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RESEARCH OF THE INFLUENCE OF INNOVATION AND INVESTMENT PROCESSES ON THE REPRODUCTION OF HUMAN RESOURCES: DIRECTIONS AND PRIORITIES IN NEW ECONOMY

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Abstract. *The purpose of the article is to determine the main and priority areas of research into the influence of modern innovation and investment processes on the reproduction of human resources in the new economy. In the works of foreign and Russian economists, starting from the 60s of the last century, this issue was raised and considered in a narrow aspect as an investment in the development of human capital. In this projection, the attention of economists was focused on a set of the most important aspects of financing a new quality of professional and qualification training of company employees, which was necessary to implement the ideas of the scientific and technological revolution of the post-war period and ensure a longer period of labor activity. The authors substantiate a broad approach to considering the impact of investment processes on the reproduction of human resources, which includes the role of innovation and investment processes at all stages of the reproduction of human potential. In this regard, research areas are highlighted that show the transformation of the social sphere, the content of labor, the structure of jobs as a material basis for the inclusion of an employee in the labor process, the sphere of consumption, the spatial boundaries of reproduction in the context of the contradictory unity of the processes of globalization and de-globalization, the foundations of state and corporate regulation. In the context of the COVID-19 pandemic, the priority for investing in the formation of human resources is the innovative sector of the non-financial economy, the previous and present development of which ensured the transition to new technologies and the prevention of global economic collapse.*

Keywords: *reproduction, human resources, human potential, new economy, investment, innovation sector, COVID-19 pandemic, communication technologies, non-financial sector*

Introduction

From the 60s of the last century to the present, for foreign and Russian economists, the problem of investment in the formation of human resources has been one of the central research topics. In the works of Western researchers (Schulz T.W. [1], Armstrong M. And Brown D. [2], Becker G. [3]) the provisions were proved that in modern society, the socio-economic form of human resources is human capital. Investments in its development are not expenses, but have the properties of investments and return with increased profitability for investors. The radical restructuring of the technical and technological foundations of society, which began in the 50-60s, required a new quality of vocational and qualification training of the younger generation and significant investments in obtaining higher and secondary specialized vocational education.

For households, investment in human capital provides potential access to high-paying jobs for the younger generation and a fairly quick return on these investments. Corporate investment in human capital is an essential part of corporate competitiveness strategies and employee loyalty programs.

In Russian studies, considerable attention is paid to the role of the state in the formation of a new quality of human resources through investments in education, health care, culture, sports and other social spheres. In the works of S. G. Erokhin [4], M. M. Kritsky [5], S. A. Kurgansky [6], human capital is considered as the main factor of the economic development of society in the post-industrial era, the need for state regulation of all stages of its the formation and justification of increasing investments in vocational education and health care of all participants in the innovation and investment process (households, corporations, the state).

Despite the widespread use of the concept of "capital", Russian authors to a lesser extent focus on the return on investment for households and the market nature of this category. In this regard, it should be noted that it is legitimate to state that a significant “array of economic knowledge, which was developed by the Russian economic community by the beginning of the XXI century, can be attributed to a specific form of knowledge - recombined knowledge, and it is the result of a peculiar combination of theoretical constructs of Western researchers of the market economy and modernized socio-economic theories, which bear the imprint of the previous stage in the development of domestic economic science and the achievements of institutionalists, including the "new" wave "[7, p. 113].

A brief analysis of the positions of foreign and Russian researchers showed a one-sided (narrow) approach to the issue of the influence of investment processes on the reproduction of human resources. An integrated (broad) approach is needed to determine the research directions for studying the role of modern innovation and investment processes on the reproduction of human resources in the new economy.

Purpose of the study

The purpose of the article is to determine the main and priority areas of research into the influence of modern innovation and investment processes on the reproduction of human resources in the new economy.

Materials and methods

Mainly theoretical research methods were used (analysis and synthesis, generalization, abstraction and concretization, induction and deduction; comparison), as well as empirical methods and statistical methods. The systematic approach ensured the complexity of considering the directions of the influence of innovation and innovation processes on the reproduction of human resources in the new economy.

A significant array of foreign and Russian economic literature, from the 60s of the last century to the present, devoted to the problem of reproduction of factors of production in the unity of all reproductive phases (formation, distribution, use) was studied.

Results and discussion

The emergence with different time lags of new elements of the economic system in various countries of the modern world leads to a profound transformation of reproduction processes. Let us highlight the following main directions of research into the influence of modern innovation and investment processes on the reproduction of human resources in the new economy:

First, the study of the content and consequences of the digital and functional transformation of the social sphere under the influence of investment investments, which are directed to the infrastructure of the social sphere. Technological innovations are qualitatively changing the technical and technological foundations of the functioning of social sectors and the form of providing social services. Currently, in many countries, including Russia, a transition is underway to the massive use of digital technologies and the release of the population from routine operations to receive social benefits, payments and other public goods. Thanks to digitalization during the COVID-19 pandemic, the social infrastructure in Russia has ensured an increase in the targeting and efficiency of the provision of social support measures at the federal, regional and municipal levels;

Secondly, the analysis of the transformation of the processes of creation and renewal of the structure of workplaces as a material basis for the inclusion of an employee in the labor process. Innovation and investment qualitatively change the relationship between jobs that were created on an industrial and post-industrial basis. During the COVID-19 pandemic, the process of virtualization of the workplace system accelerated, accompanied by the transition to remote forms of organizing the labor process and the widespread use of the platform economy [8]. In addition, the environmental factor affects the increasing role of environmental

investments, the rise in the cost of new jobs and the formation of a new composition, taking into account the organization of jobs that implement the ideas of transition to carbon neutrality;

Thirdly, the study of the transformation of the content of labor and the transition to the principles of organizing the production of Industry 4.0. The new technical and technological structure requires the dynamic development of the intellectual and productive and creative potential of a person who is included in the system of a socially oriented market economy as a decisive element of social reproduction and a leading factor in the economic growth of the new economy;

Fourth, the study of the transformation of the processes of formation of the ability to work and investment in the system of raising the professional and qualification level of human resources. A quick change in technical and technological solutions under the influence of innovation and investment processes devalues the previously acquired professional knowledge, skills, and abilities. The transition to the concept of lifelong learning reflects the requirements of Industry 4.0 and sets new challenges for the vocational education system in all countries of the world;

Fifth, analysis of the impact of innovation and investment on the processes of unification and standardization of the consumption fund. Under the influence of the processes of transnationalization of the production of consumer goods and their branding, the share of consumption of the products of transnational companies in the consumer markets of all countries is increasing. Taking into account the marketing and pricing policy formed by transnational manufacturers of consumer goods and services, in country markets, thanks to franchising and foreign investments, similar goods are sold and bought, which make up the consumption fund. Development and implementation of ideas for a shared consumption economy based on a platform economy;

Sixth, the study of the transformation of the labor market, which reflects the ongoing processes of transition from the protoglobal to the global labor market through the mechanisms of glocalization of reproductive relations. Currently, in the context of the contradictory unity of the processes of globalization and deglobalization, the spatial boundaries of the reproduction of human resources and labor markets are changing. Cross-border employment and mismatches in the space of the workplace and the location of the employee himself allow international companies to widely use the human resources of all national labor markets;

Seventh, the analysis of the processes of intensification of the primary and secondary (repeated) movement of human resources in the new economy, reflecting the qualitative changes in the content and methods of labor, geography and ways of using human resources at the level of the national and global economy. At present, under the influence of innovative investments in various spheres of labor and business activity, considered in a broad sense as the inclusion of a per-

son in routine or creative activities, the mobility of human resources in all country markets is increasing and the transition to a new model of the life cycle of the employed is being completed. ... The primary movement of human resources can be described as a movement through the stages “the formation of primary professional competencies in the areas of education - entry into the labor market (distribution) - inclusion in the production process (implementation of competencies)”. The secondary movement presupposes passing through the phases “release - professional retraining - re-inclusion in the production process (implementation of newly formed competencies;

Eighth, the analysis of changes in the configuration of social and labor relations and the growth in the number of self-employed and the part of human resources that do not present demand for jobs. Currently, the labor model of including human resources is losing its attractiveness for the younger generation in developed countries, including Russia. These processes lead to deficits in labor markets in developed countries and are the economic basis for the formation of migration policy in developed countries;

Ninth, study the transformation of corporate regulation in all aspects of staff recruitment and retention. Currently, the implementation of large investment projects by business requires the provision of highly qualified human resources. In this regard, corporate investment in the development of internal labor markets, the system of motivation and corporate training is increasing;

Tenth, the study of the modification of state regulation of the reproduction system of national economies, including the mechanisms of reproduction of human potential, changes in emphasis in the subject relations of the main agents of reproduction of human potential (household - firm - nation state - supranational bodies of regional economic associations). Since 2018, national projects and federal programs for the development of a number of key areas and sectors of the national economy have begun to actively move forward on the investment field of Russia. These projects can be considered as innovation and investment projects that have formed a project approach to state regulation of all phases of reproduction, including the reproduction of human resources.

