extract, after extraction of flavanoids, 90 ºC
	Dry AG	AG Extract, 23 ºC	AG Extract, 90 ºC		
Increase in average daily gain,% of control	9,4	24,3	31,2	43,2	64,5
Labor and material costs, rub.	1324,1	403,8	403,1	156,9	230,1
Economic effect, rub.	7,9	3800,3	4284,8	1895,1	4977,9
Economic efficiency, rub. / rub.	0,01	9,4	10,6	12,1	21,6

Tests confirmed that AG contributes to the intensification of growth and development of calves, ensures the formation of passive immunity, accelerates the process digestive status formation, contributes to easier flow of gastrointestinal disorders of sick animals and shortens its treatment. This leads to a significant increase in the average daily weight gain of young farm animals compared to the control [3]. Studies have shown that the presence of phenolic extractive substances in the composition of effective additives based on AG increases the biological value of the drug [4]. The purpose of this work is to develop a biologically active substance to produce an inexpensive, effective veterinary drug based on extractive substances of Siberian larch wood — arabinogalactan and dihydroquercetin (DHQ) as well as to determine its acute toxicity.

The revealed biological activity of phenolic compounds of larch biomass allows us to consider it promising for use in veterinary practice as therapeutic and prophylactic drugs. We believe that the use of crude raw dihydroquercetin will reduce the cost of the developed veterinary drug and at the same time increase its biological effect, due to the content of neutral resinous substances (a mixture of mono-, sesqui-and diterpene hydrocarbons, carbonyl compounds along with polyphenolic compounds , a mixture of diterpenic alcohols, etc.) in raw DHQ (Table 2).

Table 2 - *Characteristics of the selected source substances*

Substance	Moisture of the source material, %	Content, %		
		DHQ	Minor Flavanoids	Resinous substances (incl. TC)
AG technical	6,3	1,4	-	-
Raw DHQ	6,7	82,8	3,0	14,2

Nowadays, the resin fraction containing valuable natural substances (including terpene compounds (TC) is an industrial waste in the further purification of the raw DHQ material to pharmacopoeial dihydroquercetin. A detailed study of the chemical composition of the resin is presented by the authors [5].

A promising way to modify BAS with arabinogalactan is a mechanochemical synthesis, which allows to obtain the target products without solvents, in one technological stage. The preference of mechanochemical modification of BAS in comparison with chemical methods is obvious, thanks to the simplicity of its implementation. In addition, it was found that the mechanochemical treatment of AG does not reduce its biological activity [6].

Mechanical processing of the total fraction of raw DHQ with arabinogalactan was carried out in a roller mill ML-1m with a 150 ml stainless drum. Stainless steel spheres with a diameter of 9 mm were used as grinding bodies, the load was 236 g. Acceleration of grinding bodies was 1 g (free fall). The total load of the components of the processed mixture was 5.25 - 5.5 g with the ratio DHQ_{raw}: AG 1:10, 1:15 and 1:20, the duration of mechanical processing 1-4 hours (Table 3).

Table 3 - *Conditions for the production and characteristics of mechanocomposites DHQ_{raw}: AG*

Sample	Ratio DHQ_{raw}: AG	Processing time, h	Content, %			
			Tannins	DHQ	Resin fraction	Ash
-	Source AG	-	1,27	0,71	-	1,90
1	1:10	3	1,58	8,5	1,46	1,84
2	1:15	3	1,49	6,42	1,10	1,57
3	1:20	1	1,27	4,92	0,84	1,79
4	1:20	2	1,04	5,42	0,93	1,43
5	1:20	3	1,58	4,98	0,85	1,70
6	1:20	4	0,82	4,94	0,85	1,63
7*	1:20	2	1,4	4,90	0,84	1,73

*average sample of a test batch

To select the optimal conditions for the preparation and study of the physicochemical composition of the mechanocomposites obtained the following methods were used : elemental analysis, IR, UV and NMR ^{13}Ñ spectroscopy, high performance liquid chromatography (HPLC).

The data of IR and NMR spectra indicate that the resulting mechanocomposites are mainly a mixture of polysaccharide and phenolic compounds. The presence of phenolic compounds is confirmed by the data of the UV spectra, in which intense absorption in the range of 200–230 nm is observed , a maximum at 288 nm, with a shoulder in the range of 330–335 nm, and weak absorption in the range of 400–450 nm.

Molecular masses of all mechanocomposites samples are characterized by one peak and narrow molecular weight distribution (polydispersity 1.46-1.7), their average molecular weight varies slightly from 17,990 to 18,960 Da.

Determination of the acute toxicity of the developed drug substance DHQ_{raw} -AG (Table 3, sample 7) was performed on Wistar male rats weighing 250-300 g. The daily diet of animals included: animal feed, dried fruits, fish, cereals, vitamin supplements.

The duration of the quarantine (acclimatization) period for animals before the start of the experiment was 14 days, during which daily inspection of animals was conducted and the behavior, general state was recorded.

A water solution of the combined DHQ_{raw} AG drug was administered to animals intragastrically (i/ g) with an atraumatic rigid probe. The observation period for experimental animals was 14 days. The experiment was conducted in accordance with generally accepted international bioethical criteria for the humane treatment of experimental animals.

For the study of acute toxicity, an initial 40% solution (0.4 g / ml) of DHQ_{raw} -AG drug was prepared.

Next were prepared dosages per rat:

1) dose of 9000 mg / kg - 6.75 ml of 40% of DHQ_{raw} -AG drug solution

2) a dose of 18000 mg / kg - 13.5 ml of 40% DHQ_{raw} -AG drug solution. Experimental animals were divided into groups: No. 1 (n = 5), No. 2 (n = 5), No. 3 control (n = 3) (Table 4).

In the control group No. 3, distilled water was injected instead of the drug.

Table 4 - *Scheme of the experiment per animal*

Grup	DHQ_{raw} -AG drug dose mg/kg	Intragastric (i/g) drug administration			
		Single i/g dose, ml	Number of sequential doses	Total amount, ml	Interval btw i/g doses,h
№ 1	9000	2,25	3	6,75	1,5
№ 2	18000	3,4	4	13,5	1,5
№ 3 (control)	-	3,4	4	13,5	1,5

In group No. 2 with the maximum concentration of DHQ_{raw} -AG , the death of two animals was observed, which was directly related to the moment of intragastric administration of the substance. The death of animals occurred on the third

injection of the substance and was associated, in both cases, with the perforation of the esophagus of the stomach with a metal probe, which was confirmed by conducting an autopsy immediately after the death of the animals.

Pathological analysis has shown that acute intragastric administration of the drug substance of the DHQ_{raw}-AG drug in the studied doses does not cause macroscopic changes in the internal organs of the experimental animals, and is not accompanied by changes in the gastric or intestinal mucosa. The data are confirmed by histological studies of the analyzed tissues of organs, where also no pathological changes associated with the intake of the drug substance DHQ_{raw}-AG are found.

The studied medicinal substance of the DHQ_{raw}-AG drug can be attributed to the IV class of danger.

On the basis of literature data and own research, a promising veterinary drug that is being developed, enriched with flavanoids and terpene compounds, is suggested to recommend for the treatment and prevention of gastrointestinal, broncho-pulmonary and other diseases of young farm animals.

References

1. Actual problems of development of the agro-industrial complex at the present stage. Issue 1. - Moscow: Agropromizdat. - 1999. - p. 86-89.

2. Boldyrev, S.M. World Livestock and Prospects for the Russian Livestock Sector [Text] // Bulletin of the Russian Academy of Agricultural Sciences. - 2004. - №2. - p. 10-11.

3. Development of industrial technology for the production of water extract of larch wood, the study of its chemical composition and the development of technical conditions. Production testing of extracts on farm animals in agricultural organizations of the Irkutsk region. The research report on the State Contract No. 63-57-37 / 2. - Irkutsk. - 2012.

4. Development of an experimental-industrial technology for the production of a complex biologically active additive to compound feeds for farm animals containing polysaccharides and polyphenols // Research Report on the State Contract No. 2013.217139. - Irkutsk. - 2013.

5. Ostroukhova, LA Study of the chemical composition of the resin of larch wood [Text] / L.À. Ostroukhova, V.A. Raldugin, V.A. Babkin [et al.] // Chemistry of Plant Raw Materials. - 2011. - № 4. - pp. 83–87.

6. Medvedeva, E.N. Structural transformations of arabinogalactan of Siberian larch during mechanochemical processing and biological properties of products [Text] / Medvedeva E.N., Neverova N.A., Fedorova TE et al. // Chemistry of plant materials. - 2009. - № 3. - p. 49-56.

UDC 631.6:631.445.53

利用填海技术改善盐渍土的水 - 物理性质
USE OF RECLAMATION TECHNIQUES TO IMPROVE WATER-PHYSICAL PROPERTIES SALINE SOIL

Trotsenko Irina Aleksandrovna
Candidate of Agricultural Sciences, Associate Professor
Omsk State Agrarian University named after P.A. Stolypin
Tarasova Marina Vladimirovna
Candidate of Technical Sciences, Associate Professor
Omsk State Agrarian University named after P.A. Stolypin

注解。在西西伯利亚森林草原区（Ishim-Irtysh河间洼地）水分不足的区域，年平均降水量为325毫米，在单一和重复磷石膏土壤黑钙土皮质多重过程中不同剂量的后遗症的显着特征苏打盐化成立。与一次性石膏再加工相比，SAC更加饱和了可交换的钙，土壤剖面的最深的脱盐作用以及超出米层的代谢产物的去除。根据多年的数据，已经确定，使用单一石膏，通过引入全剂量的改良剂32吨/公顷来确保成功且持久的改善效果。与单次重新改善相反，使用钙石膏提供更高的SAC饱和度，最深的土壤脱盐和超出米层的代谢产物的去除。在重复再生的土壤中，剂量为8,16吨/公顷，实际反应的磷石膏的量显着高于计算的剂量。已经证实，在这种情况下，不仅重新引入的磷石膏，而且主要的石膏钙，以及地下钙，都参与交换过程，这使得可以减少剂量改进剂或计算它的一层0 - 10厘米。

关键词：多重土壤，改良，石膏，吸土复合物，单一和重复石膏。

Annotation*. In the zone of insufficient moisture in the forest-steppe zone of Western Siberia (Ishim-Irtysh interfluvial area) with an average annual precipitation of 325 mm, distinctive features of the after-effects of different doses during single and repeated phosphogypsum soil chernozem cortical multisodium soda salinization were established. In contrast to the one-time gypsum reprocessing, the SAC was more saturated with exchangeable calcium, the deepest desalinization of the soil profile and the removal of metabolic products beyond the meter layer. According to many years of data, it has been established that with a single gypsum, a successful and long-lasting melioration effect is ensured by the introduction of a full dose of ameliorant 32 t / ha. In contrast to a single re-amelioration gives a higher saturation of SAC with calcium gypsum, the deepest desalinization of the soil and the removal*

of metabolic products beyond the meter layer. In the repeatedly reclaimed soil with doses of 8, 16 t / ha, the amount of actually reacted phosphogypsum is significantly higher than the calculated doses. It was established that in this case not only the re-introduced phosphogypsum, but also the primary gypsum calcium, as well as subsurface calcium, are involved in the exchange process, which makes it possible to reduce the dose improver or calculate it for a layer of 0 - 10 cm.

***Keywords**: soil is high in sodium, melioration, gypsum, soil-absorbing complex, single and repeated gypsuming.*

Introduction

In agricultural production for many years there has been a tendency to standardize farming systems without taking into account local landscape conditions. As a result of intensification in agriculture, the problem of soil and groundwater pollution with pesticides, nitrates, overcompaction of the topsoil, degradation and salinization of the soil eventually arose.

The question of developing a system of environmentally safe farming became relevant 30 years ago (V.I. Kiryushin, 1996), including taking into account the environmental aspects of the reclamation of alkaline soils (I.N. Lyubimova, 1996). The total area occupied by salt marshes, salt marshes and solods is very large and, according to the calculations of Academician L. I. Prasolov, makes up about 10% of the entire territory of our country (Kovda V. A., 1937). In Western Siberia, more than 40% of all Russian solontsons are concentrated. Being located as "stains" among meadow and chernozem soils, salt licks, due to unfavorable water-physical properties, impede the timely conduct of field work, causing a decrease in the yield of the entire soil complex [1]. The technology of selective gypsum has been developed, with all the elements of which one ton of gypsum gives 1.8-6.4 cc. units / ha of additional products.

Purpose of research

Under production conditions, the gypsum technology and the processing of reclaimed fields are often disrupted, which leads to a deterioration in the properties of the soil, and over time, the amelioration effect is attenuated [2].

Therefore, it is necessary to establish the effectiveness, duration and depth of reclamation changes, as well as the productivity of the reclaimed fields.

Research objects

The study of the questions was carried out on the soil of the meadow-chernozem cortical multisodium soda salinity with the initial content of absorbed sodium 17.6 mg = eq / 100 g of soil, which is 45% of the cation exchange capacity (CEC), exchangeable calcium 5.0 and magnesium 16, 4 mg = eq / 100 g of soil with a groundwater level of 2.8–3.2 m, with a salinity of 1.3–2.8 g / l.

Initially, the experiment included three options: control, acid and gypsum. The

total dose of gypsum, designed to displace exchangeable sodium from a 0–20 cm layer, was 32 t / ha.

After a significant weakening of the effect, phosphogypsum was reintroduced after 15 years at doses of 8, 16, 32 t / ha across the gypsum and control variants and surfaced with BDT – 3. With repeated phosphogypting, a dose of 16 t / ha is complete for a layer of 0-20 cm.

Discussion of the received results

Observations on the composition of the SAC for 20 years made it possible to establish that the sodium content is unstable. Thus, at the absolute control (no ameliorant was added) the amount of sodium displaced from the SAC ranges from 11.7 to 18.8 in a layer of 0–20 cm and 12.8–21.7 mg = eq / 100 g of soil at a depth of 20–40 see. The soil demand for calcium varies widely, and the amount of displaced magnesium in a somewhat smaller amount (Tables 1, 2). With the predominance of the process of salinization, the process of ameliorative is under way - the introduction of sodium into the SAC and vice versa.

A single application of a full dose of phosphogypsum 32 t / ha significantly reduced the sodium content in the SAC in the 0–20 cm layer from 18.8 in the control variant to 12.7 after the first year of reclamation and to 2.9 mg = eq / 100 g of soil per 20th year post-meliorative period with proper processing.

Such vigorous displacement of sodium led to the saturation of SAC with phosphogypsum calcium, about 21.8 mg = eq / 100 g of soil throughout the entire observation period (Table 2).

Table 1 - *Changes in the qualitative composition of SAC [max - min, * their average content (mg = eq / 100 g of soil) and criteria for materiality of differences] [3,4]*

Gypsum dose, t / ha	Single casting			Re-plastering		
	fluctuations by year	$\bar{x}$±m*	t_{fact}	Fluctuations by year	$\bar{x}$±m*	T_{fact}
1	2	3	4	5	6	7
a) displaced from SAC Na + (calculated)						
layer 0 - 20 cm						
0	18,8-11,7	14,8±	-	18,6-7,3	11,2±	-
8	21,1-8,3	13,7±	-1,5	8,0-2,7	4,9±	-7,9
16	14,0-5,9	10,2±	-7,7	6,3-0,9	4,6±	-8,2
32	12,7-0,7	4,3±	-18,9	2,6-0,0	1,70,7	-13,2
layer 20 – 40 cm						
0	21,7-12,8	18,2±	-	24,2-15,1	19,2±	-
8	25,8-18,5	21,1±	4,6	20,4-11,0	15,5±	-4,8
16	23,9-17,2	19,9±	2,9	21,3-9,5	14,8±	-5,3
32	21,9-14,2	17,8±	-0,6	16,8-4,4	12,3±	-7,1
b) exchange Ca^{2+}						
layer 0 - 20 cm						
0	0	0	0	0	0	0
8	8	8	8	8	8	8
16	16	16	16	16	16	16
32	32	32	32	32	32	32
layer 20 – 40 cm						
0	0	0	0	0	0	0
8	8	8	8	8	8	8
16	16	16	16	16	16	16
32	32	32	32	32	32	32
c) extruded Mg^{2+}						
layer 0 - 20 cm						
0	7,2-4,1	5,6±	-	8,0-3,0	5,1±	-
8	5,6-3,1	4,3±	-4,0	6,4-3,7	4,8±	-1,7
16	8,7-3,0	4,6±	-3,6	5,4-3,8	4,5±	-2,6
32	6,2-3,2	4,4±	-5,0	6,2-2,4	4,3±	-2,4
layer 20 – 40 cm						
0	8,2-3,9	6,6±	-	9,6-4,3	5,9±	-
8	9,1-3,3	4,5±	-4,6	9,1-4,3	6,3±	0,9
16	8,8-4,0	5,1±	-4,5	7,2-5,3	6,1±	0,8
32	7,7-4,1	5,5±	-3,2	9,1-3,6	6,4±	1,8
n=22, t_{theor}^{05}=2,09						

*t - the criterion of materiality of the difference was calculated between the variants and the absolute control during one-time gypsum and between the variants and the "background soil" during the second-gypsum, $\bar{x}$ - arithmetic mean, n - repetition, m - error of the average difference.

The introduction of a half dose of phosphogypsum 16 t / ha (optimal for a layer of 10 cm), even if all the technology elements are observed, significantly reduces the effect of amelioration over the entire study period and creates an improved layer of lower power.

The fourth dose of phosphogypsum is not sufficient for qualitative changes of SAC. In the long-term dynamic cycle, it does not provide sustainable changes and creates a temporary improved layer with a capacity of 10 cm.

Repeated melioration of the "background soil" in doses of 8, 16 and 32 t / ha of phosphogypsum, respectively, calculated for a layer of 10, 20, 30 cm, made it possible to improve the ameliorative indicators and create a more powerful homogeneous meliorated layer.

Against the background of the residual effect of primary gypsum in a layer of 0-10 cm, repeated phosphogypsum provides the most profound transformation of SAC in the variant with a dose of 32 t / ha. So, in the 0–20 cm thickness, the non-repressible amount of sodium from SAC is already in the first or fourth years of research within –2.6; 0.6; 1.0 and 1.3 mg = eq / 100 g of soil (Table 2).

Since sodium, according to N.V. Semendeyaevoy [5] in multisodium soil is located on the surface of organo-mineral complexes and easily enters exchange reactions, periodically in some years it is completely displaced from SAC and goes into a water-soluble form - 0.0 mg = eq / 100g of soil. This variant is characterized by the stability of saturation with exchangeable calcium during the whole ameliorative and post-reclamation periods (Table 2).