In the context of the COVID-19 pandemic, the priority for investing in the formation of human resources is the innovative sector of the non-financial economy, the previous and current development of which ensured the transition to new technologies and the prevention of global economic collapse. In the Russian sector of the non-financial economy, over the past decades, the government invested heavily in the defense industry, which provided satisfaction in such a public good as the protection of the state. In addition, over the years, investment has been made in innovative industries such as communications networks, aircraft manufacturing, engine manufacturing, shipbuilding and other manufacturing-related industries.

Reforms in the direction of optimization of the Russian healthcare sectors, which began in 2011 with the implementation of the provisions of Law 326-ФЗ dated November 29, 2010 "On compulsory health insurance in the Russian Federation", showed the weaknesses of insurance medicine in general, and in a force majeure situation the COVID-19 pandemic, especially. Overcoming the risks of the functioning of the medical care system and adjusting the provisions of insurance medicine in the Russian Federation began in 2019 with the adoption of the concept "On the Strategy for the Development of Healthcare in the Russian Federation for the Period up to 2025" and the National Project "Health Care" for the period from 2019 to 2024. The implementation of these documents in full presupposes not only the priority of their financing, but also the allocation of additional human, informational and material resources.

Conclusion

The study of the influence of modern innovation and investment processes on the reproduction of human resources showed the need for an integrated approach to this issue, as well as the limited conclusions that follow from the interpretation of the concept of investing in human capital by Western and Russian economists. Without denying the theoretical and methodological resource of this concept, from the standpoint of the reproductive approach, at least several research areas should be distinguished. The analysis of each of the directions discussed above allows us to more deeply analyze the role of investment in the formation and development of human potential, and the conclusions obtained from the analysis can be used as the basis for the formation of a scientifically grounded economic state policy in the field of reproduction of human resources as the main factor in the economic progress of society.

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DEVELOPMENT OF INTELLECTUAL RESOURCES IN THE CONTEXT OF DIGITALIZATION OF EDUCATION OF THE NATIONAL ECONOMIC SYSTEM

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Annotation. *This article is devoted to the study of trends in modern forms of education in the conditions of digitalization of economic systems. The differences between e-learning and distance learning are emphasized. The basics of ensuring effective training of specialists and the development of their abilities are highlighted. The importance of the development of intellectual resources for the modern national economic system is emphasized.*

Keywords: *economic system, distance learning, e-learning, intellectual resources.*

Introduction

In modern conditions of digitalization of the world space, there is a rapid transformation of education, which develops the professional abilities of future specialists, their intellectual resources and, as a result, increases the efficiency of research and innovation activities of national economic systems. There is a tendency to blur the boundaries between the full-time format of knowledge acquisition and distance learning, which is mainly provided by the formation of educational digital platforms, professional mobility of teaching staff and universal access to Internet information resources.

The purpose of the study - is to identify current trends in the digital transformation of education of the national economic system as conditions for the development of intellectual resources.

Materials and methods general scientific research methods were used:

analysis, synthesis, deduction, induction

Results and discussion

More and more students, in the process of learning, resort to the help of Internet resources, where you can find almost any topic of interest, exploring a wide variety of educational literature, author's courses, and other sources. The "World Wide Web" makes it easier and reduces the time to search for information. Students of the XXI century are the information generation. The use of electronic textbooks, libraries, educational programs does not go beyond their usual lifestyle and is effectively integrated into the educational environment. Information and software helps all students to acquire knowledge, skills and abilities, and, thanks to this, move up the career ladder without interrupting the educational process. Distance and online education are processes of virtualization of society[1].

Professional mobility of the teaching staff is the ability of teachers to ensure the ability to quickly adjust the system of interaction with students. The increasing role of professional mobility of teachers is due to the need for almost simultaneous use of two forms of education in the educational process or operational integration: from distance learning to full-time and vice versa. In such conditions, there is a need to apply various methods, approaches to the organization of the educational process, differentiation of knowledge control tools, personalization of interaction with students, which is provided not only by experience and knowledge, but also by the ability to increase concentration of attention and its rapid switching, the ability to process an increasing amount of information, the ability to positively perceive changes.

It should be noted that currently in the scientific and applied environment, along with the concept of "distance learning", the concept of "e-learning" is used. Scientists and practitioners do not always share these definitions and use them as synonyms. A number of researchers define distance learning in a narrower format than e-learning, while others, on the contrary, define a more expanded content. Highlight the distinctive features of the two forms of education.

Specialists, most often, understand by e-Learning - training built using information and communication technologies[2]. For example, now an electronic course may include remote program launch or process simulation, so that the user learns to work with a list of available functions. Also, it can be a course with gamification elements that requires making certain decisions based on calculations.

The e-Learning course is based on the principle of asynchrony and takes place in a rhythm that is most convenient for the listener. Unlike standard training, where students have to adjust to schedules and regulations set by a teacher or institution, e-Learning courses can take place anywhere and at any time. Although learning in a free rhythm gives freedom, some teachers or organizations set deadlines for completing the course.

Distance education is a form of education in which knowledge is transmitted by a mentor or teacher at a distance. This format covers many different activities, ranging from support during training, ending with the delivery of educational material to students via online broadcasts or LMS platform.

Since distance education is remote, it can connect students to universities around the world, making it more accessible to students in different countries. In addition, this format of education is more affordable than full-time education, which is another factor that helps to make education cheaper for many students around the world. Also, the distance learning format significantly reduces the costs of educational institutions.

The study of the content of distance and electronic forms of education allowed us to identify their features (Table 1)

Table 1.

Features of distance and electronic forms of education

№ п/п	Criteria	Features of e-learning	Features of distance learning
1	Training base	Using web 2.0 services	Educational institution
2	Type of training	Asynchronous or mixed learning	Using web 2.0 services
3.	Standards	Unified international format of electronic courses SCORM or Tin Can	Synchronous or asynchronous learning
4.	Teacher participation	Absence of a teacher	Standards of the Ministry of Education

Source: compiled by the authors based on [3], [4];

Conclusion

Thus, we can say that distance education is a kind of form of learning, whereas e-learning is a technique. At the same time, the combination of distance education via the Internet and interactive multimedia e-learning formats turns a regular course into an effective way to gain new knowledge and skills.

The role of the teacher in the conditions of distance education is increasing, which is caused by the use of a mixed form of education.

The accessibility of a modern person to various forms of education in the conditions of digitalization of the national economic system contributes to increasing the opportunities for the development of the abilities of future specialists, the development of their intellectual resources and effective use in innovation activities in order to improve the quality of life of the country's population as a whole.

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RUSSIAN PIPE-ROLLING INDUSTRY IN THE FACE OF THE GLOBAL ENERGY CRISIS

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Abstract. *The article reveals the negative impact of sanctions, restrictions on the OPEC + deal and the COVID-19 pandemic both on the development of the world's industrial energy sectors and on the energy security of Russia. Based on the analysis of statistical data, the shock impact of numerous lockdowns associated with the spread of coronavirus infection and the volatility of oil prices on the operation of the pipe-rolling industry in the Russian Federation is discovered. The author proposes possible ways to overcome the crisis situation for the pipe industry, affecting the energy security of our state.*

Keywords: *pipe-rolling industry, OPEC +, COVID-19 pandemic, volatility of oil prices, energy security.*

Introduction

The global energy system is experiencing a major shock today, on the one hand vulnerable to the huge negative impact of sanctions and counter-sanctions, as well as to the impact of lockdowns associated with the COVID-19 pandemic, and on the other hand, the volatility of oil and gas prices. This shock obliges us to reflect on the correctness of the previous course towards globalization of the world economy, which had an extremely negative impact not only on the global development of the energy market, but also directly on the energy security of the Russian Federation.

The main exporting countries created the OPEC bloc (Organization of the Petroleum Exporting Countries) to stabilize world oil prices. The instrument for this stabilization is the distribution and control of extraction quotas of raw materials in these countries. In November 2016, OPEC extended its format for greater opportunities for market regulation, which was later called OPEC +. The Russian Federation became one of the newly joined countries, which allowed it to influence the stabilization of the world oil market. However, the energy market is still

volatile, as it depends on the volatility of oil prices due to many adverse factors, including lockdowns associated with the fast spread of the second wave of the COVID-19 pandemic.

Incoherence and contradictions between the OPEC+ countries lead to increased uncertainties and lower energy prices, for example, the disagreements that arose in March 2020 between Russia and Saudi Arabia.