The effect of the phosphogypsum dose of 16 t / ha (again) on the change in quantitative and qualitative indicators of SAC is also highly and its stabilizing and reclaiming role covers the 0-40 cm layer. Close to the 16 t / ha option and the same successful development of the reclamation process gives repeated phosphogypsum with a dose of 8 t / ha, designed to improve the 0-10 cm layer.

Table 2 - *Changes in the composition of SAC by year, determined by different methods in a layer of 0-20 cm, mg = eq / 100 g of soil*

Years after effects	Gypsum, t / ha	Single casting				Re-plastering			
		Shunover method			Ca^{2+} exchange. according to Guering	Shunover method			Ca^{2+} exchange. according to Guering
		absorbed Ca^{2+}	pushed out			absorbed Ca^{2+}	pushed out		
			Mg^{2+}	Na^{+} calculated			Mg^{2+}	Na^{+} Calculated	
2	0	23,1	4,3	18,8	9,0	18,2	5,5	12,7	9,0
	32	18,9	6,2	12,7	15,6	7,6	5,0	2,6	19,6
3	0	19,7	4,1	15,6	6,5	12,1	3,9	8,2	13,3
	32	10,4	5,3	5,1	18,4	48	4,2	0,6	23,5
4	0	21,1	4,1	16,7	8,5	17,8	5,7	12,1	11,8
	32	10,8	4,9	5,9	18,5	5,7	4,7	1,0	22,5
5	0	20,3	4,4	15,9	10,0	15,0	4,2	10,,8	13,6
	32	6,5	4,3	2,2	24,1	5,0	3,7	1,3	24,3
6	0	23,4	5,2	18,2	9,5	11,8	4,5	7,3	16,9
	32	9,0	4,6	4,4	23,5	5,2	4,9	0,3	25,7
7	0	23,0	5,4	17,6	8,1	17,5	5,3	12,2	13,8
	32	6,9	4,6	2,3	21,2	4,3	4,3	0,0	24,7
8	0	20,3	5,1	15,2	9,8	14,5	6,3	8,2	15,3
	32	4,4	3,7	0,7	25,6	6,1	5,1	0,0	26,9
10	0	19,3	4,2	15,1	7,1	13,5	4,3	9,2	13,2
	32	5,9	3,7	2,2	20,8	3,0	3,0	0,0	25,0
11	0	25,4	7,2	18,2	9,5	16,5	5,3	11,2	14,2
	32	7,6	3,2	4,4	23,5	6,4	4,8	1,6	23,9
12	0	21,0	6,7	14,3	6,3	21,2	6,7	14,5	5,7
	32	6,7	4,2	2,5	19,7	6,1	41	2,0	23,4
14	0	16,9	4,4	11,7	9,3	16,5	5,5	11,0	11,5
	32	8,8	4,6	1,2	20,5	5,8	4,6	1,2	22,9
16	0	20,5	5,6	14,9	9,3	21,8	8,0	13,8	8,9
	32	9,0	3,9	5,1	21,5	9,3	6,8	2,5	25,0
17	0	20,3	4,3	16,0	Not	23,0	4,4	18,6	Not
	32	6,3	3,4	2,9	def.	6,8	5,6	1,2	def.
19	0	19,7	6,4	15,3	Not	17,8	5,5	6,6	Not
	32	10,3	4,1	6,2	def.	3,8	4,3	1,9	def.
20	0	21,5	6,5	15,0	8,9	20,5	7,8	12,7	10,3
	32	5,9	3,0	2,9	21,8	5,1	4,3	0,8	22,4

One year after reclamation, in the arable 0-20 cm layer of soil meliorated by a dose of 32 t / ha once, the amount of reacted gypsum was 15.2 t / ha or 47% of the applied dose. At the same time, practically the same amount of sodium has been removed from SAC. According to the water extract, it follows that the displaced sodium has turned into a water-soluble form [6,7]. With the dissolution of phosphogypsum and the interaction of its Ca^{2+} with SAC in the fourth year of reclamation, almost all of it entered into an exchange reaction with sodium SAC - 31.6 t / ha or 98.8%.

In favorable conditions of moistening, the process of saturation of SAC with gypsum calcium at a half-dose reduction process proceeds even faster. In the second year after interaction of the improver with the soil, phosphogypsum reacted in the amount of 19.3 t / ha or 120.6%, which is higher than the calculated value.

In accordance with this, with a one-time gypsum treatment, it is possible to recommend a reduction in the ameliorant dose to half during the application of perennial herbs in order to create an improved layer of small thickness of 0-10 cm.

In contrast to the one-time re-amelioration, the calcium saturation of SAC in terms of the amount of reacted $CaSO_4 \cdot 2H_2O$ phosphogypsum is not equivalent to the amount of sodium displaced from SAC in terms of $Na_2SO_4 \cdot 2H_2O$. The differences are significant t_{fact} = -2.3; -4.1; -8.9 t_{theor} = 2.2, according to the doses of phosphogypsum of 8, 16, 32 t / ha. With repeated phosphogypsum, on the contrary, with decreasing phosphogypsum doses, the relative amount of absorbed calcium increases. Different doses give almost close saturation of SAC with them - 31.4; 35.4; 39.6 t / ha (392, 221, 124%) of $CaSO_4 \cdot 2H_2O$ and significantly lower the amount of formed $Na_2SO_4 \cdot 2H_2O$, respectively 15.6; 16.0; 28.8 t / ha

In our opinion, at the repeated phosphogyping with doses of 8 and 16 t / ha, the primary gypsum calcium is involved in the ameliorative process, as well as the subsurface calcium reserves are involved in the exchange reaction along with the gypsum calcium.

Conclusions

Thus, the experimental material obtained indicates the feasibility of re-plastering. Re-reclamation provides a high rate of metabolic processes and more active desalinization of the soil profile and the removal of metabolic products beyond the meter layer. For 20 years of observation, signs of secondary salinization have not been established [6].

In the reclaimed alkaline soil, not only the primary ameliorant but also the subsurface carbonates are connected to the meliorative process, which makes it possible to prolong the effect of the estimated dose to the soil of soda saline, and to reduce it by half to 10.0 cm.

During the study period, the average annual increment was 1.33 on the practically barren soil until the second reclamation of the soil; 1.50; 1.68 t. units / ha, respectively, the doses of phosphogypsum are 8, 16, 32 t / ha. The cost of reclamation paid off for 3 - 4 years.

References

1. Berezin L.V. Melioration and the use of soils in Siberia: monograph / L.V. Berezin. - Omsk: Publishing house FGOU VPO OmGAU, 2005.-208p.

2. Okorkov V.V. Colloid-chemical studies of the soils of northern Kazakhstan and the experience of their chemical melioration: dissertation.– Moscow, 1990. - 566 p.

3. Schoonover W. R. Examination of soil for alkali. University of California Extension Series. Berkeley. California, 1952.

4. Buluchevskiy S.I. The application of the method of Goering to determine absorbed calcium in carbonate and calcareous soils // A comparative study of the methods of chemical and physico-chemical analysis of soils.- L., 1931. - p. 20-23.

5. Semendyayeva N.V., Dobrotvorskaya N.I. Theoretical and practical aspects of chemical melioration of soil soils of Western Siberia. Novosibirsk: Zap. - Sib. Prince Publishing house, 2005. - 156 p.

6. Voropaeva Z.I. Features of the salt regime and the dynamics of the exchange bases of meliorative soil soils of Western Siberia: abstract. dis. ... kand. biol. Sciences: 06.01.03 - Novosibirsk, 1990. - 22 p.

7. Trotsenko I.A. The influence of single and repeated melioration on the ameliorative state of the multisodium cortical soil / Trotsenko IA, Tarasova MV // Bulletin of the Altai State Agrarian University. 2014. № 8 (118). p. 38-44.

低乳糖乳制品发酵过程的研究
STUDY OF THE PROCESS OF FERMENTATION OF LOW-LACTOSE DAIRY PRODUCTS

Antcyperova Maria Aleksandrovna
Student, engineer
Arsen'eva Tamara Pavlovna
Doctor of Technical Sciences, Professor
St. Petersburg National Research University of Information Technologies, Mechanics and Optics

注解。牛奶和乳制品是人口日常饮食的必要组成部分。由于发酵病的传播日益增加，特别是乳糖酶缺乏，很大一部分人不能食用乳制品。吸收综合征受损的小肠最常见病理，与乳糖酶缺乏或活性不足有关。根据世界卫生组织的统计，世界上65%的人口中有不同人群患有乳糖酶缺乏症。

根据科学，技术和专利文献的数据，研究了乳中乳糖的酶水解。对于乳糖的水解，从细菌，霉菌和酵母中分离的β-半乳糖苷酶是最常见的。

该文章讨论了各种酶制剂。用制剂进行发酵研究的结果给出：乳糖酶婴儿(National Enzyme Company)，Lacta-Free(Laktoferm ECO)，Lactasis 6500K(Kaprina)。为此，进行酶比色法。获得的数据允许我们计算在水解过程中反应的乳糖的量。

实验研究允许得出关于使用药物对乳糖水解的有效性的结论，以及根据乳制品中所需的水解程度计算制备药物的剂量。

关键词：食品工业，乳制品工业，牛奶，低乳糖制品，乳糖，乳糖酶，β-半乳糖苷酶，Shimadzu UV-1800，水解，发酵。

Annotation. *Milk and dairy products are a necessary component of the daily diet of the population. Due to the increasing spread of fermentopathy, in particular, lactase deficiency, a significant proportion of people cannot consume dairy products. The most common pathology of the small intestine with impaired absorption syndrome, associated with the absence or insufficient activity of the enzyme lactase. According to the World Health Organization, 65% of the world's population among various groups of the population suffer from lactase deficiency.*

According to the data of scientific, technical and patent literature, enzymatic hydrolysis of lactose in milk was studied. For the hydrolysis of lactose, β-galactosidase enzymes isolated from bacteria, mold fungi and yeast are the most common.

The article discusses various enzyme preparations. The results of the study of fermentation with preparations are given: Lactase Baby (National Enzyme Company), Lacta-Free (Laktoferm ECO), Lactasis 6500K (Kaprina). For this, an enzymatic colorimetric method was carried out. The data obtained allow us to calculate the amount of lactose reacted in the process of hydrolysis.

An experimental study allows to draw conclusions about the effectiveness of the use of drugs for the hydrolysis of lactose, as well as to calculate the dose of making drugs, depending on the desired degree of hydrolysis, in dairy products.

***Keywords**: food industry, dairy industry, milk, low lactose products, lactose, lactase, β-galactosidase, Shimadzu UV-1800, hydrolysis, fermentation.*

Milk and dairy products are a necessary component of the daily human diet. However, 65% of the world's population, including 16-30% of Russians, are diagnosed with milk sugar intolerance - lactose [2]. Lactose intolerance, or hypolactasia, is a pathological condition caused by a decrease in the body's lactase enzyme level, which is necessary for lactose absorption. At the same time, lactose is the main sugar contained in milk and dairy products.

The main problems arising from the use of lactose in the composition of dairy products are associated with a deficiency of the enzyme lactase in the human body. In the case of lactase deficiency caused by its low activity or a small amount secreted by the intestinal wall, hydrolysis of lactose becomes impossible and, accordingly, its absorption stops. As a result, two problems arise. First, due to the high osmotic activity of lactose, like all carbohydrates, contributes to water retention in the intestinal lumen. Secondly, and more significantly, undigested lactose becomes a nutrient substrate for the putrefactive microflora of the small intestine, with the release of various metabolites, leading to poisoning of the body. At the same time, the appearance of external symptoms of lactose intolerance is already a secondary reaction to the products of fermentation, namely, fast-decomposed fatty acids, hydrogen, lactic acid, methane, and coal anhydride. As a result, food intolerance develops, i.e., lactose allergy [6].

Lactase deficiency, causing milk intolerance, is more characteristic of most older people. This is the normal response of the body associated with a decrease in the consumption of milk in food. However, the same problem can be observed in children. In this case, especially in newborns, it is genetically determined. Many people suffering from lactose intolerance, try to avoid in their diet of milk and dairy products, in order to reduce unpleasant symptoms. However, the absence in the traditional menu of milk and dairy products leads to disruption of the nutritional structure [1]. The limited diet deprives the body of many easily digestible nutrients that dairy products are rich in.

By the number of substances beneficial to the human body, milk has no ana-

logues. Cow's milk contains about 250 chemical components - 20 amino acids, more than 25 fatty acids, 30 mineral salts and 20 different vitamins, - in a balanced ratio and easily digestible forms. One glass of milk per day replenishes the body's daily need for essential nutrients [5]. Milk is rich in vitamins B_2, B_3, B_{12}, H, calcium, potassium, phosphorus, iodine, molybdenum, cobalt. Amino acids, enzymes, milk phospholipids are involved in the brain, heart, kidneys, liver, nervous and digestive systems of humans [3].

To solve the problem of lactose intolerance when drinking milk, modern milk processing technologies provide a number of methods to reduce the lactose content or completely remove it from milk and dairy products. These include the traditional method, membrane filtration and enzymatic breakdown of lactose.

The traditional way is to remove lactose from milk by lactic fermentation. This method is not suitable for the manufacture of low-lactose milk, as the resulting product belongs to the group of fermented milk products. Membrane filtration technology provides for ultrafiltration of milk, ensuring the removal of a portion of lactose, followed by enzymatic cleavage of the residual amount of lactose in the ultrafiltrate when lactase is added. On an industrial scale, the lactase required for enzymatic hydrolysis of lactose is obtained artificially from *Aspergillus niger* and *Aspergillus oryzae* fungi or extracted from *Kluyveromyces fragilis* and *Kluyveromyces lactis* yeast. For directional enzymatic hydrolysis, it is necessary to pay attention to the optimal pH and temperature values, as well as the presence of activators and inhibitors for this type of β-galactosidase (see table 1). The expediency of applying this method is due to the simplicity of the process and the absence of the cost of expensive equipment.

Table 1. *Characteristics of β-galactosidase products*

β-galactosidase products	pH optimum	pH range of stability	Temperature optimum, °C	Activators
Aspergillus niger	3,0-4,0	2,5-8,0	55-60	–
Aspergillus oryzae	4,5	3,5-8,0	50-60	–
Kluyveromyces lactis	6,9-7,3	6,0-7,0	35	Mn, K
Kluyveromyces fragilis	6,6	5,8-7,5	37	Mn, K

According to TR TS 033, low-lactose dairy products are milk processing products in which lactose is partially hydrolyzed or removed [4]. The purpose of the work was to study various types of enzyme preparations used to obtain low-lactose dairy products.

Modern methods for determining the mass fraction of lactose in milk include iodometric, cryoscopic and spectrophotometric methods. During the study, an experimental determination of the lactose mass fraction by an enzymatic colorimetric method was carried out in samples after enzymatic treatment with the following preparations: *Lactase Baby (National Enzyme Company), Lacta-Free (Laktoferm ECO), Lactasis 6500K (Kaprina)*.

The prototypes, fermented by the above preparations in the dosages recommended by manufacturers (see table 2), were developed in the laboratory of the Faculty of Food Biotechnology and Engineering, St. Petersburg National Research University of Information Technologies, Mechanics and Optics. The mass fraction of lactose in the fermented samples was determined using a Shimadzu UV-1800 spectrophotometer.

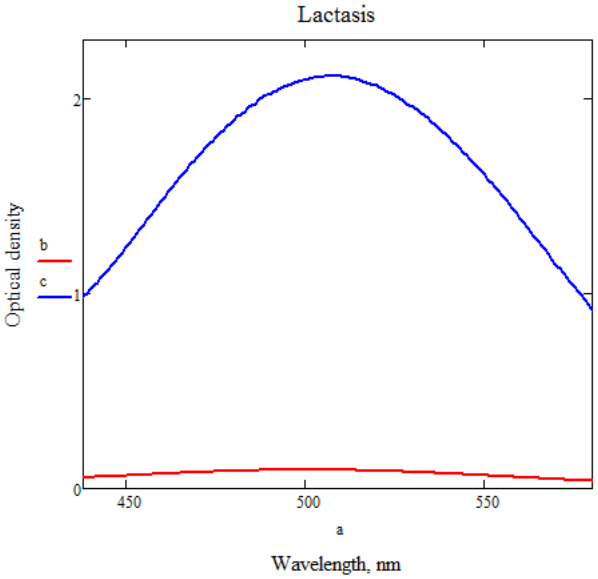
The principle of the method: β-D-glucose under the action of the enzyme glucose oxidase is oxidized to D-gluconolactone. The hydrogen peroxide formed in this reaction with the participation of the peroxidase enzyme contributes to the oxidative coupling of 4-aminoantipyrine and phenol with the formation of a colored compound (quinone imine dye). The color intensity of the reaction medium is proportional to the glucose content in the material under study and is determined photometrically. The glucose content is equivalent to the reacted lactose content.

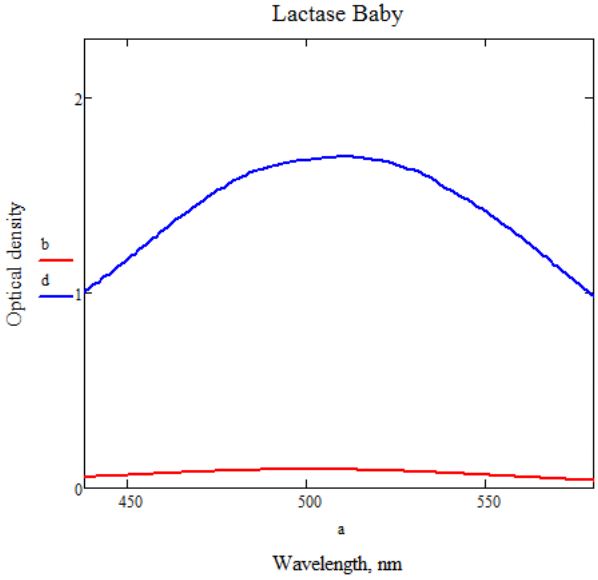
Table 2. *Prototypes*

Sample number	Infusible drug	Dosage
1	*Lactase Baby* (*National Enzyme Company*)	0,65 %
2	*Lacta-Free* (*Laktoferm ECO*)	0,70 %
3	*Lactasis* 6500K (*Kaprina*)	0,10 %

The study was subject to three samples of protein-free whey, obtained by the method of thermo-acid coagulation of the corresponding samples, fermented by various preparations (see table 2), as well as a sample of serum from a mixture not subjected to fermentation.

During the study, the dependence of the optical density of serum on the wavelength was obtained. The differences in this dependence for samples, fermented preparations and the sample, not subjected to fermentation, are presented in Figure 1.


Lactasis
Optical density
b
c
2
1
0
450
500
550
a
Wavelength, nm


Lactase Baby
Optical density
b
d
2
1
0
450
500
550
a
Wavelength, nm

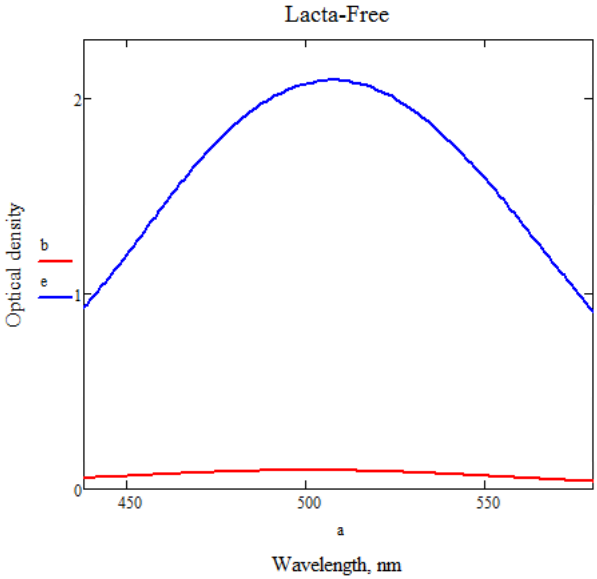


Figure 1. *The change in optical density during fermentation with various preparations*
Legend: a - wavelength; b - the original sample; c - sample fermented with Lactasis; d - sample fermented with Lactase Baby; e - sample, fermented with Lacta-Free

The data obtained allow us to calculate the amount of lactose reacted in the process of hydrolysis. Comparison of lactose content in dairy products with the possibility of hydrolysis with drugs in recommended dosages are presented in the form of a diagram in Figure 2.

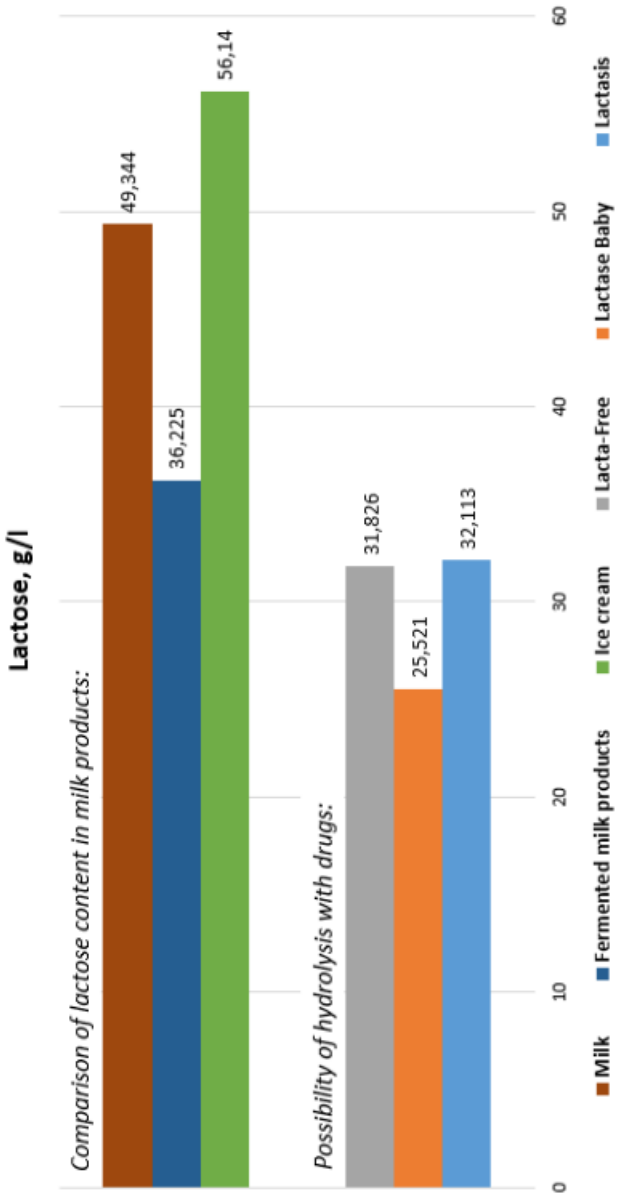


***Figure 2** - Comparison Chart*

With the help of preparations introduced into dairy products in dosages recommended by manufacturers, it is possible to hydrolyze lactose in the amount of 25.52 g/l (Lactase Baby) to 32.11 g/l (Lactasis 6500K). The degree of hydrolysis is in the range of 45.45% (Lactase Baby in the manufacture of ice cream) to 88.65% (when Lactasis 6500K is added to milk). The degree of hydrolysis can be adjusted by changing the dosages recommended by manufacturers depending on the initial content of lactose in the product.

An experimental study allows to draw conclusions about the effectiveness of the use of drugs for the hydrolysis of lactose, as well as to calculate the dose of making drugs in dairy products.

References

1. Management and treatment of lactose malabsorption / M. Montalto, V. Curigliano, L. Santoro, M. Vastola, G. Cammarota, R. Manna, A. Gasbarrini, G. Gasbarrini // World journal of gastroenterology. – 2006. – v. 12(2). – p. 187-191.

2. News and analytics of the dairy market [Electronic resource]. - Access mode: milknews.ru/index/novosti-moloko_3168.html.

3. Skurikhin I.M., Volgarev M.N. The chemical composition of food: Book 2: Reference tables of the content of amino acids, fatty acids, vitamins, macro-and microelements, organic acids and carbohydrates. - 2nd ed., Revised and add. - Moscow: Agropromizdat, 1987 - 360 p.

4. Technical regulations of the Customs Union "On the safety of milk and dairy products" (TP TC 033/2013).

5. Fesenko A. On the benefits of milk // Milk processing [Electronic resource]. - Access mode: www.milkbranch.ru/publ/view/40.html.

6. Center for healthy nutrition [Electronic resource]. - [2017]. - Access Mode: eat-info.ru/references/calories/laktoza-molochnyy-sakhar.

甲醇供应到气田系统的自适应控制
ADAPTIVE CONTROL OF METHANOL SUPPLY INTO A GAS FIELD SYSTEM

Prakhova Marina Yuryevna
Associate Professor
Krasnov Andrey Nikolaevich
Candidate of Technical Sciences, Associate Professor
Khoroshavina Elena Alexandrovna
Candidate of Technical Sciences, Associate Professor
Ufa State Petroleum Technological University

注解。 在开发大多数气体和气体凝析油田时，出现了防止水合物形成的问题。 这个问题对西西伯利亚和远北地区的发展尤为重要。 这些地区的低储层温度和恶劣的气候条件为井和天然气管道中的水合物形成了有利的条件。 甲醇最常用于控制水合物，因此产生确定其最佳消耗的问题。 本文提出了一种自适应甲醇供应控制系统和决策算法，首先要优化甲醇的消耗，其次要提高现场运行的可靠性。

关键词：水合物形成，羽流，温压条件，水合物形成抑制剂，甲醇，自适应控制。

Annotation. *When developing most gas and gas condensate fields, the problem of combating the formation of hydrates arises. This issue is of particular importance in the development of fields in Western Siberia and the Far North. Low reservoir temperatures and harsh climatic conditions of these areas create favorable conditions for the formation of hydrates in wells and gas pipelines-plumes. Methanol is most often used to control hydrates, so the problem of determining its optimal consumption arises. The article proposes an adaptive methanol supply control system and a decision-making algorithm, which allow, firstly, to optimize the consumption of methanol, and secondly, to improve the reliability of the operation of the field.*

Keywords: *hydrate formation, plume, thermobaric conditions, hydrate formation inhibitor, methanol, adaptive control.*

Many components of natural gas (methane, ethane, propane, isobutane, carbon dioxide, hydrogen sulfide, nitrogen) in combination with water form crystalline

hydrates - solid crystalline compounds that exist at high pressures and positive temperatures. They are unstable physicochemical compounds of gas and water (clathrates) formed during the introduction of gas molecules into the voids of crystal structures composed of water molecules. In appearance, it is a white crystalline mass, similar to ice or snow, which decomposes into gas and water with increasing temperature or decreasing pressure [1]. The process of hydrate formation depends on many factors: thermobaric conditions, physical and chemical characteristics of the gas, moisture content, hydrodynamic characteristics of the flow, etc. At the same time, the danger of hydrates occurs at all stages of the development of gas condensate fields (GCF). So, for example, at Yamburg gas condensate field in the initial period of gas development, the pressure was 9.4 - 9.8 MPa at a temperature at the wellhead of 10 - 16 ˚C [2]. The temperature of the onset of hydrate formation at these pressures is 12–13 °C [3], respectively, part of the plumes (mainly long, from 8 to 12 km) operated in the mode of hydrate formation. Currently, the pressure at the wellhead has decreased to values of the order of 3 MPa, but in almost all wells there is an intense uncontrolled removal of produced water, which creates favorable conditions for the formation of gas hydrates.

The formation of hydrates in the bottomhole zone causes a fall in well flow rate of 18–19% [4]; in the plumes, this leads to a reduction in the flow area of the pipeline, a decrease in the productivity of both the gas well cluster, and the integrated gas treatment unit (GTU) and the entire field as a whole. Under certain conditions in the plumes, the formation of hydrate plugs is possible, which can lead to a complete cessation of the passage of gas through the loop. This situation at the gas-condensate field of the Far North is considered to be a serious accident, the elimination of which is an extremely expensive undertaking, requiring considerable time and material costs [5]. In general, the costs associated with the prevention of hydrate formation in the conditions of the Extreme North are very significant and reach 30% of the cost of produced gas [6].

Therefore, the task of creating a hydrate free mode of loop operation is an actual scientific, technical and production problem.

The hydrate-free mode can be created in two ways: by selecting the technological mode of operation of the wells and loops, or, if this is not possible, by feeding the hydrate formation inhibitor to the wellbore and plume. It should be borne in mind that even in wells that work with flow rates that provide an hydrate-free mode, hydrates may form when their mode deviates from hydrate-free, therefore, it should still be possible to supply an inhibitor to prevent hydrate formation when the wells deviate from normal mode [4]. Methanol, glycoli (in particular, diethylene glycol), electrolytes (for example, a 30% solution of calcium chloride) or a mixture of various inhibitors, for example, methanol with a solution of calcium chloride, are widely used as hydrate formation inhibitors.

Practically ubiquitous use of methanol is due to its relatively low cost, the ability to produce directly in places of consumption (in gas fields), the high adaptability of the process of introducing and distributing methanol to the required parts of the process chain, the maximum among known inhibitors with antihydrate activity, which persists even at low temperatures, very low freezing point of concentrated methanol solutions and their extremely low viscosity even at temperatures below minus 50 ° C and a number of other reasons [7].

In the field gas collection systems of the Yamburg GCF, hydrate formation is also prevented by supplying methanol to the gas stream at the wellhead [6]. Metanol has a high degree of decrease in the temperature of hydrate formation, the ability to quickly decompose already formed hydrate plugs and mix with water in any ratios, low viscosity and low freezing point.

Methanol is injected into the gas stream, providing good atomization and mixing with the total gas stream. At the same time it forms alcohol-water mixtures with vaporous and liquid moisture, the freezing point of which is well below zero. Water vapor is absorbed from the gas, which significantly reduces the moisture content of the gas and the dew point, thus creating conditions to prevent the formation of hydrates.

The required amount of methanol is determined by special nomograms [3], depending on the equilibrium temperature of hydrate formation in a particular plume. The consumption of methanol increases with increasing pressure and decreasing temperature. For typical thermobaric conditions of operation of plumes in the northern fields, the theoretical methanol consumption can vary within rather wide limits (from 0 to 300 g/1000 m^3 of gas). In practice, an additional reserve of 20–25% for the consumption of methanol is required when the plumes are inhibited in order to eliminate the danger of hydrates in the reservoir [7]. Although the wasteful consumption of methanol leads to unnecessary material costs, in most fields, including the Yamburg gas condensate field, when dosing methanol, it is assumed that too economical consumption can cause a serious accident, the elimination of which will cost much more than in the case of uneconomical consumption of methanol. Thus, the task of determining the optimal consumption of methanol is of great importance both for ensuring the reliable operation of the field gathering systems and for the economic efficiency of the operation of the fishery.

The greatest difficulties in rationing methanol consumption are related to the conditions of inhibition of the system “well - plume (collector) - inlet separator of the GTU”. This is due, primarily, to the fact that the modes of operation of wells, loops and reservoirs can differ significantly from each other. As a result, the consumption figures for methanol for them may also differ markedly. Among the factors that contribute to this difference are the well productivity, the length of the plumes and their loading, which determines the temperature regime of their work; the amount of water removed

from the well and its mineralization; amount of hydrocarbon fluid, etc.

Thus, for example, when water salinity exceeds 30–40 mg / l, it is also necessary to take into account the decrease in the hydrate formation temperature due to the presence of salts dissolved in water.

Thus, the supply of excess amount of methanol to the plumes is due to two reasons.

First, the consumption of methanol is determined from the ratios of material balance, which are correct only under steady-state thermo-hydrodynamic conditions (conditions of material balance for water, volatile and non-volatile components of the inhibitor, related to the unit mass (or volume) of gas). In practice, this is not always implemented. For example, during the start-up period, an aqueous solution of the inhibitor may gradually accumulate in places with high hydraulic resistance. Sometimes a periodic mode is realized, when the accumulated liquid phase is time out of time from the system (this is typical for gas collection systems at a late stage of field operation). In some cases, when the hydrodynamic regime is almost steady, there is a unsteady temperature regime.

Secondly, due to the lack of individual dosing systems and methanol lines to each well, as well as control over the distribution of methanol along individual tailings from the total methanol line, methanol is supplied in the maximum amount required.

Thirdly, when water-methanol solution gets into the gas stream, if there is water carried from the well in it, the inhibitor is diluted, therefore, in order to ensure a reliable hydrate-free GTU mode, the methanol concentration is increased to 1.15 ... 1, 2 times compared with the theoretical calculated value.

Fourthly, the uncertainty and incompleteness of the initial information for calculating the amount of methanol.

Thus, the algorithm for determining methanol consumption at the Yamburg GCF based on the data of operational temperature and pressure measurements at the inlet of the integrated gas treatment unit (GPP) and periodic temperature and pressure measurements at the wellhead, carried out manually by operators, is rather inefficient because It does not take into account many parameters of plumes and well clusters, such as the actual heat transfer coefficient of plumes, the water-cut of wells, etc. [6]. In [8], the authors proposed to measure the temperature and pressure at the mouth of each well also in real time, for which purpose to install on them the recorders of technological parameters of GTP-4, included in the system of telemetric control of technological parameters of gas condensate wells and plumes [9], and to take into account factors that cannot be measured directly, use the knowledge base.

Let us consider one of the possible options for the implementation of such an adaptive methanol supply control system (ACS PM), the block diagram of which is shown in Fig. 1.

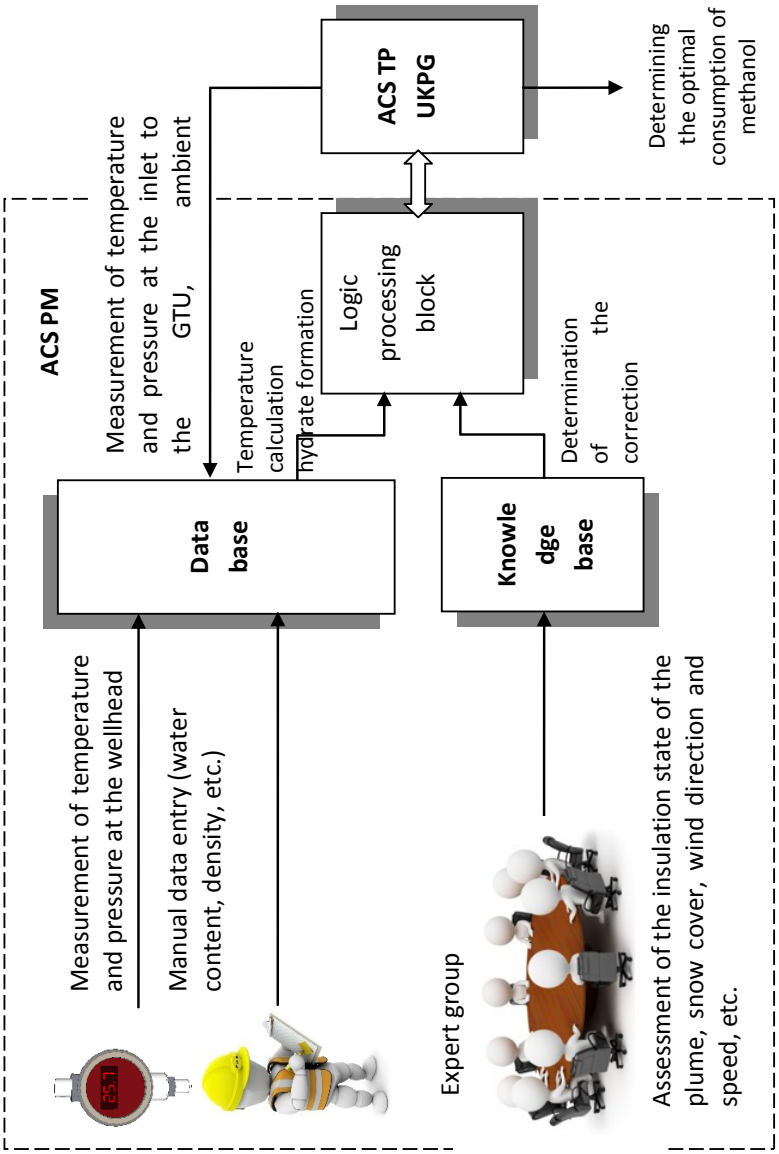


***Fig. 1** - Block diagram of ACS PM*

ACS PM is one of the subsystems of ACS TP UKPG. Within the framework of this subsystem, it is possible to diagnose the conditions of possible hydrate formation and to control the process of preventing hydrate formation in the input stubs and the GTU itself through the optimization of methanol supply. It includes three main blocks: a database, a knowledge base and a block of logical processing.

GTU operators record the following information in the ACS PM database in the regulatory and reference information section: the number of input loops; the theoretical value of the heat transfer coefficient of the plumes from the gas to the environment; distance from well cluster to GTU; the concentration of inhibitor supplied to the wellhead and coming from the plume; amount of formation water coming from wells; gas density, etc. The content of this section is regularly updated as necessary. The same section records the rational part of the information necessary for the normal functioning of this system.