The desire of the EU countries and the PRC to transit to renewable energy sources will be another of the key drivers of world energy development, capable of seriously changing the volume of international energy trade. In other words, the OPEC + countries must make the transition to a qualitatively new model of relations, which will take into account the interests of all market members, both exporting and importing countries of hydrocarbons.

Against the background of the rapidly developing deterioration of the global situation in the oil market, associated with the fourth wave of the spread of the COVID-19 pandemic, Saudi Arabia and other OPEC countries are considering the possibility of reducing oil production, which could lead to stabilization of prices in the “black gold” market. OPEC + deals extending should be the most important factor in supporting this sector.

It is necessary to realize opportunities for the progressive and innovative development of the world's industrial energy sectors to overcome the crisis in the oil market, which is dictated by today's numerous sanctions measures, as well as restrictions on the OPEC + deal and numerous lockdowns for the countries of suppliers and consumers of hydrocarbons caused by the COVID-19 pandemic.

The impact of the crisis on the energy security of the Russian Federation

The created conditions first make us think about abandoning the previous course, completely focused on the globalization of the world economy. They had an extremely negative effect on the energy security of our state and on the need to move from an exportable raw material to an innovative scenario of development in the domestic market for the Russian Federation.

This requires effective development of the petrochemical industry in Russia, aimed at achieving a high level of competitiveness of production through the synchronization of production, delivery and processing of raw materials while stimulating domestic demand for petrochemical products with high added value. Construction of new enterprises (clusters) that will be able to ensure the transition from the raw-materials export model of the development of the petrochemical industry to the resource and innovative one, which involves the production of high value added products along the entire technological chain from raw materials to finished products. In modern conditions, petrochemistry is one of the most innovative industries not only in the oil and gas complex, but also in the entire industrial

production. Almost all sectors of the economy consumed its products and they are an integral part of any modern society, acting as not only end-use goods, but also raw materials for further redistribution both within the petrochemical industry itself and in other sectors of the economy. Without these products, it is impossible to ensure not only energy, but also the country's defense security.

Analysis of the impact of sanctions, restrictions on the OPEC + deal and the COVID-19 pandemic on the pipe industry

Pipe-rolling enterprises are part of the structure of the industrial complex of Russia, are one of the basic sectors of the national economy. They are considered the foundation for generating innovative development of the country as a whole. And the economic stability of the industrial complex is due to the creation of an active part of fixed capital, the use of the latest technologies, methods of managing and management [1].

A distinctive feature of the Russian pipe-rolling industry is its particular importance for ensuring the functioning of the Fuel and Energy Complex of Russia. In turn, it was the first to bear all the negative impact of restrictions on the OPEC + deal and, as inevitability, the impact of lockdowns caused by repeated, ever-growing waves of the COVID-19 pandemic and ongoing promotional measures. Export business barriers have reduced the flow of investment for the fuel and energy complex and, accordingly, have an extremely negative impact on the financial activities of all its associated enterprises. So, one of the most important factors affecting the energy security of Russia is the effective interaction of the oil and pipe industries, the qualitative development of each of which is directly related to the determination of timely strategic guidelines for them and ensuring their support from the state. For example, for the pipe-rolling industry, the restriction of oil demand dictated by the OPEC + bloc and quarantine measures taken to prevent the spread of the fourth wave of the COVID-19 pandemic at the global level, affect the reduction of investments in the construction of new cross-boundary major pipelines, modernization of existing and etc.

Analysis of Russian customs statistics for 2018-2021 showed a decrease in the volume of foreign trade in goods of the pipe-rolling industry (the volumes of 2021 are taken for the first 3 quarters, the indicators will slightly increase by the end of the year) (Figure 1). This was due to the unfavorable economic situation in the world resulting from the COVID19 pandemic and the volatility of oil prices associated with restrictions on the OPEC + deal [2, 3].

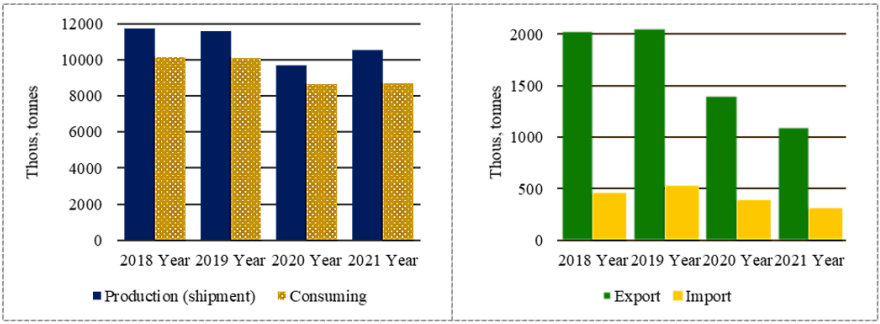

Figure 1. *Analysis of the Russian steel pipe market for 2018-2021*
Source: Drawn up by the author based on affiliated data [2, 3]

From the graphs (Figure 1), we can conclude that the share of exports for the pipe industry is 14%, imports - 4%.

The main external market for the pipe-rolling complex of the Russian Federation was the neighboring countries, such as Kazakhstan, Belarus and Uzbekistan. In 2020 and 2021, they accounted for about 75% of export sales. Until 2019, the United States was a major buyer of Russian pipe products, but then supplies to the American market dropped significantly due to the introduction of anti-dumping and countervailing duties on Russian products.

Seamless pipes occupy the most important place in Russian imports of pipe products. In 2020-2021, most of the purchases were for oil and gas production (OCTG) pipes and general-purpose seamless pipes, mainly used in mechanical engineering and consumer goods manufacturing.

Russian companies have managed to replace most of the imports of casing and oil and gas pipes by mastering the production of premium products for the production of hard-to-reach oil on the shelf and in the Far North. The share of imports remains quite high only in the drill pipe sector.

Three countries dominate among the suppliers of steel pipes to Russia - China, Kazakhstan and Belarus. In 2020-2021, they accounted for about 70% of imports. Companies such as Kazakhstan's "KSP Steel" and the Belarusian Metallurgical Plant (BMP) are traditional members in the Russian market.

In general, about 25% of Russian imports of steel pipes are high-quality products used in oil and gas production, mechanical engineering, and industrial equipment. Its suppliers, as a rule, were companies from developed countries of the European Union, North America, Japan and South Korea. In addition, imports continue to satisfy a significant part of Russian demand for stainless seamless and welded pipes.

However, it should be taken into account that a decrease in the turnover of pipe-rolling enterprises allows them to develop at the expense of the domestic market, in which there is a shortage of pipe-rolling products, which, in turn, will contribute to energy security and a positive economic situation in the country as a whole [4].

That is, against the backdrop of restrictions on the OPEC + deal and the COVID-19 pandemic in the global steel pipe market, there is a decline in its consumption and, although Russian pipe manufacturers export to more than 80 countries of the world. Most of the pipe production in the first three quarters of 2021 was sold on the domestic market. Moreover, significantly more than half of all shipments were made for the country's fuel and energy complex. (Figure 2)

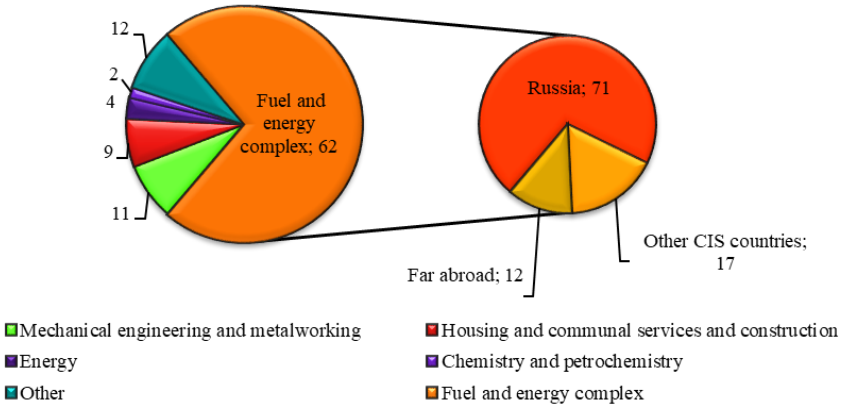

Figure 2. *Geography of sales and structure of shipment of pipe products by industry for the first three quarters of 2020*

Source: Drawn up by the author based on affiliated data [3]

But today the shock impact of the COVID-19 pandemic and the volatility of oil prices, creating a non-standard and difficult situation in all respects, which, of course, strongly influenced the work of the pipe-rolling industry in the Russian Federation, led to an overall decrease in the consumption of pipe products in the domestic market of Russia [5].