The operational information section of the database records the results of temperature and pressure measurements at the wellhead coming over the radio channel from the RTP-4 recorders, and the temperature and pressure at the inlet to the GTU, measured by measuring instruments that are part of the automated process control system of the GTU.

Based on the data of both departments of the database, the theoretical value of hydrate formation temperature is calculated.

The knowledge base is recorded information obtained as a result of a survey of experts and formalized in the form of production rules, and the content of the knowledge base in the process of work all the time is refined and supplemented.

According to the results of temperature and pressure measurements and the data stored in the database, the theoretical temperature of hydrate formation and the corresponding nominal consumption of methanol are calculated.

Management of the process of prevention of hydrate formation in the plumes is carried out on the basis of temperature and pressure control at the end of the plume (at the entrance of the GTU). Within the framework of the automated process control system, these parameters are automatically measured in real time with a predetermined periodicity and are entered into a database, which is the same for the automated control system for control and automation equipment and control systems of the control system.

Diagnosing the possible beginning of the process of hydrate formation in the input loops and on the GTU itself is carried out by constant comparison of the theoretical calculated hydrate formation temperature t_{rt} in the loop at the GTU inlet with the temperature t_2, which is measured by means of the automated process control system of the GTU. As long as the condition $t_2 \geq t_{rt}$ is fulfilled, methanol is fed into the loop with a nominal flow rate. If the measured temperature becomes lower than the value of t_{rt}, then theoretically this means the beginning of the pro-

cess of hydrate formation. However, this may happen for another reason: when calculating t_{rt}, factors such as, for example, the insulation state of the plume and the thickness of the snow cover, affecting the heat transfer coefficient, etc., were not taken into account. Experimental studies show that the value of the actual heat transfer coefficients *K*, obtained from field measurements, varies depending on the time of year and weather conditions in the range from 0.3 to 3 - 4 kcal / (m^2h.ºC) at the calculated design value for new dry and intact insulation 1 kcal / (m^2. h.ºC).

Therefore, a comparison is then made of the current value of the pressure at the inlet of the gas treatment unit with the value obtained in the previous measuring cycle. If the pressure has increased, it is possible to make an unequivocal conclusion about the beginning of the process of hydrate formation and an increase in the amount of methanol supplied. If the pressure has not changed, then the knowledge base is accessed and expert judgment is formed on the basis of the production rules - has hydrate formation started? If the answer is negative, a correction factor is determined for the theoretical hydrate formation temperature t_{rt}, and the consumption of methanol does not change. In the case of a positive response, the process of recalculating the consumption of methanol and the formation of the control action for the methanol supply system is started.

Such an adaptive control system not only effectively prevents hydrate formation, but also makes more efficient use of methanol, which ultimately will improve the economic performance of the gas field.

References

1. Aksyutin O.E., Menshikov S.N., Laperdin A.N. et al. Formation conditions and methods for the control of hydrates in the gas field of the Yamsoveiskoye field: Overview of Inform. - Moscow: Gazprom Expo, 2010. 88 p. (Geology, drilling, development and exploitation of gas and gas condensate fields).

2. Actual problems and new technologies for the development of natural gas deposits in the XXI century. - Gazprom, Moscow, 2003. - 252 p.

3. Bekirov T.M., Shatalov A.T. Collection and preparation for the transport of natural gases. - Moscow: Nedra. 1986. - 261 p.

4. Beshentseva S.A. Analysis of methods for the prevention of hydrate formation in pipelines // Cybernetics Bulletin. - 2012. - № 11. Automation of oil and gas technologies.

5. Prakhova M. Yu., Mymrin I. N. Local automatic electric heating system to prevent hydrate formation in the waste pipeline // Automation, tele-mechanization and communication in the oil industry, 2014, № 2, P. 3-6.

6. Zhozhikashvili, V.A. The management system for the prevention of hydrato formations in the GPP of the fields of the Far North based on the processing of expert knowledge / V.A. Zhozhikashvili, M.P. Farhadov, V.A. Rykov. - Moscow: IRTs Gazprom, 1998. - p. 15-27.

7. Grunwald A.V. The use of methanol in the gas industry as an inhibitor of hydrate formation and a forecast of its consumption in the period up to 2030 // Electronic scientific journal "Oil and Gas Business", 2007. URL: http://www.ogbus.ru

8. Prakhova M.Yu., Krasnov A.N., Khoroshavina EA, Shalovnikov E.A. Methods and means of preventing hydrate formation at gas production sites // Electronic scientific journal "Oil and Gas Business". 2016. № 1. p.101-118. URL: http://ogbus.ru/issues/1_2016/ogbus_1_2016_p101-118_PrakhovaMU_ru.pdf.

9. Krasnov A.N., Fedorov S.N., The system of telemetric control of technological parameters of gas condensate wells and plumes of the Urengoi OGKM (SKTP) // Proceedings of the All-Russian Scientific and Technical Conference "Problems of control and automation of technological processes and production", Ufa, 2010, p. 60-65.

气体羽流中并发症诊断的概念
THE CONCEPT OF COMPLICATIONS DIAGNOSING IN GAS PLUMES

Emets Sergey Viktorovich
Candidate of Technical Sciences, Associate Professor
Kudayarov Vadim Naufalevich,
graduate student
Prahova Marina Yuryevna,
Associate Professor
Ufa State Petroleum Technological University

注解。由于在管道环路中形成水合物和冰堵，远北和北极条件下的天然气生产变得非常复杂。诊断水合物形成的现有方法主要基于温压条件的分析并且仅诊断水合物形成条件的发生，但是不能定位这些过程。最近开发的基于回声定位的方法由于所使用的辐射的物理性质而具有许多限制。所提出的在场截断中诊断水合物形成过程的概念是基于短截线中的温压条件和短截线的回声定位结果的组合。由于形成冰和水合物的温压条件不同，所提出的概念具有选择性并且使得可以准确地预测潜在地层的性质。该概念的wave组件提供了其本地化功能。结合这两种方法的能力是在信息分析模块的基础上进行的，该模块对波和参数诊断的结果进行联合处理，并在操作员工作站上发布关于环路当前状态的专家意见。使用所考虑的模块可以实时评估水合物形成的危险并防止不良后果。

关键词：气体羽流，天然气水合物，水合物形成条件，回声定位，羽流局部阻力的局部化。

Annotation. *Gas production under the conditions of the Far North and the Arctic is seriously complicated by the formation of hydrate and ice jams in pipelines-loops. Existing methods of diagnosing hydrate formation are mostly based on the analysis of thermobaric conditions and diagnose only the occurrence of conditions for hydrate formation, but are not able to localize these processes. The recently developed methods based on echolocation have a number of limitations due to the physical nature of the radiation used. The proposed concept of diagnosing hydrate formation processes in field stubs is based on a combination of analysis of thermobaric conditions in the stub and the results of the echolocation of the stub. Since thermobaric conditions for the formation of ice and hydrates are different, the proposed concept has selectivity and makes it possible to ac-*

curately predict the nature of potential formation. The wave component of the concept provides its localization capabilities. Combining the capabilities of the two methods was carried out on the basis of an information-analytical module that performs joint processing of the results of wave and parametric diagnostics and the issuance of an expert opinion on the current state of the loop on the operator's workstation. The use of the considered module allows real-time evaluation of the danger of hydrate formation and preventing undesirable consequences.

Keywords: *gas plume, gas hydrates, hydrate formation conditions, echolocation, localization of local resistance in the plume.*

Large Russian natural gas fields are located in the Arctic latitudes, where technological conditions for gas production and treatment are complicated by harsh climatic conditions. Gas is transported from the well to the complex gas treatment unit (CGTU) through pipelines-plumes and is complicated by precipitation of condensed moisture, ice, hydrates [1]. The consequences of these phenomena are manifested in reducing the effective cross-section of the pipeline and reducing the performance of the plume up to a very unfavorable outcome in the form of blocking the internal cross-section of the pipeline with a complete halt of gas production along this plume.

Hydrate inhibitors, for example, methanol, are widely used to combat hydrate formation [2]. The total cost of using methanol can reach 20% in the cost of produced gas [3]. The study of the conditions of hydrate formation and control is devoted to an impressive amount of scientific work, for example, [4 - 12]. However, due to the fact that hydrate formation is a complex multifactorial physicochemical process, the problem of timely diagnosis of the formation of hydrates and other sediments is not fully resolved in practical terms and remains relevant.

Most methods for determining the beginning of the process of hydrate formation in the plume are reduced to determining the position of the working point of the plume (current thermobaric conditions) in the “pressure-temperature” coordinates and analyzing its proximity to the hydrate formation zone of the transported medium. Plumes are operated, as a rule, at pressures below the hydrate formation pressure, but the gas temperature in the plume can significantly decrease due to the action of many factors: ambient temperature, the state of thermal insulation of the plume, etc. Accordingly, many parametric methods for monitoring hydrate formation processes are based on the temperature control in the plume, for example, [6, 8]. The differences in practical implementation are determined by various algorithms for processing the information received and interpreting the results. Such methods allow you to diagnose the beginning of the process of hydrate formation, but do not allow to determine the place of formation of hydrates in the plume. Another disadvantage is the inertia of these methods, especially in the case of low linear velocities of the medium in the plume.

With simultaneous measurement along with the temperature of the gas and its pressure, the possibilities of diagnosing expand, because An increase in gas pressure to hydrate pressure values directly indicates a potentially dangerous process situation. A decrease in pressure relative to the working pressure of the plume, as well as pressure pulsations, can be interpreted as signals of the beginning of a plug formation in the plume [9]. The temperature data gives an estimate of the possibility of hydrate formation in the whole gas gathering system, and the increase in pressure at the wellhead (well cluster) allows localizing the corresponding parts of the plume where hydrate formation is possible [10]. This method can be used at sites with the connection of wells through gas collection plumes to the gas collection manifold. However, a large length of plumes reduces the effectiveness of the method in terms of localization of the place of formation of hydrates.

There are also methods for diagnosing and localizing hydrates based on wave phenomena, for example, using acoustic resonance technology [11], using infrared radiation [9] or electromagnetic waves of circular or linear polarization at one or a group of frequencies [12]. Each of these methods also has certain disadvantages.

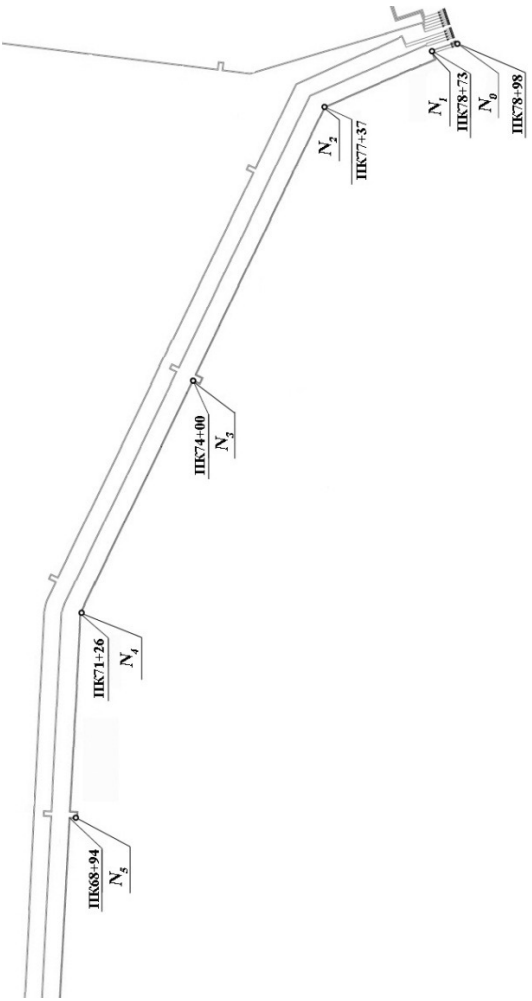
This article proposes to combine the capabilities of the wave and parametric methods. Measurement of pressure and temperature allows determining the state of the medium in the plume (proximity to the hydrate formation zone or entering it), and echolocation - the presence of sediments and their coordinates.

The proposed method is advisable to use primarily in gas fields with a collector-gas collection scheme.

To determine the place of formation of new deposits, the echolocation method is used: the distance is determined by the delay time of the scanning pressure wave (SPW) reflected from an obstacle. Before monitoring, the inner surface of the plume is cleaned of accumulated deposits by blowing on the candle or in any other way.

The echogram for a clean pipeline, obtained in the first measurement, is taken as exemplary. Further measurements are periodically repeated.

Using the passport of the pipeline on this echogram determine the characteristic points corresponding to the structural elements of the pipeline, forming the response signal: turns, knees, etc. (Fig. 1). The loop is divided into so-called characteristic areas - areas between the characteristic points attached to the design of the loop. For the general case, the number of sections is assumed to be *N*.



PC - pickets on the train; $N_0 \ldots N_5$ - characteristic points of the pipeline

***Fig. 1** - Fragment of the circuit of the studied plume*

To determine the wave propagation velocity, the reference portion of the plume is distinguished: the portion between the characteristic points to which the distance is precisely known and which give well-defined waveforms and time-stable reflections of the SPW. It is more expedient to choose this area closer to the BDU (in Fig. 1, this is the area between the characteristic point N_1 and the sensor of detection of reflected waves - the characteristic point N_0). According to the time of passage of the reflected wave of the reference area, the estimated velocity of wave propagation is determined for each scan session.

Further, by changing the time of passage of the scanning wave of characteristic sections and by the gas temperature at the end of the plume, the absolute gas temperature T_n is calculated in the vicinity of the new local resistance at site n using the recurrent formula [13]

$$T_n = T_{n-1} \cdot \left(\frac{\Delta t_{n-1}}{\Delta t_n} \right)^2 \cdot \left(\frac{\Delta L_n}{\Delta L_{n-1}} \right)^2 .$$

In addition, gas pressure at the BDT and wellhead is constantly measured. The ratio of the obtained values is calculated pressure in the vicinity of the new local resistance. For this purpose, one of the known models of pressure distribution along the pipeline is used, for example, given in [9, 10]. In this case, it is assumed that the plumes are operated in a mode in which the pressure from the wellhead to the ZPA decreases slightly (within 5 ... 8%) [13].

The possibility of the existence of crystalline hydrates under current thermobaric conditions in the vicinity of a new local resistance is determined by the diagram of three-phase equilibria for gas-hydrate-forming agents that make up the produced gas [6].

For generating pressure scanning waves, several methods are possible, for example, closing a valve on the train in the ZPA, stopping the gas flow before equalizing the pressure in front of the valve in the ZAP to the wellhead pressure values and then opening the valve, using low or high pressure receivers, etc. The specific method is chosen depending on the energy of the gas flow, which is characterized by its velocity in the plume and pressure.

The implementation of the combination of the wave and parametric methods is carried out by the information-analytical module (IAM), which has the following functionality:

- collection of echograms;
- storage of echograms;
- processing of echograms;
- obtaining gas temperature values in the plume at the ZPA from the production SCADA;
- calculation of the thermal profile and pressure distribution over the train;

- analysis of the state of the plume in terms of the proximity of the current "working line" to the ice hydrate formation zone;

- issuing an expert opinion on the current state of the plume on the operator's workstation.

The general block diagram of the proposed module is shown in Fig. 2

Information and Analytical Module (IAM) is a set of measurement tools of technological parameters, data input and output modules, means for controlling the generation of a pressure wave, modules for interaction with elements of an existing automated process control system of a gas turbine unit control package and a software system for implementing diagnostic and prognostic functions.

The result of wave monitoring is a periodically received echogram of the loop. According to the results of parametric monitoring, pressure values at the wellhead and at the entrance to the PAD, as well as the temperature at the entrance to the PAD are entered into the database from the standard sensors of the automated process control system of the gas treatment facility.

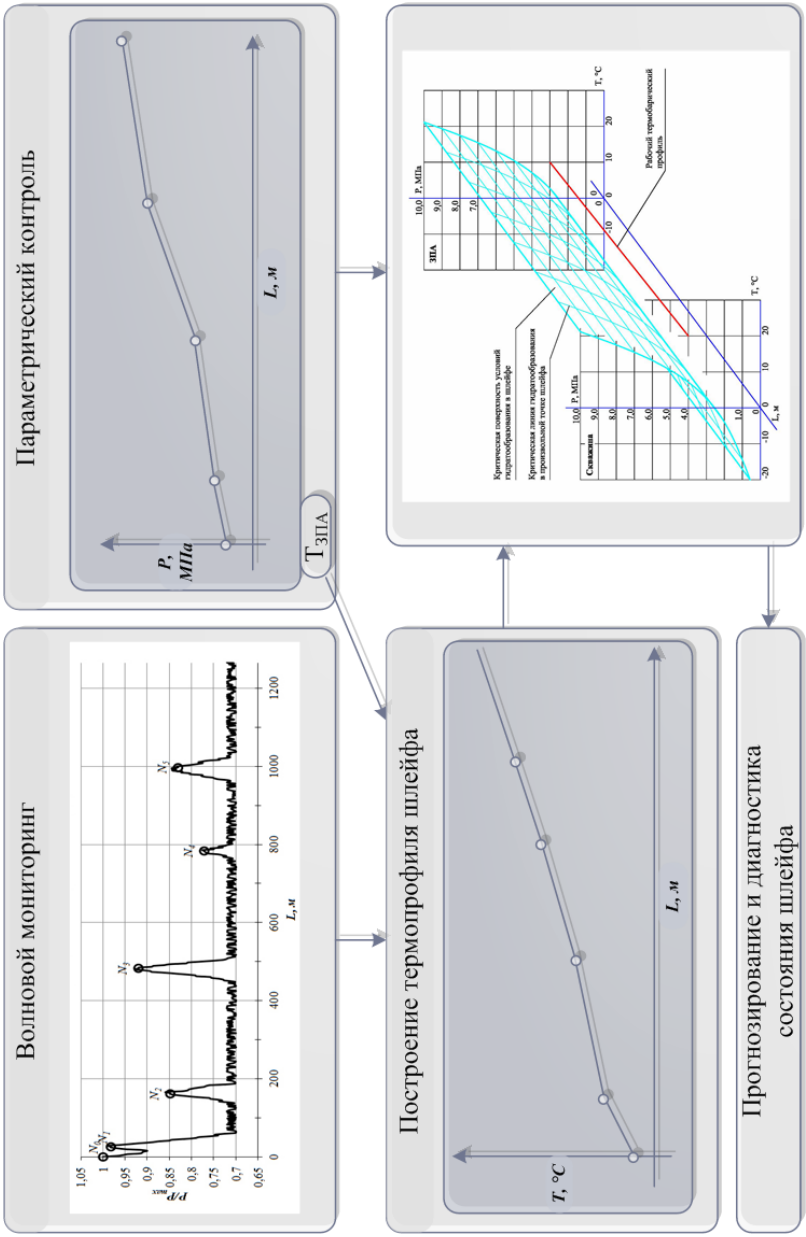


Fig. 2 - *Block diagram of an information and analytical module for the prevention of complications in gas plumes*

In each monitoring cycle, IAM implements the following algorithms:

1) recognition of pressure wave reflections on the working echogram and linking the time marks of these events to the elements of the loop construction (i.e. comparing the time points of the echogram peaks with the coordinates of the elements);

2) calculation of the velocity of propagation of the pressure wave on the reference section of the plume (the section of the plume of known length with clearly identifiable boundaries on the echogram) and on the sections of the plume between local resistances (structural elements of the plume);

3) the calculation of the pressure distribution along the plume from the well to the ZPA;

4) calculation of the temperature distribution along the plume;

5) construction of the working thermobaric profile of the plume (set of working points in the coordinates temperature - pressure along the plume);

6) construction of the critical surface of the hydrate formation conditions of the gas flow in the plume (set of critical hydrate formation lines in the temperature – pressure coordinates along the plume);

7) analysis of the relative position of the working thermobaric profile of the plume and the critical surface of the hydrate formation conditions of the gas flow in it;

8) the formation of a conclusion about the current state of the plume and the forecast of possible complications (for example, the coordinates and nature of deposits, the probability of formation of hydrate plugs, etc.).

The use of these algorithms makes it possible to implement both diagnostic (detection, character analysis and coordinates of deposited deposits) and prognostic (analysis of the proximity of the operating mode of a particular section of the plume to the area of hydrate formation) functions.

References

1. Prakhova M.Yu., Krasnov AN, Khoroshavina EA, Shalovnikov E.A. Methods and means of preventing hydrate formation at gas production sites // Oil and Gas Business. - 2016. - No. 1. P. 101–118.

2. John Carroll. Natural Gas Hydrates, A Guide for Engineers, 3rd Edition. Gulf Professional Publishin. 2014. – 340p.

3. Prakhova M.Y., Khoroshavina E.A., Krasnov A.N., Zakirnichnaya M.M. Cognitive model application for automatic system of methanol supply to flowlines /В сборнике: IOP Conference Series: Earth and Environmental Science Сер. "Innovations and Prospects of Development of Mining Machinery and Electrical Engineering - Mining and Exploration of Mineral Resources" 2017. С. 052023.

4. Hammerschmidt E. G. Formation of gas hydrates in natural gas transmission lines // Industrial and Engineering Chemistry. – 1934. – vol. 26. – № 8. – P. 851-855.

5. Sloan E.D. Natural Gas Clathrate Hydrates. – New York: Marcel Dekker, 1998. – 754 p.

6. Istomin V.A., Kvon V.G. Prevention and elimination of gas hydrates in gas production systems. Moscow .: OOO IRTS Gazprom, 2004.

7. Buts V.V. Mathematical model of hydrate formation during the movement of natural gas in pipelines in the presence of an inhibitor // Territory Neftegaz. 2010. No. 6. P. 20-24.

8. Patent RU 2 329 371. Method of managing the process of preventing hydrate formation in the infield loops of gas and gas condensate fields in the Far North / Andreev OP, Salikhov Z.S., Akhmetshin B.S. and etc.

9. Bahubali Chandragupthan, Girish Babu Nounchi. Detecting and dealing with hydrate formation (https://www.digitalrefining.com/article_1000465.pdf).

10. Patent RU 2 573 654. Method for managing the process of preventing hydrate formation in gas gathering plugs connected to a common reservoir at gas and gas condensate fields of the Far North / Arno OB, Arabic AK, Akhmetshin B.S. and etc.

11. Patent RU 2 431 828. Acoustic method and device for detecting the medium and determining its characteristics / Jacobsen Jostein (NO), Berg Askhild (NO), Wilming Steel (NO).

12. WO 00/46545 Method and device for monitoring flow parameters in a pipeline in order to register hydrate formation. / BAKKE, Knut, I.

13. Emets S.V., Kudayarov V.N., Prakhova M.Y. Method for the monitoring of hydrate formation process in intrafield flowlines // Arctic Environmental Research 18(3): 97-105. URL: https://doi.org/10.3897/issn2541-8416.2018.18.3.97.

用于技术视觉系统的“超宽带接收器”“片上系统”类型
ULTRA-WIDEBAND RECEIVER FOR TECHNICAL VISION SYSTEMS “SYSTEM-ON-CHIP” TYPE

Fakhrutdinov Rodion Renatovich
Research Assistant
Zavyalov Sergey Anatolyevich
Candidate of Engineering Sciences, Senior Research Officer,
Murasov Konstantin Vladimirovich
Candidate of Engineering Sciences, Research Officer
Omsk State Technical University

注解。 被动无线电定位被广泛用于现代电子设备中，被用作所谓的技术愿景。 电子设备的小型化导致需要增加雷达中使用的频率。 该文章描述了一种工作在0.9–18 GHz范围内的超宽带片上系统接收路径。 接收器设计为130纳米的硅锗（SiGe）工艺。

关键词：双极晶体管，SiGe，混频器，低噪声放大器，片上系统。

Annotation*. Passive radiolocation is widely used in modern electronic equipment, being used as a so-called technical vision. The miniaturization of electronic devices leads to the need of increasing the frequencies used in radar. The article describes an ultra-wideband system-on-a -chip receiving path operating in the range of 0.9-18 GHz. The receiver is designed silicon-germanium (SiGe) process 130 nm.*

Keywords*: bipolar transistor, SiGe, mixer, low-noise amplifier, system-on-a-chip.*

The development of modern electronics allows to create more sophisticated devices and systems that are used in various fields of human activity. To create devices that carry out its activities, including orientation in space, the passive radar method is widely used.

The appearance of a large number of devices leads to the complication of the electromagnetic environment. The main advantage of passive radar is the absence of radiation.

The increasing miniaturization makes it necessary to use small antennas. Given these requirements, it is necessary to increase the operating frequencies of the

receiving path to values of several tens of gigahertz. In this case, a small antenna is realizable. In order to ensure the possibility of working with different versions of antenna devices, and accordingly the ranges, it is necessary to ensure a wide range of frequencies of the received signal.

Thus, the requirements for the designed receiving path can be formulated as follows: the range of received frequencies is 0.9-18 GHz, the range of intermediate frequencies is 0.1-3 GHz, the SWR for all inputs should not exceed 2. The insulation between the inputs and outputs is not less than 25 dB.

To work in this frequency range, devices built using gallium arsenide are currently widely spread. The main disadvantage is the impossibility of placing a large number of devices on a single chip, which does not allow to create a device that contains not only the high-frequency receiving path, but also digital signal processing units, trimming units. Thus, the creation of a complex single-crystal device of the "system-on-a-chip" type is not possible using gallium arsenide technology.

The disadvantage of CMOS technology is the high cost of manufacturing processes with dimensions less than 65 nm, which could provide the required speed. In addition, MOS transistors have worse noise characteristics compared to bipolar transistors.

Thus, the optimal solution for building an integral receiving path is to use silicon-germanium technologies with a dimension of 130 ... 250 nm. Heterostructural bipolar transistors obtained in these technologies have cut-off frequencies of several hundred gigahertz, which allows to use it for processing signals with frequencies up to 20 GHz.

The block diagram of the system-on-a-chip reception path is shown in Figure 1.

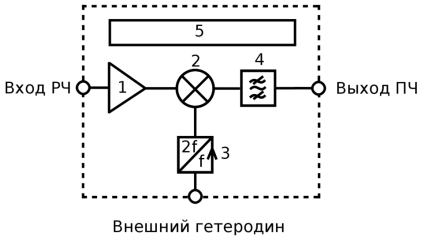
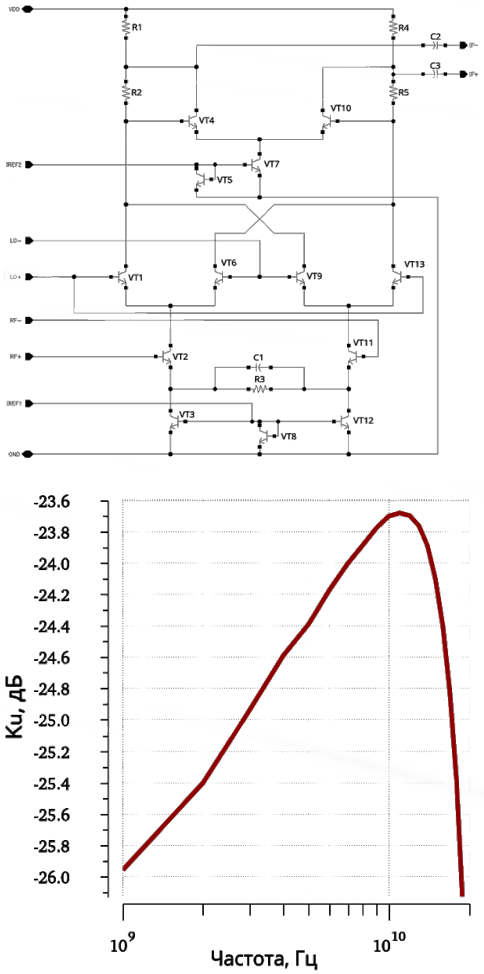


Figure 1 - *Block diagram of the receiving path.*

The receiving path consists of an input low-noise amplifier, a mixer, a frequency multiplier, an active tunable filter and a source of reference currents and voltages. Basically, the structure of the receiver corresponds to the classical one, except for the use of a frequency doubler for the local oscillator signal.

The use of the multiplier allows us to match the input of the local oscillator at a lower frequency and also simplifies the process of generating a signal.

One of the main elements of the receiving path is the mixer. In the integrated design the most optimal solution is the construction of the mixer according to the scheme of the Hilbert cell. In addition, this scheme allows us to get a wide frequency range. It should also be noted that in standard SiGe processes there are no specialized high-frequency diodes that allow to construct passive balanced mixers. The scheme of the developed mixer is shown in Figure 2a.



a)

b)

Figure 2 - *Integral mixer and its frequency response*

To increase the conversion gain, the mixer has an active load; in addition, a correction chain R3-C1 is introduced into the circuit. The correction allows to obtain the characteristic shown in Figure 2b. Increasing the gain of the conversion in the high-frequency area makes it possible to compensate the influence of parasitic reactive components appearing in the development of the topology and the connection of the crystal.

In addition to the mixer, the main parameters of the receiving path are greatly influenced by the input low-noise amplifier.

There are implementations of broadband low-noise amplifiers with distributed amplification [1], but these schemes have significant drawbacks, such as a large occupied area, as well as the absence of a differential signal necessary for the operation of the Hilbert cell.

Thus, as an LNA, it is advisable to use a circuit that, in addition to amplification, would ensure the formation of a differential signal. Often, to solve such a problem, a differential cascade is used, one of the inputs of which is connected to the common wire by alternating current, and a signal is given to the second. The main disadvantage of this scheme is its relatively small upper frequency limit. The fact is that at frequencies higher than 10 GHz, significant phase shifts occur, as a result of which, the phase error increases significantly, and a significant difference in amplitudes also occurs.

It should be noted that for normal operation of the mixer it is necessary that the phase error of the differential signals of the RF and local oscillator does not exceed 20 º. For large values of the phase error in the spectrum of the output FC signal , a significant increase in the components of the input signals is observed. The optimal solution [2] is to use a common emitter circuit - a common base. The core of the LNA circuit and its frequency characteristics are shown in Fig. 3.

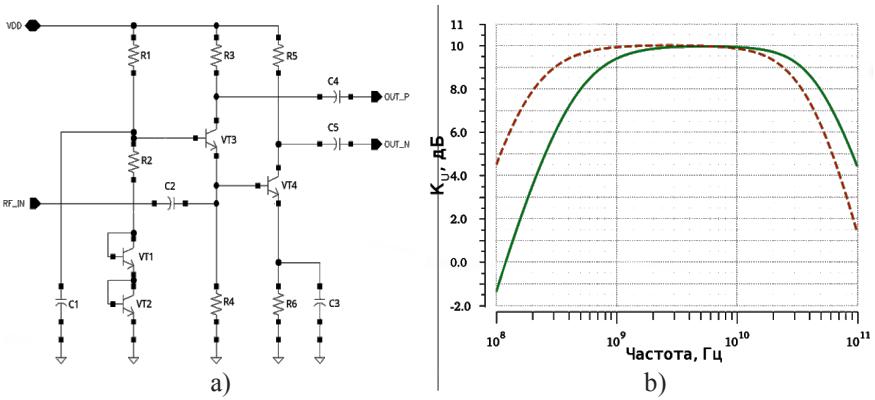


Figure 3 - *The core of the LNA circuit and its frequency characteristics*

The input signal is divided between common emitter and common base cascades , as a result, anti-phase signals are formed on the collectors of transistors. To increase the temperature stability of the amplifier, a bias circuit is applied on two transistors in a diode connection.

As can be seen from the results of the analysis shown in Figure 3b, there is some difference in the frequency characteristics of the stages. Modes of operation are adjusted so that in the required frequency range both amplifier stages have similar parameters.

To implement a frequency multiplier capable of operating with a wide frequency band, it is advisable to use schemes that do not require special phase-shifting circuits. The optimal solution as a multiplier is also to use a Gilbert cell, at both inputs of which a local oscillator signal is sent. As a result, a frequency doubled signal will be generated in the output signal.

The block diagram of the frequency multiplier is shown in Figure 4 [3].

Structurally, the multiplier consists of a mixer, amplifier stages 1, buffering stages 2 and a balancing device 3.

To balance the local oscillator signal, it becomes possible to use a differential pair, since the frequency of the input signal does not exceed 10 GHz.

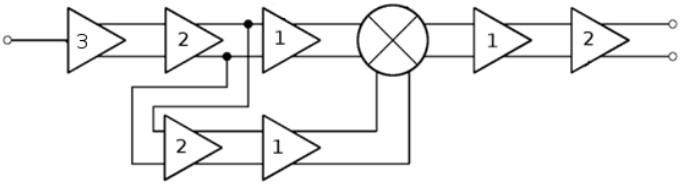


Figure 4 - *Structure of the frequency multiplier*

Band-pass filter is advisable to constructively combine with an output transimpedance amplifier. This reduces overall consumption and space. The filter structure is shown in Figure 5.

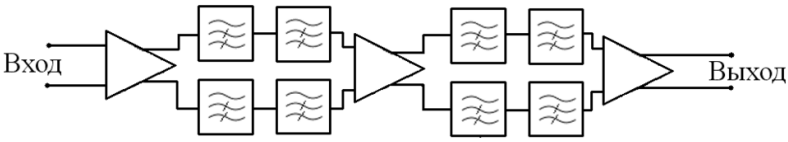


Figure 5 - *The structure of the bandpass filter.*

The bandpass filter consists of differential amplifiers and filtering cascades. Adjustment of the cutoff frequency in the range of 1 ... 3 GHz is performed by switching the integral capacitors using analog CMOS keys.

The source of reference currents and voltages is constructed according to the schemes of sources with a voltage equal to the width of the forbidden zone, which operate in the current mode and in the voltage mode. First order compensation is applied.

Much attention in the development of the source was given to reducing the source's own noise, since the operating modes of the amplifier stages with direct current are set by current mirrors.

Figure 6 shows the empirical dependence of the noise density and temperature stability on the current of the source core. This dependence was obtained for the 130 nm process used for BiCMOS.

As can be seen, a current of 50 ... 60 μA is optimal [4].

Topologies have been developed for all the SF blocks of the receiver. In the development of topologies, the focus was on minimizing the parasitic parameters of the compounds, as well as ensuring the least resistance of the earth tracks. After the topology was developed, re-modeling was carried out taking into account the parasitic parameters, not only parasitic capacitances and resistances were extracted, but also the inductances.

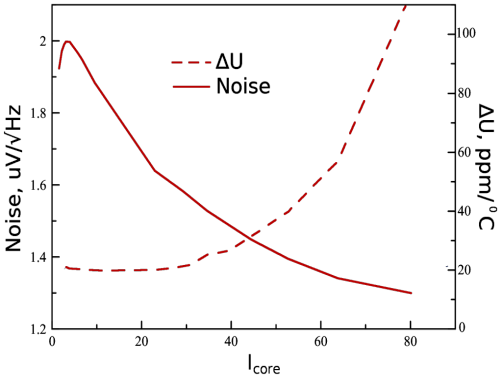


Figure 6 - *Empirical dependence of the noise density and temperature stability on the current of the source core*

Experimental samples were fabricated in a 130 nm SiGe process. Figure 7 shows a micrograph of a crystal with experimental samples of developed SF block*s of an ultra-wideband receiver.*

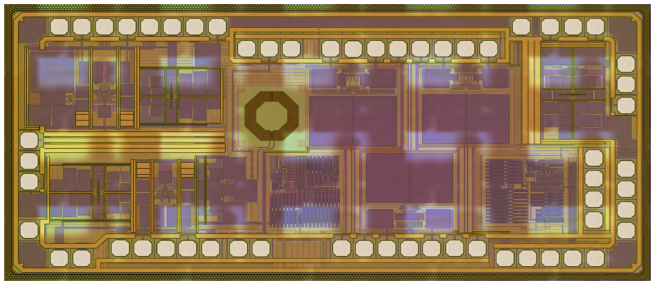


Figure 7 - *Micrograph of an experimental crystal*

Given the dielectric constant of silicon oxide and the minimum wavelength of the received signal, it can be concluded that the calculations and matching circuits inside the crystal can be carried out according to the rules for designing low-frequency circuits. The main difficulty is to ensure a consistent connection of the crystal blocks to the external elements. The inductance of the isolating conductors is 1 ... 2 nH [5], as a result, the resistance of the conductor at a frequency of 10 GHz will be about 60 ohms, which will lead to a significant increase in the SWR. Thus, the best installation method is flip-chip, the inductance of connectors of which is several tens of PH.

To perform flip-chip installation, a specialized board was developed, the photo of which is shown in Figure 8. Inlet lines have an impedance of 50 Ohms along the entire length. Figure 9 shows micrographs of the power and signal connections.