Already in 2020, Russian companies had to reduce oil production, fulfilling their obligations under the OPEC + agreement. As a result, according to FDPIR estimates, OCTG pipe consumption decreased by 6% compared to 2019. However, in the second half of 2020, oil production in Russia began to grow again, which allowed to expand the pipe market in 2021 (by approximately 3-4%). In

2021, the large-scale "Vostok Oil" project, which "Rosneft" began to implement in 2020, became an important source of growth.

The world situation is rapidly changing and it is no longer necessary to think with confidence about the prospect of selling pipe products in the direction of the European market. The European Union and almost all countries of the former socialist camp are making serious efforts to reduce dependence on oil and gas supplies from Russia, promoting a policy of supporting renewable energy, primarily wind and solar. Our state now needs to choose other benchmarks for the development of its national fuel and energy pipeline network.

This requires effective development of the petrochemical industry in Russia, aimed at achieving a high level of competitiveness of production through the synchronization of production, delivery and processing of raw materials while stimulating domestic demand for petrochemical products with high added value. Construction of new enterprises (clusters) that will be able to ensure the transition from the raw-materials export model of development of the petrochemical industry to the resource and innovative one, which involves the production of high value added products along the entire technological chain from raw materials to finished products. In modern conditions, petrochemistry is one of the most innovative industries not only in the oil and gas complex, but also in the entire industrial production. Almost all sectors of the economy consumed its products. They are an integral part of any modern society, acting as not only end-use goods, but also raw materials for further redistribution both within the petrochemical industry itself and in other sectors of the economy. Without these products, it is impossible to ensure not only energy, but also the country's defense security [6].

Thus, under the influence of numerous sanctions measures, restrictions on the OPEC + deal and numerous lockdowns caused by the COVID-19 pandemic, the Russian pipe-rolling industry is fully experiencing negative impacts and, accordingly, an urgent urgent need to prevent their destructive consequences is ripe.

Possible ways to overcome the crisis for the pipe industry

As can be seen from the statistical analysis (Figure 1), the impact of restrictions on the OPEC + deal and the new spread of the COVID-19 pandemic lead to the destruction of foreign economic partnerships between states that export pipe products i.e. a break in the supply chain, both internal and external. The cut in external supplies is particularly painful. Unfortunately, there is no replacing them in the domestic market.

In the author's opinion, the Russian state should adopt an effective regulatory policy with regard to foreign economic activity aimed at creating favorable conditions for the favorable economic functioning of the Russian pipe-rolling industry. It is necessary for preventing this negative impact, on the basis of a deep dynamic analysis of the impact of the rapid spread of the pandemic, sanctions measures and

restrictions on the OPEC + deal on international economic relations.

The next devastating consequence for the pipe-rolling industry is the resulting decline in prices and energy consumption in the world market, which reduced the flow of investments in the industry and negatively affected the financial activities of enterprises. As a result, there are losses in tax payments, which negatively affects the budgetary funds of the Russian Federation.

The solution to this problem can be the adoption of systemic decisions by the state for the modernization of the Russian energy sector by moving away from the raw-materials model of development. In other words, there should be the implementation of projects for deep processing of oil and gas to obtain chemical and petrochemical products with high added value, which, in turn, will contribute to an increase in demand for Russian pipe products.

Historically, the outflow of capital is observed during any deep crisis and leads to the "flight" of capital to more developed economies. Today, the scale and impact of COVID-19 is even greater than the devastating impact of the 2008-2009 and 2014-2015 crises [7].

Therefore, against the background of the deepening financial crisis caused by numerous sanctions and the turbulence of the spread of the pandemic, measures to retain capital in Russia must be urgently taken into account. For example, deep processing of hydrocarbon resources within the country should be provided with state guarantees for the safety of long-term investments of investors in the oil and gas industry, as well as a decrease in the interest rate on loans, and the transformation of lending for business into an affordable source of investment. At the same time, the emphasis was placed on a clear relationship between the strategies for the development of the petrochemical industry and the Russian pipe-rolling industry. In the development strategy of the state, it is necessary to tighten control over illegal financial activities for the withdrawal abroad: to conduct constant financial monitoring of compliance with currency and customs legislation, as well as to strengthen the responsibility of the inspection authorities.

To solve this problem, it is necessary, first, to apply a clear scientific rationale for the restrictive measures applied in the future to contain and then suppress COVID-19, combining organizational and medical measures. That includes also the growth of scientific research and technologies related to health, the availability of services, additional government funding in the field of medical facilities, equipment, pharmaceuticals, online consultations on health issues in the fight against the epidemic, increasing the tough mobilization capabilities of the system as a whole and ensuring the highest level of safety for doctors involved in combating the pandemic. Knowledge exchange, determination of priorities for joint coordinated work of international health organizations with domestic research centers and medical authorities are also important.

Restrictions on the OPEC + deal and the spread of the COVID-19 pandemic are leading to an increase in high uncertainty in the consumption of pipe products associated with an aggressive price war, collapse of energy prices to a level at which budget revenues are practically zero. New projects become unprofitable, and existing ones work on edge of profitability. Increased risks in the financial market, the threat of a protracted recession makes it almost impossible to forecast demand and carry out planning for the next few years.

Therefore, it is necessary to plan at the state level the work of the sectors of the economy to prevent the crisis of overproduction. The need to introduce open tenders for the purchase of raw materials and equipment in order to eliminate the corruption component, which leads to unjustified overpricing.

All this speaks about the necessity of intensive development of the pipe-rolling industry with the use of the latest technologies and its reorientation to the domestic market to ensure the energy security of Russia, which poses serious challenges to the entire industrial complex of the state.

Conclusion

Overcoming the crisis that has arisen today in the field of Russia's energy security should be the subject of constant attention and requires an urgent start of action at all levels, starting with federal government bodies, government bodies of the constituent entities of the Russian Federation and ending with local government bodies.

Restrictions on the OPEC + deal and the spread of the COVID-19 pandemic require our state to consolidate all production, financial and political forces of the country to preserve not only energy, but also national and economic sovereignty of the state.

The crisis because of COVID-19 pandemic will be the deepest recession since the Great Depression of the 1930s. The world will never be the same. Moreover, our state must remember that all efforts will be in vain if the main thing is not put at the forefront - the health of people (labor resources).

Today's difficult time also poses serious challenges for the pipe rolling industry, since the production of pipe products manufactured with the intensive use of the latest technologies has two-way interaction with the successful development of the entire fuel and energy complex, mechanical engineering, construction and other sectors of the national economy. A clear balance of this relationship is a guarantee of achieving intensive economic growth and an overall improvement in the quality of life of the country's population. Consolidation of efforts is impossible without ensuring the planning of strategically important areas at the state level. For this, the Government of the Russian Federation should use all the resources that it has aimed at the development and effective functioning of enterprises: improving the regulatory legal framework, relations between business and

government, monitoring, control, financing, coordinating development strategies and programs, preferential taxation, etc.

The time has come for urgent, radical and comprehensive decisions.

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STAGE-GATE TECHNOLOGY APPLYING TO A PRODUCT LIFECYCLE BUSINESS MODEL

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Abstract. *The active spread of the business model of the product life cycle in industry inevitably leads to the problem of project management efficiency in the framework of the new business model. The “Stage-Gate” technology is considered as one of the possible tools for managing such projects in the economy. The author examines in the article the possibilities of adapting and expanding this management technology, which is usually used when creating and bringing innovative products to the market, to solve project management problems in the life cycle business model.*

Keywords: *business model, product life cycle, stage-gate, management technologies.*

Introduction

Nowadays, an increasing number of industrial enterprises in Russia and the world are beginning to use the business model of the product life cycle in their activities, within which enterprises provide the consumer with a guarantee of the result. For example, they guaranteed aircraft performance for 9 thousand flight hours, or other performance indicators of the product. Since the business model of the life cycle is quite innovative, now there are no proven methods and technologies for the implementation and realization of this concept in economic activity.

At the same time, modern approaches to the management of complex office technical systems indicate that the implementation of the product life cycle concept requires the closest possible level of interaction between all contractors of industrial enterprises i.e. research institutes, design bureaus, factories, marketing and sales departments, and so on. It is also necessary to link all the business processes of the company in order to synchronize the various departments responsible for various stages and aspects related to the design, production and operation of the product. In addition, forms of visualization and monitoring of business pro-

cesses are necessary, by analogy to such management technologies as Stage-Gate, Toyota Production System and Lean Production [2, 3, 4], in order to ensure transparency in project implementation. As part of the study, the author presents the possibilities of adapting the Stage-Gate technology for its use as a project management tool in the life cycle business model.

The purpose of the research is to study the “Stage-Gate” technology and consider the possibilities of its use for project management in the business model of the product life cycle.

Scientific approaches and methods

The theoretical basis of the study was the scientific provisions and concepts of the life cycle of products, the theory of systems engineering, the theory of the life cycle of systems. The methods of system analysis and synthesis, design-analytical approach and technologies for analyzing business processes to achieve this goal were used.