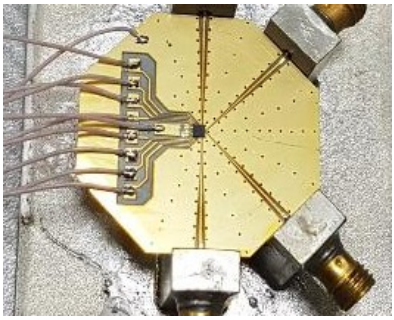
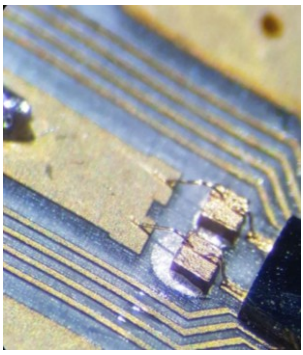
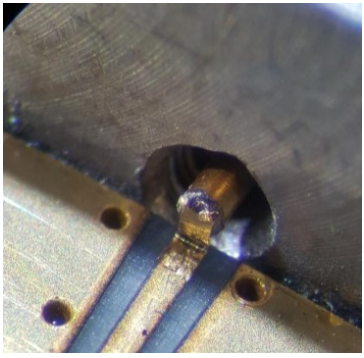


Figure 8 - *Boards for measuring experimental samples*



a)



b)

Figure 9 - *Micrographs of placing experimental samples*

High-frequency capacitors K10-71 are used as blocking capacitors. The signal connectors are connected via a foil section in order to ensure matching at the upper limit of the frequency range [6].

These measures allowed minimizing losses on the connection of the crystal with the measuring board, as well as losses arising when scaling the dimensions of the supply lines. Figure 10 shows the results of measurements of an experimental sample for two variants of compounds.

As can be seen from the measurement results, the use of standard methods for connecting the welding wires leads to a significant narrowing of the frequency range in the high frequency range.

With the use of the flip-chip placing method, the measurement results show a uniform frequency response over the entire required range of 0.8 ... 20 GHz. Also, the entire range is provided by a SWR not exceeding 2.

Thus, it can be concluded that the construction of an ultra-wideband system-on-a-chip receiver is feasible using SiGe processes. At the same time, using CMOS data structures of processes, digital blocks can be implemented on a single chip with analog blocks.

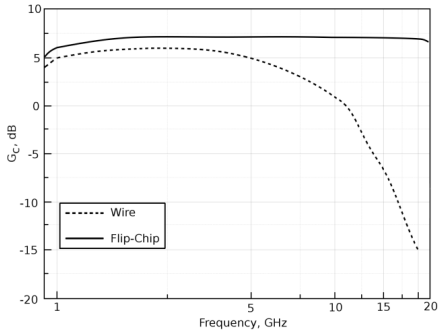


Figure 10 - *Measured frequency response of experimental samples*

Creating a single-chip receiver can significantly reduce the size and power consumption of the entire device as a whole. In addition, the number of connections by soldering decreases, which increases the manufacturability of the device.

The studies were conducted with the financial support of the Ministry of Science and Higher Education of the Russian Federation. The unique identifier of the study is RFMEFI57417X0164.

References

1. E. L. Ginzton, W.R. Hewlett, J.H. Jasberg, J.D. Noe "Distributed Amplification" //Proceedings of the IRE., Vol. 36., Iss. 8., 1948., P. 956-969.

2. K. V. Murasov, S. A. Zavyalov, A. V. Kosykh, Z. B. Sadykov "The Wideband Balun-LNA in 130 nm SiGe Technology" 2018 International Multi-Conference on Industrial Engineering and Modern Technologies (FarEastCon), 2018.

3. K. V. Murasov, S. A. Zavyalov, R. R. Fakhrutdinov, Zh. B. Sadykov "The Frequency Doubler 0.4–10 Ghz with Differential Output Based on Gilbert Cell in Si-Ge 130 Nm Technology", 2018 Wave Electronics and its Application in Information and Telecommunication Systems (WECONF), 2018.

4. R.R. Fakhrutdinov, S.A. Zavyalov, K.V. Murasov, D.A. Koemec "Current Source and Voltage Reference for Broadband Receiver in BiCMOS 130 nm", 2018 14th International Scientific-Technical Conference on Actual Problems of Electronic Instrument Engineering, APEIE 2018, P. 28-32.

5. Y-L Lai, C-Y. Ho "ELECTRICAL MODELING OF QUAD FLAT NO-LEAD PACKAGES FOR HIGH-FREQUENCY IC APPLICATIONS" 2004 IEEE Region 10 Conference TENCON 2004, Vol. D, P. 344-347.

6. K.B. Dzhurinskiy "Small radio-frequency connectors", ZAO "Radiant-Elkom", 2013.

ASSESSMENT AND FORECAST OF THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN RUSSIA

Votinova Elena Mikhailovna
Candidate of Economic Sciences, Associate Professor
Northwestern Institute (branch of)
Moscow University of Humanities and Economics
Votinov Maksim Valerievich
Candidate of Technical Sciences
Murmansk State Technical University

注解。 本文致力于俄罗斯信息社会的发展。 本文介绍了使用人口，特别是家庭，个人计算机和通信网络（如“互联网”）以及使用电子政府可能性的问题。 作者对国家计划“信息社会”期间研究的主要指标的发展进行了预测。 根据上述预测，已提出建议，以增加俄罗斯信息技术，计算机和通信网络的发展规模。

关键词：信息社会，计算机，通信网络，“互联网”，电子政务，评估和发展预测。

Annotation. *The article is devoted to the development of the information society in Russia. The article presents the issues of using the population, in particular households, personal computers and communication networks, such as the "Internet", as well as the issues of using the possibilities of electronic government. The authors made a forecast of the development of the main indicators studied for the period of the state program "Information Society". Based on the above forecast, recommendations have been made to increase the scale of development of information technologies, computers and communication networks in Russia.*

Keywords: *information society, computers, communication networks, "Internet", e-government, assessment and development forecast.*

Introduction

The technical, organizational and managerial changes taking place at the present stage of the development of society are closely connected with the rapid development and spread of information technologies and telecommunication networks.

According to the World Economic Forum, the index of competitiveness of national economies has a close relationship with the level of technological devel-

opment [1]. In the first place in the ranking of countries on the Global Competitiveness Index (Global Competitiveness Index) is Switzerland, Russia ranks 38 out of 137.

It is obvious that the further development of information technologies contributes to the discovery of new opportunities and development prospects, however today a comprehensive assessment of the national potential in the field of information technologies is necessary.

The aim of the research conducted by the authors is to assess the use of information technologies, computers and communication networks that form the information society in Russia, and to forecast their development for the coming years.

As part of the study, the extent to which the population, in particular households, use personal computers and communication networks, such as the Internet, is of interest. And also the question: how effectively the population uses the opportunities of e-government and how the state is prepared for successful functioning within the framework of the information society.

Information technology and society

To implement the goals of the formation and development of the information society, the Ministry of Communications and Mass Communications of the Russian Federation has developed a state program "Information Society" [2]. The program indicates the main activities, as well as indicators (targets) for its implementation up to 2020.

The Federal State Statistics Service conducts annual federal statistical monitoring on the use of information technology by the population and information and communication networks in which approximately 30,000 households are surveyed [3].

The survey shows a good growth trend in the use of information and communication technologies by the population of Russia, Figure 1. Thus, in particular, the share of personal computers used in households increased by 3.3% in 2017 compared to 2015 and amounted to 74.3 % of total households. The number of households using the Internet increased by 4.9%. As of 2017, this figure was 74.8%. It is worth noting that 70.7% of households use broadband access to connect to the Internet.

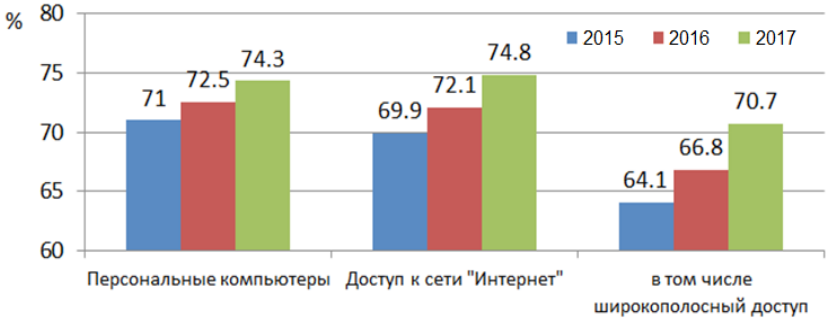


Fig. 1. *Households with personal computers and Internet access (as a percentage of the total number of households)*

Conducted surveys among households highlighted the main problems hindering the use of the Internet in households [3]. Among the most common answers stand out: lack of desire, lack of skills, high cost of connection.

The use of the Internet by the public is connected with the receipt of services in electronic form. According to a study conducted by Rosstat, among the population aged 15–72 years, the Internet is most often used to participate in social networks (78%) [4]. At the second most popular place - download multimedia content (51.4%). Next - search for information about products, making phone calls, as well as work with e-mail, which is 43.8%, 43.6% and 41.6%, respectively. 23.1% of the population use the Internet to order goods and services.

You can pay attention to the fact that the “Internet” acts not only as an entertainment medium. Thus, 22.5% of the population uses the Internet for financial transactions, 8.5% carry out a search for vacancies through the network. It is worth noting that 2.7% of the population uses the “Internet” to increase their professional level using distance learning.

An important criterion for the development of the information society is the use of public services by the public in electronic form, as well as interaction with public authorities via telecommunication channels. It is not a secret that the idea of developing e-government in Russia is inextricably linked to the issue of increasing the efficiency of public service based on modern management methods [5].

According to statistics, the share of citizens using the mechanism for obtaining state and municipal services in electronic form in 2017 was 51.3%. Mostly the interaction is carried out through the official sites and portals of the authorities. From year to year the popularity of using electronic communication with the authorities is only growing. So in 2015, this figure was 35.2%, which is almost 1.5 times less than the current figure.

22% of the population is registered on the Single portal of state and municipal services. Moreover, 4.3% of the population has an electronic signature, which allows them not to visit government bodies, but to participate in electronic document flow with them.

Among state and municipal services received by the population in electronic form, health services are popular (32.4%), work with tax inspectorates (18.7%), as well as with the Ministry of Internal Affairs and the traffic police (18.1%).

The study shows that the telecommunications infrastructure in Russia is in its infancy. The population has significant questions about the volume and quality of online services. Thus, the low level of use of e-government is due to the fact that quite often the population is faced with the problems of obtaining services in electronic form on the portals and websites of government. For example, 17% of respondents observed technical failures when accessing state and municipal services portals, 8.7% of respondents encountered insufficiently accurate or outdated information. 3.1% of respondents could not get technical support or assistance in a timely manner.

Thus, in order to develop the idea of e-government, it is necessary not only to increase the number of services provided in electronic form, but also their quality; for these purposes, it is necessary to establish closer cooperation between government representatives and IT-specialists [6]. It should be noted that the ease of use and understandability of state and municipal portals have a positive effect on the satisfaction of users of e-government [7].

It should be noted that these issues are not related to the spread of personal computers among the population and access to the Internet and depend directly on state and municipal structures.

To date, 69.6% of respondents out of those who do not use the advantages of e-government highlight the desire for a personal visit and personal contact with the authorities. These respondents represent potential for e-government development.

Discussion

The study showed that the target indicators of the state program "Information Society" for 2017 are being fulfilled, however, indicators of 2020, before which the program is designed, are of interest. In order to analyze the implementation of the state program in 2020, we conducted a forecast of the main indicators studied in the work, their development prospects. To build a trend line, a logarithmic approximation was chosen as a more "pessimistic" scenario of the development of indicator values.

Figure 2 presents indicators characterizing households: "Personal computers", "Access to the Internet", "including broadband access". The magnitude of the accuracy of the approximation R^2 for these indicators is more than 93%.

Figure 3 shows an indicator characterizing public participation in e-government. The reliability value of the R^2 approximation - 84.4% is due to the sharp increase in the share of the population receiving public services in electronic form in 2017 compared to 2016 (51.3% and 39.6%, respectively).

Figure 2 - *Prediction of changes in indicators characterizing the use of information technology by households*

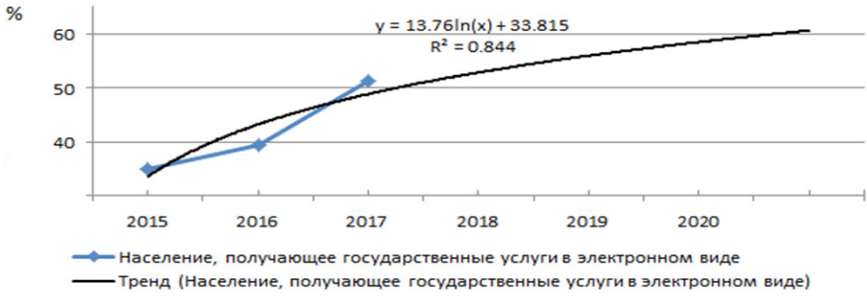


Figure 3 - *Prediction of changes in the indicator characterizing public participation in e-government*

By 2020, the state program "Information Society" predicts that not less than 95% of households in the country will have access to the Internet. At the same time, the share of citizens using the mechanism for obtaining state and municipal services in electronic form should be at least 70% [2].

The calculations show that by 2020 76.5% of households will have personal computers, 77% will have access to the Internet. Broadband access is projected for 74% of households. The share of the population of Russia, using the mechanism of obtaining state and municipal services in electronic form, is projected at 60%.

As you can see, our forecasts are somewhat more modest, but they can be adjusted if there is a more complete dynamic sample according to these indicators.

On the basis of the information obtained in the course of the study on the main problems facing the process of the formation of the information society in Russia, it is possible to formulate the main ways to solve them.

According to the authors, to improve the forecast and the current degree of development of information technologies, computers and communication networks and their use by people and organizations, as well as in order to realize the existing development potential, attention should be paid to the following provisions:

First, to revise the approaches to the organization of online services, involving work directly from personal computers. Develop online services that allow you to perform the same functions, but using mobile devices. This should contribute to the proliferation of the use of mobile devices to access the "Internet" and lure more people to work with e-government.

Secondly, to popularize the possibilities of the information society, the prospects for citizens from its full implementation in order to reduce the number of skeptical against modern information technologies of the population.

Thirdly, for all existing online services to improve the level of technical support. To create round-the-clock call-centers in order to ensure that even the simplest question a user can always get a detailed and understandable answer.

Conclusion

Thus, the study presented an assessment of the use of information and communication technologies by the population of Russia, as well as a forecast of the development of the main indicators studied for the period of the state program "Information Society". The forecast showed that the development of some parameters does not correspond to the declared plans of the state program. Based on the above forecast, the authors formulated recommendations for increasing the scale of development of information technology, computers and communication networks in Russia.

The results can be useful in the development of activities aimed at the further development of information and communication technologies and the involvement of the population in the use of new forms of interaction.

We hope that this publication will be useful and interesting for government decision makers, sociologists, economists, researchers, teachers and students who are all interested in the development and development of the information society in Russia.

References

1. Global Competitiveness Index [Electronic resource]: http://reports.weforum.org/global-competitiveness-index-2017-2018/competitiveness-rankings/ (appeal date 06.02.2019).

2. Resolution of the Government of the Russian Federation of April 15, 2014 N 313 "On approval of the state program of the Russian Federation" Information Society (2011 - 2020) "[Electronic resource]: http://ivo.garant.ru/#/document/70644220 (appeal date 06.02.2019).

3. Selective federal statistical observation on the use of information technologies by the population and information and telecommunication networks [Electronic resource]: http://www.gks.ru/free_doc/new_site/business/it/fed_nabl-croc/index.html (appeal date February 6, 2019).

4. The Information Society in the Russian Federation: a statistical compilation / K.E. Laykam, G.I. Abdrakhmanova, L.M. Gokhberg, O.Y. Dudorova, and others; Rosstat, Nat. researches University "Higher School of Economics". - Moscow: HSE, 2018.

5. Irkhin, Iu. V. "Electronic Government" and Society / Sociological Research. Mar/Apr2007, Vol. 46 Issue 2, p77-92. 16p. 1 Chart.

6. Marsden Chris How Law and Computer Science Can Work Together to Improve the Information Society: Seeking to remedy bad legislation with good science / Communications of the ACM. Jan2018, Vol. 61 Issue 1, p29-31. 3p. 1 Color Photograph.

7. Bernd W. Wirtz Local e-government and user satisfaction with city portals – the citizens' service preference perspective / International Review on Public and Nonprofit Marketing October 2016, Volume 13, Issue 3, pp 265–287

论自动信息系统在体育运动成绩监测中的应用
ON THE APPLICATION OF AUTOMATED INFORMATION SYSTEMS FOR MONITORING SPORTS RESULTS IN MASS SPORTS

Chirkova Lidiya Nikolaevna
Candidate of Pedagogical Sciences, Associate Professor, master student
Northern (Arctic) Federal University Lomonosov

注解。 文章显示了开发信息和分析系统（IAS）的必要性，该系统允许收集，存储，分析参与群众体育的每个团队成员的体育成就的发展结果，他们的准备程度。 IAS允许教练有效地管理培训过程，并对竞赛团队成员的选择做出客观决策。

关键词：自动信息与分析系统，体育与训练过程监控，电子运动员日记。

Annotation. *The article shows the need to develop an information and analytical system (IAS), which allows collecting, storing, analyzing the results of the development of sports achievements of each team member involved in mass sports, their level of preparedness. The IAS allows the coach to effectively manage the training process and make an objective decision on the selection of team members for competitions.*

Keywords: *automated information and analytical system, monitoring of the sports and training process, electronic athlete diary.*

The need to develop sports, including mass sport, is associated with the policies of the state, interested in maintaining the health of citizens against the background of environmental degradation and the development of physical inactivity in people whose work involves using a computer in their professional activities.

At the same time, information technologies provide tremendous opportunities for the development of various areas of human activity, including sports. It is known that the training of athletes occurs in conditions of tough competition. Trainers and mentors use traditional and innovative methods and technologies, including informational. In order to effectively manage the training process and make a decision on the selection of candidates for participation in competitions, the coach needs reliable information not only about the athlete's health status, but also about the results of the training process of each team member. Therefore, a

large role in the activities of the coach should be given to the use of modern hardware and software solutions to support the training process, designed to process a large number of data on the characteristics and characteristics of the development of each athlete.