Research results

Stage-Gate technology can be used (as if - "stage-gate", in Russia it is often translated as "method of control lines") in order to build links between all business processes within the business model of the product life cycle. This technology was developed by an expert in innovation management Robert J. Cooper at the end of the XX century and is described in the book "Winning at New Products: Creating Value Through Innovation" [2]. Initially, the Stage-Gate model was developed as a system of gates when creating and bringing innovative products to the market, when it is necessary to keep very tight control over a large investment project. In case of deviations from the original commercial, technological or production plans, it is necessary to be able to scuttle the project at any gate, in order to reduce potential losses from the project in the future. At the same time, as we pass the “gates” using Stage-Gate technology, the risks of the project should be reduced.

The implementation of the life cycle business model also implies a change in the product that enterprises sell beginning from a product in the form of a technical product ending with a product in the form of a guarantee of the result and normalized performance indicators. Therefore, a new type of product in the life cycle business model can also be considered as an innovative product. Accordingly, Stage-Gate technology can be a relevant tool for this kind of project.

The main idea of the Stage-Gate is that work is carried out on the product at each stage (stages). The gate (gates or milestones) act as cut-off criteria that allow you to check whether the necessary indicators have been achieved at the previous stage. If all the specified criteria for passing gate are successfully met, then gate is considered passed, and the project can proceed to the next stage. The number of such gates and milestones can be determined individually depending on the product and the enterprise, but the fundamental Stage-Gate model by Robert J. Cooper, described in his works, has 5 stages (Figure 1).

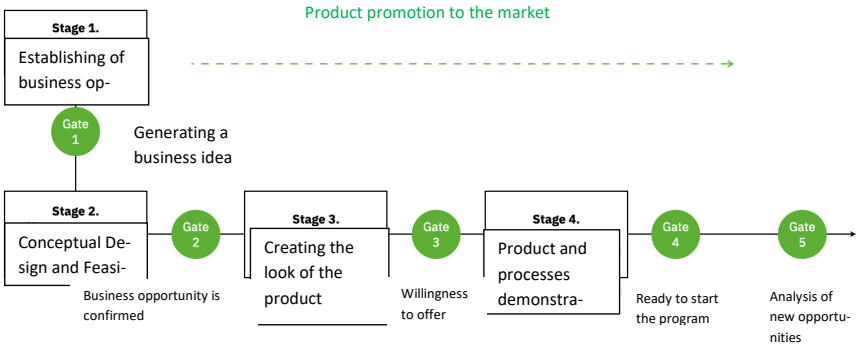

Figure 1. *Stage-Gate Technology (by Robert Cooper)*

Stage-Gate technology is used by many machine-building enterprises of the world: Boeing, Safran, Rolls-Royce, etc. [1] In Russia, this model began to be adapted and implemented by UEC, Russian Helicopters, Sukhoi Civil Aircraft, USC [5, 6, 7].

The idea behind Stage-Gate project management in a business model of product lifecycle is that the base Stage-Gate model can be expanded as many stages as needed in accordance with the particular product lifecycle. This will allow you to track all the necessary tasks within each stage throughout the entire product life cycle and make a decision on the further fate of the project in an iterative mode based on the fulfillment or non-fulfillment of the target technical characteristics and financial and economic indicators that were planned for each gate. The minimum required expansion of the basic Stage-Gate technology should include two additional stages: Stage 6. Product Operation and Stage 7. Decommissioning of Products (Figure 2). However, a specific enterprise implementing a business life cycle model can implement additional stages into the minimal model. For example, the Stage-Gate model has from 13 to 15 stages in selected projects in the shipbuilding and aircraft building industries.

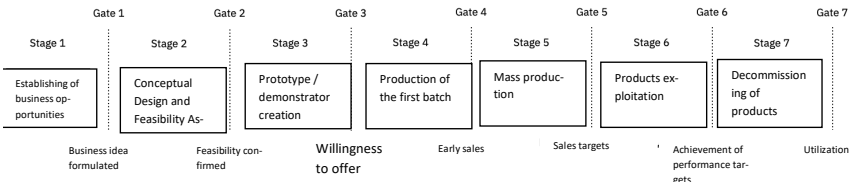

Figure 2. *Extended Stage-Gate model*

In addition, Stage-Gate can be integrated with classical approaches for describing corporate business processes (e.g. BMPN, ARIS, etc.) to form a product lifecycle management matrix in terms of stages (according to Stage-Gate), and in the context of the business processes of the enterprise.

Figure 3 shows a conceptual model for integrating Stage-Gate technology and decomposition of enterprise activities in the form of business processes:

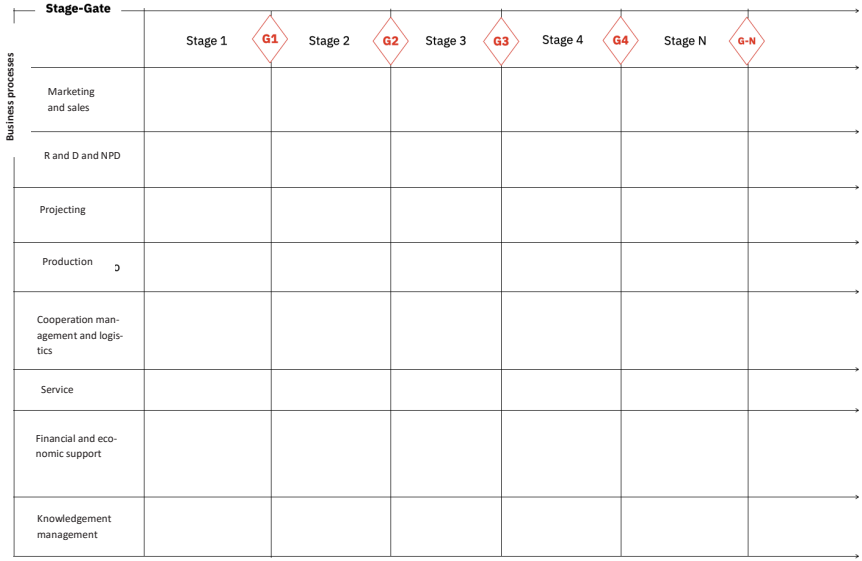

Figure 3. *Model of integration of Stage-Gate management technology and business processes of the enterprise*

The model is basic and universal. This means that it contains attributes that can be inherent in any of the engineering corporations. In the future, this model can be supplemented based on the specifics of the organization of work in a particular industry. For arranging work in the life cycle business model, the following 8 business processes are required at least (operational and strategic management processes are "taken out" outside this model):

1) marketing and sales;
2) research and development work;
3) design;
4) production;
5) cooperation management and logistics;
6) service maintenance;

7) financial and economic support.

8) knowledge management and staffing support.

The number of stages and gates should also be determined by each corporation independently, based on the duration of the product life cycle and the characteristics of the life cycle support. The overlapping of stage and business processes is necessary to fix specific project tasks at each stage of the life cycle and for each business process. By analyzing the position of the company's current products using this technology, the management of corporations will be able to launch steps to build a business model of the product life cycle. It can also gradually begin the process of building the entire necessary infrastructure for the implementation of this business model: a service system, a unified digital environment, new forms of contracting, etc.

In addition, such a decomposition of the matrix by stage-milestones and business processes makes it possible for the top management of the corporation to manage all key stages of the product life cycle. It also gives an opportunity to track the results of the enterprises' work on each gateway and timely carry out the check and the necessary adjustment to achieve the target indicators of the project, implemented according to the life cycle model.

Conclusion

The business model of the life cycle is currently an innovative and poorly studied, both in theoretical and practical terms, a tool for conducting commercial activities of enterprises. At the same time, already now, industrial enterprises need to implement this business model and carry out project management within the framework of the life cycle business model. Stage-Gate technology, designed to ensure the creation and launch of innovative products on the market, can become a tool for managing such projects. The foundations of this technology allow it to be scaled over the entire product life cycle and decomposed into key business processes of the company.

It should be noted that the presented model is a concept for project management within the business model of the product life cycle and does not describe the solution of possible problems of enterprises in the implementation of such projects. However, it allows you to structure the main tasks of project management within the framework of a new business model, as well as outline a further range of work, both in terms of research functions and in terms of applied management work.