In this connection, the developments of domestic scientists are relevant, in which the objects of research are:

- design processes of informational-analytical and factor methods for analyzing and processing personal data of athletes (E.A. Shirkovets, A.O. Kachaev, V.K. Balsevich and others);
- development of scientific and methodological support of the training process of athletes using digital platforms as platforms supporting "a set of automated processes and model consumption of digital products (services) by a significant number of consumers" (V.Ye. Zhabakov N.A. Shirokova, R.I. Bazhenov and others) [2];
- creation of automated systems and applied software products for monitoring and analyzing sports activities and optimizing the management of the training process for athletes (A.G. Katranov, A.V. Evtukh, V.N. Ryazanov, M.N. Umarov, etc.)
- processes for organizing automated monitoring and analysis of the physical development of athletes and methods for statistical processing of the results of sports activities (I.A. Veolin, G.V. Guriev, A.O. Kachaev, etc.).

These studies are consistent with the Strategy for the "Development of the Information Society in the Russian Federation for 2017-2030", which defines the goals, objectives and measures to implement the policy of the Russian Federation in the field of ICT applications, designed to develop the national digital economy. [3]

The Federal Law "On Physical Culture and Sport" notes the need to maintain a system for recording data on athletes who practice various sports in a physical education and sports organization [4]. The All-Russian Register of Sports Objects systematizes data on the number, purpose and condition of sports facilities located in Russia.

Much attention in the field of sports is paid to the use of ICT in the sport of higher achievements. For the preparation of the Olympic reserve, various simulators, accelerometers, magnetometers, heart rate monitors, smart sports equipment are being developed, information-analytical systems based on mobile devices are being created, "clothing" technologies are used, and much more. For example, sensors worn by an athlete monitor his every movement, speed, energy, and other characteristics during the entire workout. The software of the Omega-Sport complex has a real-time monitoring mode, a biofeedback mode, screening diagnostics, multi-channel ECG recording and more. These data are analyzed by trainers in order to identify the personal reserves of the athlete.

Analyzing the work of scientists in the application of information technology in various sports, it should be noted that among them there are no studies on analytical activities in mass sports using the electronic diary of a young athlete, although many companies in the IT market offer the latest developments. Among them, for example, Basis Peak, which allows you to determine the heart rate, pace, calories burned and time. At the end of the workout, the device generates a report on the bracelet screen or through an application available to owners of Android smartphones. It successfully provides the athlete with information on the development of individual biological characteristics.

Examples of such IAS are: international system of collecting and processing information “Biological passport of an athlete” [1], mobile application of remote monitoring of an athlete “Sport. Athlete Monitoring ”[5], computer program Sport 4.0, which allows you to plan and monitor the parameters of the loads, Statgraphics applied statistical package.

However, in NArFU named after MV Lomonosov in 2018 by a group of developers, which included E.V. Shirshov, M.I. Bocharov, K.V. Rochev, S.Yu. Belenko, N. Yu. Krasnyansky, L.N. Chirkova, developed an information-analytical system (IAS) "Electronic diary of an athlete-boxer" [5]. When the system was introduced into the training process at the cadet school, the reaction speed of the young boxers significantly improved. However, these IT solutions do not allow the coach to make an informed decision about the preparedness of the whole team for the competition.

Thus, there is a need to develop an information and analytical system that, based on the personal sports diaries of adolescents, will allow collecting, storing, analyzing the results of the development of athletic performance of the team as a whole.

To solve this problem, a draft information-analytical system for a football team coach has been proposed, the requirements for the system and its functions have been defined. The system allows you to automatically calculate the rating of each member of a sports club on the main indicators in this sport (for example, data on the effectiveness of participation in matches, psychological, strength, speed and other personality characteristics) in order to make an objective decision to include them in the team for more competitions high level

It is impossible to create such a system alone, therefore, to solve this problem, it is necessary to integrate the activities of programmers, analysts, trainers, mathematicians, biologists, teachers, technicians and other specialists.

The system also allows the coach to make management decisions about planning individual training loads without negative impact on health for each athlete, determine the roles of players on the field, taking into account their versatility and interchangeability, effectively organize the team's training process, which undoubtedly increases the team's performance in competitions.

References

1. Biological passport of the athlete (BPS) [Electronic resource] - URL: http:// rowingrussia.ru/wp-content/uploads/2016/09/biologicheskiy-pasport-sportsmena_1-1.pdf (revised: 07/15/2017).

2. Plenary session of the St. Petersburg International Economic Forum // President of Russia [Official Website]. 06/02/2017. URL: http://www.kremlin.ru/ events/p resident / news / 54667 (revised: 02/14/2017).

3. Program Development of the digital economy in Russia until 2035 [Electronic resource] - URL:: http://spkurdyumov.ru/uploads/2017/05/strategy.pdf (revised: 07/12/2018).

4. Federal Law "On Physical Culture and Sport in the Russian Federation" of 12/04/2007 N 329-ФЗ (last edition) [Electronic resource] - URL: http://www.consultant.ru/document/cons_doc_LAW_73038/(revised: 03/04/2017).

5. Shirshov EV, Krasnyansky N. Designing an information-analytical system for monitoring the process of sports training for adolescents [Electronic resource] / E.V. Shirshov, N. Krasnyansky // In the collected papers: Topical Issues of Psychology, Pedagogy and Education, a collection of scientific papers on the basis of an international scientific-practical conference. 2017. P. 59-62 .: URL: https:// elibrary.ru/item.asp?id=2913785359-622017 (revised: 07/02/2017).

设计一个基于云服务进行教育和方法文档的系统
DESIGNING A SYSTEM FOR CONDUCTING EDUCATIONAL AND METHODICAL DOCUMENTATION BASED ON CLOUD SERVICE

Testova Irina Vyacheslavovna[1]
Astakhov Denis Yurevich[2]
Chirkova Lidiya Nikolaevna[3]
[1]Associate Professor at the Department of Applied Informatics and High Performance Computing, Candidate of Physical and Mathematical Sciences
[2]2nd year Master student of Higher School of Information Technology and Automated Systems, major "Applied Mathematics and Computer Science", master program "High-performance and cloud computing"
[3]1st year master student, major "Applied Informatics"
Northern (Arctic) Federal University Lomonosov
Arkhangelsk, Russia

关键词：云服务，UMD（教育和有条理的文档），UMKD（学科的教育方法复杂），RP（教育计划），FOS（评估工具基金）。

Keywords: *cloud service, UMD (educational and methodical documentation), UMKD (educational methodical complex of disciplines), RP (educational program), FOS (fund of assessment tools).*

Today the issue of automating and informatization of workflows stands apart, because every day the information flow of data is constantly growing, and on this basis there is a need for searching and processing the necessary information using as little time as possible. In addition, the focus is on simplifying access to the requested data and using only not local drives, but also cloud storages to store the requested data, which allow storing data outside of your own personal computer. Higher education institutions have a need for the availability of structured data on educational documentation. This task is planned to be solved by introducing a cloud service into the educational process and create a developed database in it.

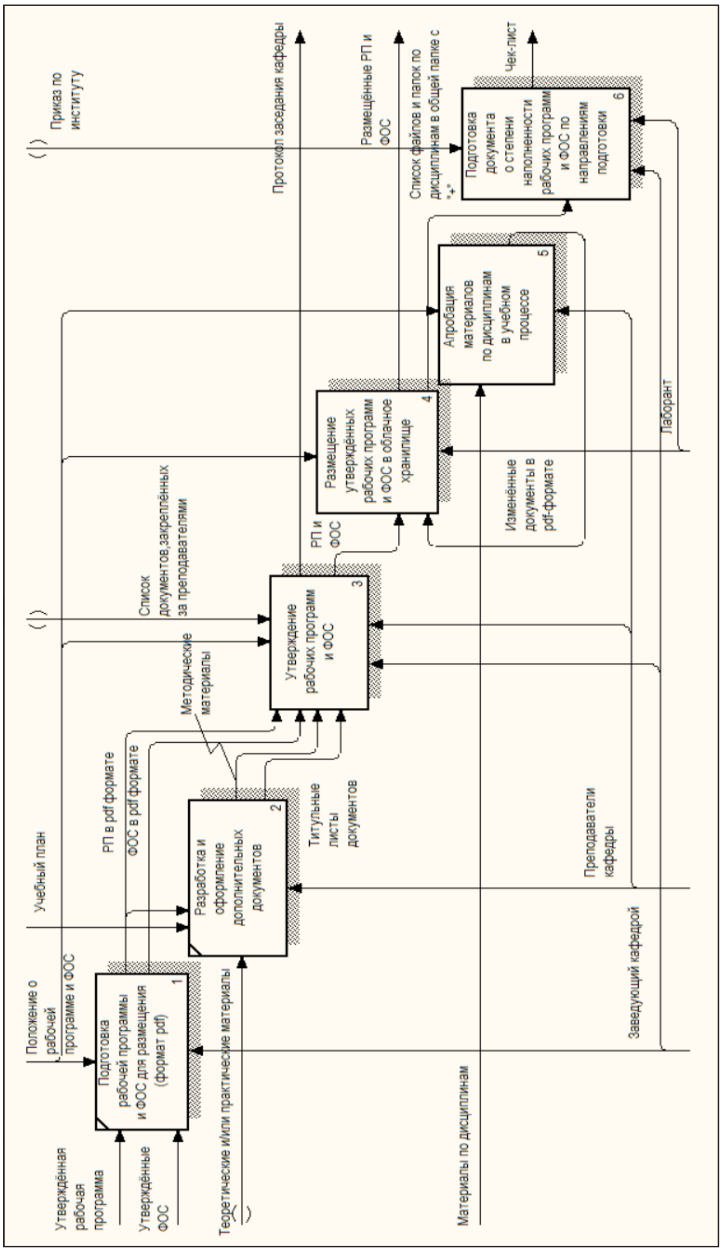
The relevance of the topic lies in the emergence of online educational programs, as a result of which there is a need to use a cloud service to organize access to the curricula of other universities. Access to educational and methodical docu-

mentation is supposed to be simplified due to the structuredness of the developed database. The essence of the work is to find ways to store information in the database of educational and methodological documentation using cloud data storage and the usage of cloud technologies in educational activities. The work consists in creating a system for working with a database on educational and methodical documentation and subsequent work of a database based on cloud storage. The hypothesis of the study is as follows: if you implement the introduction of cloud technologies in the process of storing and processing educational materials of the Department of Applied Mathematics and High Performance Computing, this will reduce the time spent by the teaching staff on finding the necessary educational materials and simplify the procedure determining the required information by partner universities. This paper proposes a detailed approach that provides the structuring of data on educational and methodological documentation and the interaction of elements in the system. The purpose of the work is to develop a system for maintaining educational and methodological documentation based on cloud service.

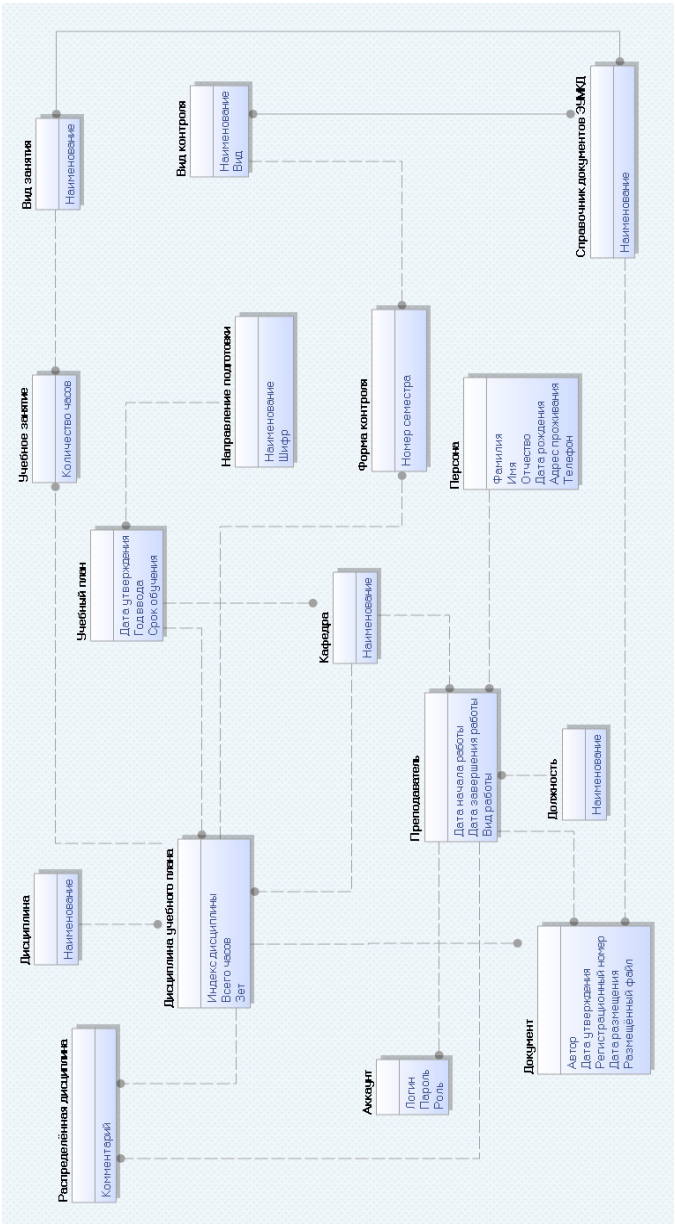
Currently, emphasis is made on the creation of international network educational programs with the aim of exchanging experience between students and teachers. Examples of such programs include the network program, which takes place as a result of the cooperation of universities in the Barents Euro-Arctic Region, which has been going for the past 25 years.

The essence of the implementation of cloud storage is to support and operate a database with information on educational and methodological documentation and organize access to this information not only for the faculty of the department of applied mathematics and computer science, but also for university staff participating in online student exchange educational programs and partnering with the Higher School of Information Technologies and Automated Systems . The practical significance is the usage of the system in higher education institutions for faculty members.

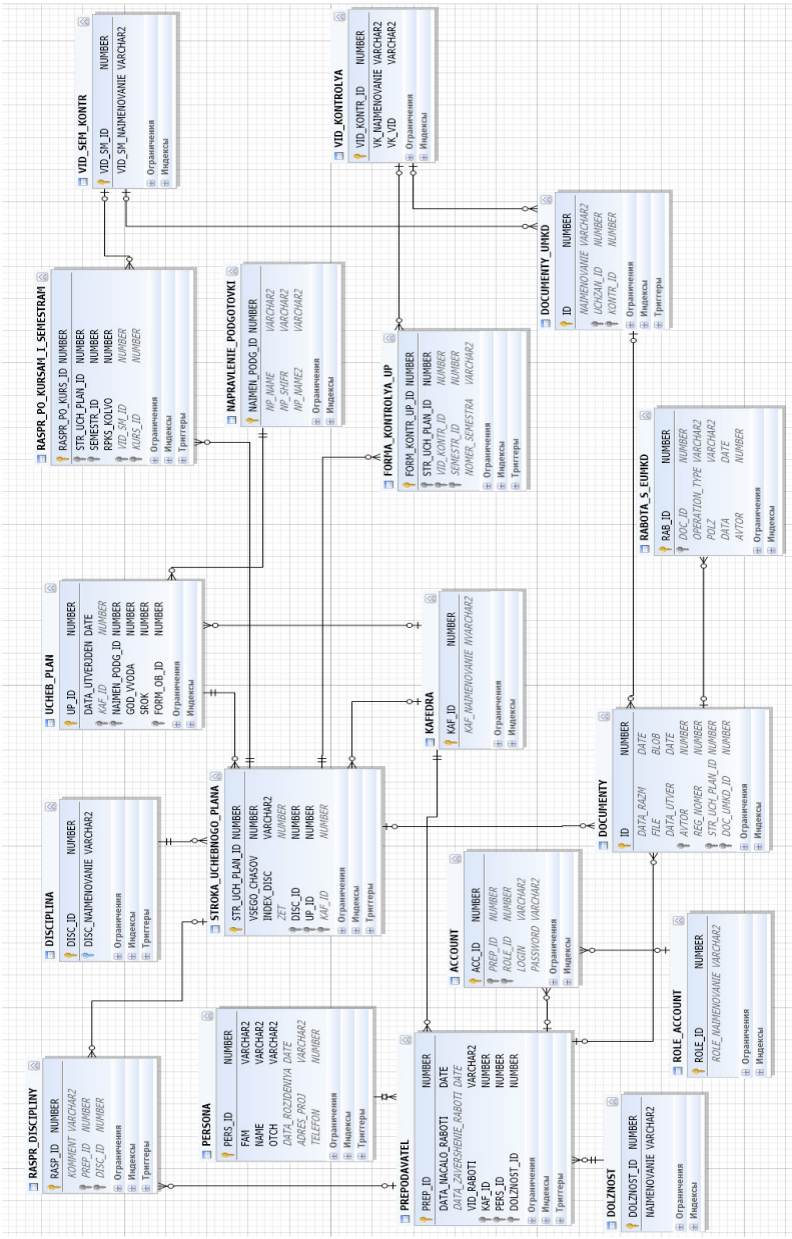
One of the main areas of work of the department is to ensure the educational process of educational and methodical documentation. The main purpose of creating an educational and methodical complex is to provide students with a complete set of teaching and learning materials for the independent study of the discipline. At the same time, in addition to direct training of students, the tasks of the teacher are: the provision of consulting services, the current and final assessment of knowledge, as well as the motivation for independent work. UMK of a discipline consists of basic documents, such as a title page and an approved work program of the discipline (module) and additional documents, such as basic test and measurement materials (control tests, topics of essay, abstracts, examinations, course projects, etc.), academic - methodical and informational support of the discipline (methodological development of a higher educational institution, Internet resources and other literature) and documents on methodological support (methodical recommendations for teachers on guidelines for students).



Decomposition diagram of business processes of the department for work with educational and methodical documentation



Logical database model



Physical database model

The main input documents here are the approved work program, approved funds of assessment tools, theoretical and practical materials, as well as additional materials on disciplines. At the exit are the minutes of the meeting of the department, which indicates the distribution of disciplines among teachers of the department, posted work programs and FOS and checklist, resulting from the formation of the document on the completion of the RP and FOS in areas of preparation.

The logical model of the system was developed in the CASE tool for designing and documenting Erwin Data Modeler 9.7 databases. The following entities are used in the project: Discipline, Curriculum, Training Direction, Department, Teacher, Person, Position, Document, Distributed Discipline, Curriculum Discipline, Document Handbook EUMKD, Study Lesson, Type of Control, Form of Control, Type of Lesson, Account.

The main entities of this logical model are “Discipline of the curriculum”, “Curriculum”, “Document” and “Teacher”.

The physical model of the system was developed in the dbForge Studio for Oracle DBMS. The RABOTA_S_UMKD table reflects the main actions performed on documents, such as adding, editing and deleting.