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IMPLEMENTATION OF THE GOVERNMENTAL ECONOMIC POLICY FOR THE SETTING UP AND DEVELOPMENT OF THE INTEGRATION ASSOCIATIONS OF THE COUNTRIES WITH EMERGING MARKETS: PRINCIPALS AND MODELS

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Abstract. *The article has devoted to the setting up and development of the integration associations of the countries with emerging markets. The author has substantiated the groups of principles on which the state economic policy should be built for the setting up and development of the integration associations of the countries with emerging markets. The author has introduced the concepts of "productive" and "reproductive" model of state economic policy in order to set up and develop the integration associations of the countries with emerging markets. The article discusses the characteristic features and differences of these models. The author has concluded that the slowdown of the integration processes in the economic space of the countries with emerging markets is a consequence of the lack of a full-fledged theoretical and methodological concept of the formation of state economic policy for the setting up and development of the integration associations, which was shared by all participants in integration relations.*

Keywords: *state economic policy, integration associations, countries with emerging markets, Shanghai Cooperation Organization, regional economic integration, principles of implementation of state economic policy in the field of regional integration, models of implementation of state economic policy in the field of regional integration*

Introduction

Since the 2000s, the world economy has been developing under the conditions of simultaneous action of the vectors of globalization and regionalization, acquiring integrated features of global and regional economic interstate groupings[1].

The regional integration structures aim at the development of the world economic space and provide it new features. At present, it is legitimate to assert that

the world economy consists not so much of national-state economic systems, as of a set of integration economic structures of different levels of integration[2].

In the context of the strengthening of the interaction of economic and geopolitical processes at the national-state and global levels, the ability of countries to act independently of each other in the global economic space is being transformed. That fact has manifested during the pandemic KOVID-19 clearly. The aspirations of individual countries in integration groupings, such as the EU, to independently solve economic problems have failed and common coordinated solutions have been developed to eliminate economic risks and prevent a sharp economic downturn because of the pandemic.

In recent years, the growing economic strength of the emerging-market countries has increased the economic role of inter-State structures created by these countries with the participation of China and with the significant integration potential. Chinese and Russian researchers refer to such structures as Intergovernmental International Organization Shanghai Cooperation Organization (SCO) with a population of more than half of the world's population and the most capacious world market.

In the historical aspect, the priority of creating the SCO was to ensure the security and development of organization structure that could reflect the real threats to the internal and external stability of the SCO member countries. The crisis issues of the late 20th century and the beginning of the 21st century of Eurasia have shown that the political cooperation of the countries with emerging markets should have a stronger, namely, economic, basis[3,4].

The joint efforts of the countries with emerging markets in the field of security and close economic cooperation of this group of countries are two "wheels" that should ensure the progressive advancement of the SCO along the path of deepening interstate integration for the benefit of the prosperity of the peoples of these countries.

Now from economic point of view we position the SCO as a proto-integration structure with the significant integration potential. Further motivation for the development of the integration economic space of the SCO member states is due to the need for a more decisive transition to the formation of the elements of the economic integration as a factor of the economic security of the countries with emerging markets. At the same time, it is important for the SCO member states to maximize the geo-economics benefits of each country from participating in this structure in the face of tighter competition and strong confrontation through the “China-USA” line in the international arena.

At present despite the phased solution of the SCO targets announced in the "Development Strategy of the Shanghai Cooperation Organization until 2025”, it should be noted that there are signs characteristic of the specific situation of

the "institutional phase of stagnation" of SCO. Overcoming that situation and the inclusion of additional factors for the intensive development of integration economic processes urgently requires a conceptual justification of the principles, models and directions for the implementation of economic policies for setting up and development of integration associations of the countries with emerging markets. These elements of the economic policy of setting up and developing the integration associations of the countries with emerging markets should be considered not only in relation to the specific structure of the SCO, but also in a broader theoretical plan. Their implementation is necessary for the development of the integration structures of countries with emerging markets in the present and future.

Purpose of the study is to substantiate the principles and highlight the models of governmental economic policy for the setting up and development of the integration associations of the countries with emerging markets.

Materials and methods

In Russian science, the formation of the economic policy of states in relation to setting up and development of integration interstate associations is considered in the broad context of theoretical and methodological studies of the patterns of globalization of the world economy and its impact on the functioning of national-state economic systems [E.F.Avdokushin (2015), V.V. Perskaya (2016), Sizov (2015), Khasbulatov, R.I. (2019), Eskindarov, M.A. (2016)]. In-depth studies of integration economic interstate relations and their reflection in the economic policy (strategy) of states are conducted by I. V. Andronova (2019, 2015), E. Yu. Vinokurov (2017), S. Yu. Glazyev (2019), N. P. Gusakov (2019), A.M. Libman (2016, 2017), N. G. Shchegoleva (2019) N.V. Dyuzheva (2019), M.V. Ganeeva (2019). The content and main elements of the governmental economic policy are deeply justified in the works of Russian economists G. B. Kleiner (2019), M. A. Rybachuk (2019), O. S. Sukharev (2018, 2019), R. I. Khasbulatov (2016, 2019).

In Chinese studies, the political economic approach to integration issues and the role of economic policy in the development of regional national-state systems is implemented in the works Wang Hongyan (2012), Liang Shuanglu, Chen Xiaojun (2007), Jiang Wenxue (2009), Cao Jiyun, Tong Jiadong (2017), Qian Zongxin, Chu Qingqing, Wang Fan (2018), Zhou Sichang (2012),

Considerable attention of Chinese scientists is focused on determining the directions of China's economic policy in relation to the SCO and the prospects for the transformation of the SCO from a proto-integration to an integration economic association of countries with emerging markets, which has significant integration potential. Let us highlight the work Li Jinfeng (2019), Qi Zhenhong (2019), Sun Zhuangzhi (2018), and Guan Chuanjing (2020). In Chinese studies, the political economic approach to integration issues and the role of economic policy in the development of regional national-state systems is implemented in the works Wang

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The methodological basis of the research was theoretical research methods (scientific abstraction, analysis and synthesis, conceptualization, comparison, generalization, grouping). The systematic and logical-genetic approaches have provided a holistic view of the content and elements of the state economic policy for setting up and development of integration associations of countries with emerging markets.

Results and discussion

A scientifically based governmental economic policy for the setting up and development of the integration associations of the countries with emerging markets should be based on an integration project at the level of a national-state economic system. The implementation of the principles of the governmental economic policy in the field of institutionalization of integration relations is aimed at solving the most important problems facing each stage of the development of integration economic associations of countries with emerging markets[5]. These are, first of all, the tasks of deepening the economic cooperation of the entrepreneurial community within the integration associations (integration from below), creating a solid economic and legal basis for obtaining the integration benefit and leveling interstate contradictions during the period of aggravation of crisis phenomena, internal and external economic instability (integration from above).

The practical importance of highlighting the principles lies in creating a single foundation for conducting a joint economic policy within the framework of integration interstate associations as a result of agreeing on the goals, tasks, stages and tools for implementing the integration interstate project.

The cornerstone of this foundation is the scientific and conceptual principles that are implemented in the process of setting up and development of the integration economic space and its institutions, including integration institutions. The content of the group of scientifically based principles of economic policy for the creation and development of integration associations of countries with emerging markets is specified in the principles of consistency, integrity, complexity, rationality. These principles form the basis of the" Charter of the Shanghai Cooperation Organization» as a program document of the SCO, the provisions of which

form the content of the state policy of the SCO member states for the development of the common economic space.

Another group of the principles consists of the strategically oriented principles, in which the principle of long-term cooperation of the main economic agents in all areas of the integration policy of states with emerging markets plays a special role. At the same time, the principle of the strategic goal setting ensures that all countries participating in integration economic associations are united in interpreting the target settings of the integration project.

Based on the principle of priority, the participating countries determine and rank priority tasks to strengthen the competitive advantages of the regional economic association and the dynamic development of integration institutions at each stage of the implementation of the integration project. In addition, the governmental economic policy for the setting up and development of the integration associations of the countries with emerging markets is based on the principle of continuity, that allow each participant to pursue predictable economic policies with a clear goal.

The next group of principles on that the governmental economic policy for the setting up and development of the integration associations of the countries with emerging markets are value-oriented principles.

Their content determined by values that are shared by all states of the integration association (friendship and good-neighborliness equality, mutual assistance, respect for freedoms, good faith, mutual trust, etc.). This group of principles for the SCO member states defines the content of a specific integration institution, which is designated in the SCO documents as the "Shanghai spirit". In the conditions of significant differences in the economic strength of the SCO countries, the "Shanghai spirit" is a determining factor in the unity of the aspirations of the SCO countries, leveling objectively and subjectively emerging contradictions on the promising path of forming a single economic integration space.

The success of all integration interstate associations is ensured by a group of effective-oriented principles of economic policy of countries forming and developing integration institutions within the framework of these integration structures.

In this regard, the principles of efficiency and mutual benefit are aimed at realizing the socio-economic interests of all participants in integration relations[6].

The financial and economic program of business units incorporated in the countries participating in integration associations is always aimed at a dynamic growth of economic benefits and an increase in the level of return on capital. So, in the SCO there is an increase in mutually beneficial direct investment and the creation of enterprises with mixed country capital. At the same time, the provision of certain preferences to business units from the SCO countries has not yet been fully implemented, although it. As part of the efficient-oriented principles of economic

policy for the creation and development of integration associations of countries with developing markets, we highlight the principle of the supra-situationally. This principle, in contrast to adaptability, is actively implemented in the policy of Chinese state bodies regarding the interface of the proto-integration processes in the SCO and the "One Belt, One Road" project in order to form elements of a free flow of resources and overcome elements characteristic of the "institutional phase of stagnation" of the SCO.

In theoretical and practical aspects, the implementation of the principles of the governmental economic policy for the setting up and development of the integration associations of the countries with emerging markets requires from the countries participating in the integration processes a constant proactive position, flexibility, responsibility, openness, consistency in decision-making.

Analysis of theoretical provisions existing in the economic literature showed that mainly modern researchers have determined the models of state economic policy in the field of setting up and developing the integration associations, based on the stages of development of trade, economic, investment, industrial and foreign exchange relations (free trade zone, customs union, common market, monetary union).

This approach is certainly legitimate. In the same, it should be supplemented by the consideration of at least two other models of the governmental economic integration policy of the countries with emerging markets[7]. Such models include the productive model and the reproductive models of the governmental economic policy for the setting up and development of the integration associations of the countries with emerging markets.

The reproductive model of the governmental economic policy for the setting up and development of the integration associations of the countries with emerging is reproduced by the system of dependent on the most economically developed country and the dominance of this system of dependence in economic relations with the integration associations of developed countries. This model reflects the catch-up pattern of emerging-market economies and hampers the pace of the establishment of an integration space for emerging-market economies.

The productive model ensures the emergence of a new type of equal economic relations and the development of innovative mechanisms of state regulation of the common integration economic space. In other words, the productive model of state economic policy for the creation and development of integration associations of countries with emerging markets provides an innovative type of reproduce of countries with emerging markets.

Currently, the priority tasks of the SCO member countries are the gradual formation of a productive model and the suppression of processes that in practice lead to the reproduction of elements of the reproductive model of state integration

policy and increased dependence on the integration groupings of the developed countries (for example, the EU).

Conclusion

Currently, for various reasons, including increased geopolitical tensions and the situation of the spread of COVID-19, a certain slowdown in integration processes in emerging markets should be noted. In our opinion, among the reasons for such a slowdown, one of the main reasons is the lack of a theoretical and methodological concept shared by all countries for the formation of a government economic policy for the creation and development of integration associations of countries with emerging markets. In this regard, the substantiation of the principles and the allocation of models of this type of state policy is aimed at accelerating integration processes in the SCO and BRICS member countries.

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OUTSOURCING AS A SOURCE OF IMPROVING THE QUALITY OF CUSTOMS SERVICES

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Abstract. *At present, in the work of Russian state bodies, much attention is paid to improving the quality of service provision: work is underway to regulate the actions of officials, determine the list of services provided by the authorities, and develop IT technologies. Minimizing costs for participants in foreign economic activity by developing automatic registration of declarations, automated issuance of declarations, taking measures to reduce the time of control by integrating software is one of the priorities in the work of customs authorities. At the same time, to date, issues with the conceptual apparatus have not been settled: the concept of customs services is absent, the concept of customs control is not included in the list of public services, the criteria for the quality of work of customs authorities in interaction with participants in foreign economic activity and persons crossing the border have not been determined. The criteria for the quality of services provided by the customs authorities, which allow participants in foreign economic activity to assess the quality of services, have not been defined. There is no trust in private business in using the business processes already created by the latter, in simplifying the implementation of government functions. As a result, it is not possible to improve the quality of service delivery when crossing the border by only one authority. The development of public-private partnerships is a prerequisite for improving the quality of services, infrastructure, and business processes. The article presents an analysis of the existing situation of outsourcing in the customs sphere and presents proposals for priority measures aimed at developing public-private partnerships in order to improve the quality of the work of a state body at a checkpoint in the context of creating a "client-oriented" customs.*

Keywords: *outsourcing, customs services, public-private partnership.*

The skyrocketing consumer demand is driving competition between organizations, the development of a "customer-centric" approach and new forms of interaction with customers. State bodies, ensuring the implementation of a large volume

of services, actually do not cope with maintaining their quality at the proper level in comparison with commercial structures. The lag in this direction in the context of digitalization and automation of processes in the economy is becoming one of the important strategic points in the need to optimize public administration, introduce new forms of interaction between the state and society. Outsourcing is becoming one of the modern and relevant forms of interaction between the state and society.

It should be noted that the introduction of outsourcing was assumed in accordance with the Concept of Administrative Reform in the Russian Federation in 2006-2010 [1]. Within the framework of this direction, the following tasks were set: development of criteria for identifying administrative and managerial processes subject to outsourcing, creation of a list of functions and activities not subject to outsourcing; development of procedures and mechanisms for monitoring the effectiveness of outsourcing and monitoring the fulfillment of contract terms; development and implementation of mechanisms stimulating government bodies to carry out outsourcing; conducting experiments and pilot projects on the application of principles and technologies of outsourcing of administrative and management processes; introduction of principles and technologies for outsourcing administrative and managerial processes in federal executive bodies and executive bodies of the constituent entities of the Russian Federation. In a number of constituent entities of the Russian Federation, a number of legal acts have been adopted, within the framework of which the terminology of outsourcing is considered, the procedures for outsourcing of administrative and managerial and auxiliary activities of the executive bodies of state power, the procedure for the implementation by executive bodies of actions related to the acquisition on a contractual basis of the services of third-party organizations. to perform the functions required by the executive authority in connection with the implementation of the powers assigned to it, or in order to increase their effectiveness. Examples are the Resolution of the Cabinet of Ministers of the Chuvash Republic of March 16, 2007 № 45 "On the use of outsourcing by the executive authorities of the Chuvash Republic", Resolution of the Tambov Oblast Administration of July 12, 2007 № 775 "On the mechanism of outsourcing in the activities of the Oblast executive authorities"; Resolution of the Government of Leningrad Oblast dated February 27, 2010 № 43 "On approval of the procedure for the use of outsourcing in the executive authorities of Leningrad Oblast", Regulation of JSC Russian Railways dated April 27, 2006 № 530 "On the use of outsourcing by branches of JSC "Russian Railways". However, the provisions of the Concept were not fully implemented, the concept of outsourcing was not introduced into Russian legislation into the Civil Code of the Russian Federation and into the sphere of public administration. At the same time, outsourcing took its place in the service sector in the form of imposing on a

different organization of secondary operations for the purpose of ensuring its activities: accounting (maintaining financial statements, taxes, payments), logistics (transportation, storage), marketing (organizing and conducting promotions, the creation and maintenance of online resources)), the provision of cleaning services, the organization of work for the provision of personnel, including the work of a state body in ensuring its activities: cleaning, purchase and maintenance of equipment, etc. [2]. Thus, outsourcing began to be widely introduced not only in the economic sector, but also in the field of customs services.

In the field of customs services, an example of outsourcing is the interaction of participants in foreign economic activity with customs representatives, authorized economic operators, logistics companies, and storage companies. Enterprises cannot independently carry out customs declaration and resort to the services of customs brokers. [3, 4].

It is difficult to disagree with this statement, because such interaction really helps to reduce the burden on a participant in foreign economic activity. However, this interaction is within the G2G framework. Commercial organizations pursue the goal of increasing profits, and they are interested in increasing the attractiveness of their services, which in turn entails:

- the use of highly qualified employees;
- creation of a "client-oriented" approach to interaction with a client (struggle for the confidence of the client, the state, planning marketing activities, PR-support and other economic instruments for the development of the organization).

However, this type of outsourcing does not improve the quality of the work of the customs authority, does not simplify its work. In modern conditions, it is required to develop outsourcing on the part of government bodies and B2G business, as a private type of public-private partnership.

The customs sphere requires the organization of a whole system that will satisfy the needs of both participants in foreign economic activity (ease of use, security, the ability to exclude paper circulation of documents) and government bodies (to minimize the labor costs of customs officials, to ensure transparency of operations related to the movement of goods across the customs border for customs control purposes).

The format of outsourcing interaction between commercial entities is regulated in accordance with the civil legislation of the Russian Federation by such an agreement as the provision of compensated works and services.

The format for the implementation of interaction between the state and business proceeds in accordance with the Federal Law "On the contractual system in the field of procurement of goods, works, services to meet state and municipal needs" dated 05.04.2013 № 44-FZ in the form of a competition, auction, which in existing realities does not always bring positive results: large "rating" companies

are not always interested in interacting with the authorities (insufficient contract price, conditions, etc.) and as a result, applicants become persons who are actually not interested in increasing the quality of services provided by a state body, hanging their rating in the market. The main reason may be the obligation to accept work, and then fix the deficiencies. Also, at present, the organization of a competition to ensure its activities, including in the field of IT, is carried out by all bodies, which, as a result, may lead to the impossibility of combining the products of different departments into a single product or ensuring their mutual integration.