Currently, as a tool for creating a database, the choice is on the Amazon Elastic Compute Cloud (Amazon EC2) computing cloud service, which provides secure scalable computing resources in the cloud. This choice is due to the fact that the tool named is the AWS Database Migration Service, which allows you to migrate quickly and safely databases to the AWS platform. The initial database during migration remains in a fully operational state, which is undoubtedly a big plus when choosing this option.

References

1. Federal Educational Standard of Higher education Applied Mathematics and Computer Science (Master's level) [Text]. – Intr. 2015-08-28.- M. : Ministry of Education and Science of the Russian Federation, 2015. – 21 p.

2. Kyte T. Oracle for professionals: architecture and programming techniques [Text] : teaching medium.;/Kyte T., Kun D. : Authorized translation from the English language edition . - M. : 3rd edition. OOO "I.D. Williams", 2016. - 960 p.

3. Tovma N.A. Ploshai A.G. H.A. Educational and methodological support for the educational process [Electronic resource]. / Tovma N.A. Ploshai A.G // – Access mode: http://www.konspekt.biz/index.php?text=56659, free (Revised: 10.02.2019). – The title from the screen.

4. Tatarintsev A.I. Electronic educational-methodical complex as a component of the information-educational environment of a pedagogical university [Text] // Theory and practice of education in the modern world: materials of the Intern. scientific conf. (St. Petersburg, February 2012). - SPb., 2012. - p. 367-370. [Electronic resource]. - Access mode: https://www.fundamental-research.ru/en/article/view?id=34052 (Revised: 10.02.2019)

5. AWS Database Migration Service [Electronic resource]. - Access mode: https://aws.amazon.com/ru/dms/, free (Revised: 10.02.2019). - Title from the screen.

UDC 547.917,547.824 :615.281

2,6-二苯基-3-异丙基-4-酮碳水化合物衍生物的生物活性的合成与预测

SYNTHESIS AND PREDICTION OF BIOLOGICAL ACTIVITY OF CARBOHYDRATE DERIVATIVES OF 2,6-DIPHENYL-3-ISOPROPYL-4-ONE

Ibragimova Aizada Almazbekovna
graduate student
Khaperskaya Lidia Stepanovna
Candidate of Chemical Sciences, Associate Professor
Sarymzakova Roza Kopbaevna
Doctor of Chemical Sciences, professor
Kyrgyz Republic, Kyrgyz National University named after J.Balasagyn

注解。寻找新的，更有效的药物仍然是现代化学的实际问题。结果发现，糖基化 - 向具有生物活性的片段结构中添加碳水化合物可以降低毒性，增加溶解度并扩大生物作用范围。 γ-哌啶酮的N-取代衍生物广泛用于医药中，并涉及一组重要的生物活性化合物。本文致力于基于N-糖基化反应合成哌啶衍生物。进行2,6-二苯基-3-异丙基哌啶-4-酮的合成，并基于该化合物合成哌啶酮的N-糖基化的N-取代衍生物。通过使用PASS程序，对所得化合物进行生物活性的预测。已经表明，这些化合物可以表现出抗肿瘤，免疫抑制，抗真菌，抗病毒和湿疹活性。

关键词：合成，γ-哌啶酮，碳水化合物，N-糖基化反应，计算机生物活性预测。

Annotation. *Search of new, more effective medicines remains to be an actual problem of modern chemistry. It was found, that glycosylation – the addition of carbohydrates to structure of fragment with biological activity allow to decrease toxicity, increase solubility and expand the range of biological action. N-substituted derivatives of γ-piperidones are widely used in medicine and relate to group of important biologically active compounds. This article is dedicated to synthesis of piperidine derivatives based on reaction of N-glycosylation. The synthesis of 2,6-diphenyl-3-isopropylpiperidin-4-on was carried out and, based on this compound, was synthesized N-glycosylated, N-substituted derivatives of piperidones. By using PASS-program the prediction of biological activity for obtained compounds was made. It was been shown that these compounds can demonstrate antitumor, immunosuppressive, antifungal, antiviral and eczema activities.*

Keywords*: synthesis , γ-piperidones, carbohydrates, reaction of N-glycosylation, computer prediction of biological activity.*

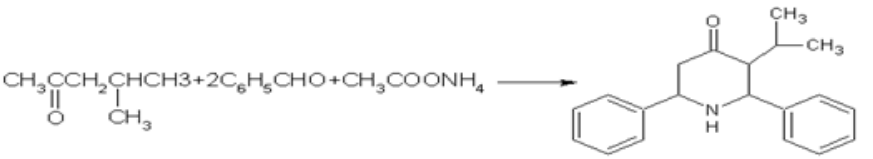
Currently, the scientific direction on the structural - chemical modification of physiologically active compounds based on carbohydrates continues to actively develop. The introduction of carbohydrates into the structure of biologically active compounds leads to a decrease in overall toxicity, an increase in water solubility and selectivity of action on the body. These circumstances allow us to recommend glycosylation — the binding of a physiologically active compound or its individual fragments of C_1 sugars — as one of the possible ways of synthesizing low-toxic drugs [1]. At the same time, it is known that heterocyclic compounds of the piperidine series are currently widely used in medicine, since possess a wide range of biological effects. In recent years, they have been used to treat diseases such as cancer and diabetes. In synthetic and applied terms, among the piperidine derivatives, gamma-piperidones are of the greatest importance, on the basis of which many effective drugs have been developed [2,3].

In the synthesis of urea sugars (N-glycosylation), two main approaches are used: direct interaction of carbohydrates with carbamides and their analogues under conditions of acid catalysis, interaction of acetyl-substituted N-glycosyl isocyanates with amines, or interaction of acetyl-substituted glycosylamines with arylisocyanates.

The first, direct path requires prolonged exposure of the reaction mixture at elevated temperatures. In crystalline form, the product was obtained only after enzymatic cleavage of unreacted glucose. In further work, the direct method was somewhat improved and extended to other mono- and disaccharides, but no fundamental changes were made to the synthesis method. The second method, the amination of glycosyliso (thio) cyanates, was proposed by E. Fisher. The method is widely used in the synthesis of glycoprotein analogues and pyrimidine nucleosides and heterocyclic carbohydrate derivatives [5].

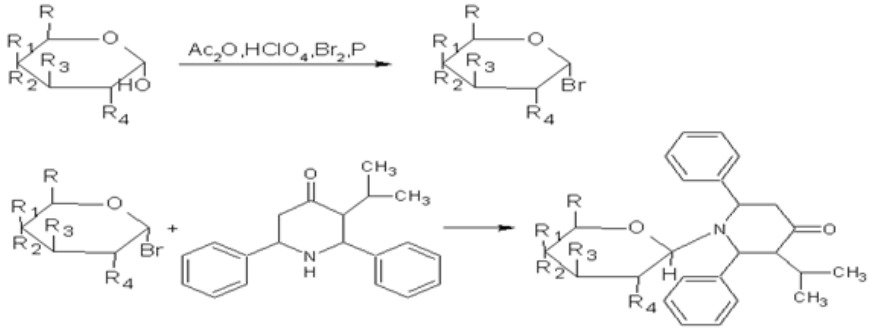
The purpose of this work is the development of preparative methods for the synthesis and study of the properties of glycosylated derivatives of N-substituted gamma piperidones. The synthesis of physiologically active compounds was carried out by introducing carbohydrate residues into their molecular structure at the expense of hydrolytically stable N-glycosylamide bonds. 2,6 - Diphenyl - 3 - isopropylpiperidine - 4 - one was synthesized and a glycosylation reaction based on it was carried out. As carbohydrates we used: from monosaccharides - glucose and mannose; disaccharides include maltose and lactose.

4 - methylpentanone –2, benzaldehyde and ammonium acetate were taken as starting compounds for the synthesis. Condensation of 4 – methylpentanone –2 with benzaldehyde and further cyclization with ammonia takes place with a slight resinification, as a result of which the yield of 2.6 – diphenyl – 3 – isopropylpiperidine – 4 – does not exceed 57% (synthesis scheme No. 1).

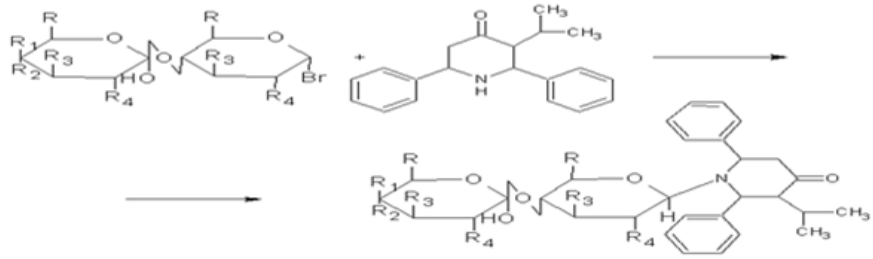


Scheme № 1. *Synthesis of 2,6 - diphenyl - 3 - isopropylpiperidine - 4 - one:*

The reaction of N glycosylation with the original ketone was carried out according to Scheme No. 2 (based on the monosaccharide) and Scheme No. 3 (based on the disaccharide).



Scheme №2. *Synthesis of glycosylated product based source ketone and glucose*



Scheme № 3. *Synthesis of glycosylated product based source ketone and lactose*

Materials and research methods

IR spectra were obtained on an IKS - 29 spectrophotometer, SpecordM - 80 with the SoftSpectra program. The melting temperature was measured on a Baetuis micro heating table. Control over the course of the reaction and the individuality of the substances was carried out by TLC on the plates "SilufolUV -254". The quantitative content of "C", "H", "N" in the products was determined by the methods of elemental analysis. Evaluation of the prediction of biological activity was determined by the PASS method (Prediction of Activity Spectrafor Substanas: Complex and Trainiy).

The results of the study and discussion of the results.

The reaction of the interaction of D glucosyl -, D mannosyl -, D lactosyl -, D maltosyl - glycopyranosyl bromides with 2,6 - diphenyl - 3 - isopropylpiperidine - 4 - one was studied. The reactions of interaction of the above - glycopyranosyl bromides with 2,6 - diphenyl - 3 - isopropylpiperidine - 4 - one lead to the formation of final products. Control over the course of the reaction was carried out by the method of thin-layer chromatography in the system: hexane: diethyl ether = 3: 1 (for monosaccharides) and (for disaccharides) chloroform: acetone: hexane = 10: 1: 2.

Under similar conditions, final products were obtained, the physicochemical characteristics of which are presented in Table 1.

Table № 1. *Physico - chemical characteristics of N glycosylated - N substituted gamma piperidone*

№	Compound Name and Gross Formula	Output %	T melting ^{0}C	Rf	Mol weight	Calculated / Found %		
						C	H	N
1	2,6-diphenyl-3-isopropyl-piperidine-4-one **$C_{20}H_{23}O_1N$**	57	119-121	0,83	293	82,05 / 81,93	7,81 / 7,56	4,78 / 4,04
2	1-β-N-2,6-diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,4^1,6^1$-tetra-O-acetyl-D – glucose **$C_{34}H_{41}O_{10}N$**	20	151-152	0,45	637	65.81 / 64,90	9,33 / 8,76	2,74 / 2,19
3	1-β-N-2,6-diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,6^1,2^2,3^2,4^2,6^2$-hepta-O-acetyl-D-lactose **$C_{47}H_{61}O_{18}N$**	10	168-169	0,60	869	85,92 / 85,13	9,33 / 9,04	2,74 / 2,19

To prove the structure of the synthesized substances, IR spectra were taken for both the initial heterocyclic ketone and the glycosylated reaction products.

IR spectrum: (KBr, v, cm-1) 2,6-diphenyl-3-isopropylpiperidin-4-one: 1698.1v (C = O), 3298.8v (NH), 1130.4v (CN), 2948.6v (CH). $\mathbf{C_{20}H_{23}O_1N}$

Mol. Weight = 293. Found:% N-4.04. Calculated:% C-82.05; % H-7.81; % N-4.78.

IR spectrum: (KBr, v, cm-1) 1-β-N-2,6-diphenyl-3-isopropyl-4-oxopiperidine-21,31,41,61-

tetra-O-acetyl-D-glucose: 1742.4v (C = O), 1666.7b (C = O), 1096.6v (C-O-C), 1261.9 v (O-Ac), 1030 , 3b, 719.7b (pyranotic ring), 1166.7v (C-N), 2922.4 v (CH). $\mathbf{C_{34}H_{41}O_{10}N.}$ Mol. Weight = 637. Found:% N-2.0. Calculated:% C-65.81; % H-6.58; % N-2.25.

IR spectrum: (KBr) 1-β-N-2,6-diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,6^1,2^2,3^2,4^2,6^2$- hepta -O- acetyl -D- lactose :1751,9 см-^{1} (C=O), 1099,7 см-^{1}(C-O-C), 1265,5 см-^{1}(O-Ac), 1040,8 и 724,7 см-^{1} (pyranose ring), 1174,5 (C-N) , 2931,4 см-^{1} (C-H). $\mathbf{C_{47}H_{61}O_{18}N}$

Mol. Weight = 869. Found:% N-2.19. Calculated: %C-85,92; %H-9,33; %N-2,74.

Recently, in the prediction of biological activity, mathematical methods and computer technologies have found increasing use for establishing the relationship between the structure of a substance and the manifestation of the biological activity of new synthesized substances [6, 7]. The PASS program allows, based on the structure of a compound, to quantify the likelihood of its activity of various types of biological activity [8,9]. Table 2 shows the calculation of the computer forecast of the biological activity of the synthesized compounds. For a more accurate comparison, the types of biological activity were taken the same.

Table № 2. *Computer prediction of the biological activity of N glycosylated - N substituted gamma piperidones*

№	Compound Name and Gross Formula	A %	B %	C %	D %	E %	F %	G %
1	2,6-diphenyl-3-isopropyl-piperidine-4-one **$C_{20}H_{23}O_1N$**	0,00	26,70	0,00	30,0	37,7	29,8	80,1
2	1-β-N-2,6- diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,4^1,6^1$- tetra-O-acetyl-D-Glucose **$C_{34}H_{41}O_{10}N$**	87,9	44,1	21,1	40,7	75,9	55,2	68,4
3	1-β-N-2,6- diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,6^1,2^2,3^2,4^2,6^2$- hepta-O-acetyl-D-lactose **$C_{47}H_{61}O_{18}N$**	85,9	37,6	17,4	31,0	70,7	44,0	60,0

where: **A** is anti-tumor activity, **B** is antimetastatic, **C** is anti-viral (hepatitis C) activity, **D** is antiviral (herpes), **E** is immunosuppressive activity, **F** is antifungal activity, **G** is anti-eczema activity.

CONCLUSION:

1. The development of a scientific direction in the field of bioorganic chemistry on the structural - chemical modification of physiologically active compounds by introducing carbohydrate residues into their molecular structure due to hydrolytically stable N - glycosylamide bonds continues.

2. Synthesized, previously unknown, four carbohydrate derivatives based on the starting ketone: 1-β-N-2,6-diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,4^1,6^1$-tetra-O-acetyl-D-glucose, 1-β-N-2,6-diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,4^1,6^1$-tetra-O-acetyl-D-mannose, 1-β -N-2,6-diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,6^1,2^2,3^2,4^2,6^2$- hepta-O-acetyl-D-lactose, 1-β-N-2,6-diphenyl-3-isopropyl-4-oxopiperidine $2^1,3^1,6^1$, $2^2,3^2,4^2,6^2$ - hepta-O-acetyl-D-maltose.

3. The structure of the substances obtained is established. The individuality of the new compounds has been proven by applying modern physicochemical research methods: IR - spectroscopy, elemental analysis, thin layer chromatography.

4. PASS programs show a remarkable prognostic ability. With the introduction of carbohydrate components, such activities as: antitumor, antimetastatic, immunosuppressant and antifungal activity increase, with a general decrease in toxicity. It is shown that these types of biological activity with the introduction of monosaccharides is higher than with the introduction of disaccharides.

References

1. L.S. Khaperskaya, J.M. Medetbekova, R.K. Sarymzakova. // Synthesis of new biologically active compounds based on N-substituted gamma piperidones. Successes of Modern Science. - 2016, –9, –p.38-42

2. A.A. Ibrahimova, J.M. Medetbekova, S, A. Adylov, L.S. Khaperskaya // Synthesis of N-benzyl-2,6-diphenyl-3-isopropylpiperidin-4-one and its derivatives. // Bulletin of the KNU. –2009. –Series 5, Issue 2. - p.64.

3. P.A. Gurevich, L.F.Satarova, B.P.Strunin. / / Introduction to the chemistry of biologically active compounds. – Kazan,: KSTU, - 2008, - P.15– 17

4. R.K.Sarymzakova, Yu.A. Abdurashitova, Zh.A. Jamanbayev. / / Ways to reduce toxicity and increase the selectivity of drugs. - Bulletin Mosk.gos.un –ta, Ser. Chemistry. –2006, - t.47, - №3, p 242-244.

5. Yu.A. Abdurashitova, J.A. Dzhamanbaev, R.K. Sarymzakova, V.S. Dermugin // Synthesis of carbamides of sugars. - Vestnik KNU.-2006.-Series 5, -Vyp.1- P.203.

6. Zh.A. Dzhamanbayev, B.K.Ernazarova. // Purposeful synthesis of carbohydrate-based biologically active compounds. Vestnik Zhagu.-Jalal-Abad, - 2002, - Ser. agrarian - biolog.nauki, №1, - p 81 - 84.

7. V.V. Poroikov. / / Computer prediction of the biological activity of substances: the limits of the possible. Chemistry in Russia. - 1999, - №2, - p.8 - 12.

8. RK Sarymzakov. // Correlation of the activity of N - derived glycosylthioureas with their structure by the methods of quantum chemistry. - Vestnik KazNU, - 2004, # 2, (34), - P. 73 - 77.

9. V.V. Poroikov, D.A. Filimonov, T.A.Gloriozova, A.A. Lagunin, D.S. Druzhilovsky, A.V. Stepanchikov. // Computer prediction of the biological activity of chemicals: virtual chemogenomics // Vestnik VOGiS. - 2009 - Volume 13, №1. - P.137–143.

科学出版物

上合组织国家的科学研究：协同和一体化

国际科学大会的材料

（2019年2月11-12日，中国北京）

编辑A.A.Siliverstova
校正A.I.尼古拉耶夫

2019年2月16日印刷版。格式60 x 84/ 16。
USL。沸点：98.7。 订单253.流通450份。

在编辑和出版中心印制
无限出版社


中央民族大学