In this connection, the question arises: maybe the state should reconsider its views on public-private partnership? If so, what form of cooperation should be chosen in this case and how to determine: what to betray or not to choose and not to transfer at all?

Considering the foreign experience of providing state functions through another person, it should be noted, for example, the organization of the work of the Singapore customs (under the control of the state body, the company CrimsonLogic Pte Ltd., whose work is designed to simplify the procedures for the movement of goods across the border. CrimsonLogic Pte Ltd is the appointed administrator of TradeNet. It provides accounting and administrative services for agents and users of TradeNet, interaction in the seaport of Roterdam).

As presented above, these are all forms of public-private partnership interaction with elements of outsourcing not only in the field of IT technologies for the purposes of customs control. Therefore, it is not possible to improve the quality of work of only customs authorities and the quality of services provided by customs authorities at checkpoints, without uniting under one state body all persons interested in the process of moving goods across the customs border. The goal of government outsourcing is to use the capabilities of a third party to improve the quality of the government agency's work.

In this connection, I believe that in order to improve the quality of services, including customs, it is necessary to transfer powers to create conditions for the implementation of state control and supervisory functions of all departments at checkpoints to one person or several (for example, a holding company). This type of controlled outsourcing with elements of a concession agreement, lease, paid provision of services (for example, the use of the territory of a checkpoint adjacent, provided conditions are created for organizing and carrying out control and supervisory functions of state bodies). This will require the definition of a list of types of economic activities with fixed average market prices for the provision of services to participants in foreign economic activity (with the possibility of indexing in the prescribed manner), a clear definition of responsibility to participants in foreign economic activity and the state.

Evaluation criteria can be claims, statements, appeals of participants in foreign

economic activity and other persons about the work of the organization:

- the cost of losses incurred due to failure to provide a service (poor quality service (recoverable damage));
- cost of losses, violation of confidentiality of information;
- the number of complaints, applications that do not declare value claims;
- the number of violations of time intervals, laid down for the performance of operations;
- full staff;
- rating in the service market.

P = performance rating
D = contract value;
A = losses for non-performance of the service;
Q = improperly provided service;

$$P=D-(A*Q)$$

Also relevant is the issue of creating conditions for individuals to obtain accessible information on the movement of goods across the customs border.

According to a survey conducted by the Federal Customs Service of Russia in 2020 [5], the first place, in relation to the question of the most convenient methods for obtaining public services, is taken by oral advice:

– in 672 cases, preference is given to the public service received orally;

– in 233 cases, e-mail is indicated as the priority method for obtaining public services;

– in 39 cases, the convenience of obtaining public services in writing is indicated;

– in 24 cases, recipients indicated the possibility of obtaining public services through the website of the customs authority on the Internet;

–in 44 cases, the desire to receive a public service through the Unified Portal of State and Municipal Services is indicated.

With regard to satisfaction with the results of the public service provided, 830 recipients indicated that they were quite satisfied with these results (92.1% of the total number of responses), 69 recipients indicated that they were more likely to be satisfied with the results of the public service (7.6%), 2 recipients indicated that they were more likely to not satisfied with the results of the public service (0.3%), there are no recipients who indicated that they are completely dissatisfied with the results of the public service provided to them, 3 recipients did not provide an answer to the question raised.

Outsourcing could be a solution to this issue, for example, at air checkpoints.

At airports, when an individual goes through a large number of checks, is faced with queues for checking baggage, in front of the check-in counters, he needs an explanation of the procedure. Otherwise, as a result, the baggage containing the goods that must be declared is checked in. Identification of undeclared goods entails the removal of an individual from the flight, delay in the departure of the aircraft and bringing the person to administrative responsibility. Placing an organization near the check-in counters, in the airport hall, will reduce the number of violations, and direct communication with an authorized person will expand the circle of users due to the fact that the customs authorities, in accordance with the legislation of the Russian Federation, located at checkpoints, are not authorized to advising and informing people crossing the border. As a rule, in order to obtain advice on the procedure for moving goods, a person applies to the customs authority, which is not at the checkpoint.

Summing up, I think it is necessary to note that the development of outsourcing in the provision of services and between private companies is developing more rapidly than in the public sphere.

In order to implement the above initiatives, it is advisable at the level of the Government of the Russian Federation to adopt a normative act detailing the specifics of procedures in this area. An example is the Rules for outsourcing the functions of central executive bodies and the Methodology for selecting the functions of central executive bodies for transferring to a competitive environment existing in the Republic of Kazakhstan [6].

Outsourcing will allow a wider use of commercial management tools: to attract highly qualified personnel with certain skills, to allow the company to make a profit, which in turn will stimulate the company to be competitive, and to develop a “client-oriented” approach [7].

Interaction with business will also allow:

- relieve the state body;
- to unite the efforts of all state bodies involved in the registration of goods and vehicles, interested parties into a single mechanism aimed at;
- to optimize the work of state bodies;
- improve the quality of services;
- to reduce the costs of participants in foreign economic activity. This type of public-private partnership will allow:
- to interact with business for the purpose of identifying bottlenecks;
- improve the image of government agencies;
- to improve the infrastructure of checkpoints in the adjacent territory.

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PROTECTING THE RIGHTS OF CONVICTS IN FOREIGN COUNTRIES: THE CASE OF THE OMBUDSMAN FOR PRISONS AND PROBATION IN ENGLAND AND WALES

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Annotation. *The article examines the historical background of the appearance in the penitentiary system and the peculiarities of the functioning of the Ombudsman for Prisons and Probation in England and Wales. Using the example of the annual report for 2020/2021, the effectiveness of the human rights activities of this service is shown.*

Keywords*: foreign penitentiary systems, prisons, probation, protection of the rights of convicts, ombudsman.*

Today, when the issue of observance of the rights of convicts is especially acute in the Russian Federation, it seems interesting to consider the human rights experience of foreign countries, in particular the activities of the Ombudsman for prisons and probation in England and Wales.

The 1990 Prison Riot Report [1] led to the creation of an independent judicial body to deal with inmate complaints. The report cited the absence of an independent appellate body as one of the reasons for the violations and recommended that an independent arbitrator be appointed to deal with complaints from claimants who failed to obtain redress through the internal complaints system. The Office of the Ombudsman for Prisons was formally established in 1994.

In 2001, the powers of the Ombudsman were expanded to include complaints from persons under probation supervision. The office was renamed Ombudsman for Prisons and Probation to reflect this change. Another expansion of powers in 2006 included complaints from persons in immigration detention.

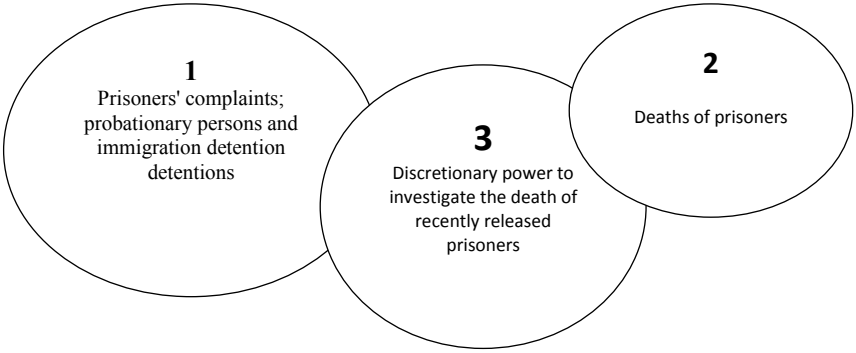
The function of investigating fatalities was introduced in 2004, adding to the powers of the Ombudsman the requirement to investigate all deaths in prisons; premises approved for probation; places of detention of immigrants and training centers. The Ombudsman also has the ability to conduct ad hoc inquiries upon request.

The Ombudsman for Prisons and Probation is appointed by the Minister of Justice and reports directly to him. The Ombudsman's Office is completely independent of other services, including Her Majesty's Prison and Probation Service, the National Probation Service of England and Wales, Community Rehabilitation Companies of England and Wales, Prisoner Escort Service, Home Office Immigration Service, Juvenile Justice Council of England and Wales and local governments. In addition, it is operationally independent from the Ministry of Justice, but financed by it.

The Prison and Probation Ombudsman investigates complaints from prisoners, including minors; detainees (prisons and safe training centers), probationers and immigration detainees (detainees). It investigates all deaths that occur among prisoners, detainees, detainees. The Ombudsman also investigates the deaths of recently released prisoners using his discretionary powers.

The purpose of these investigations is to understand what happened, correct the injustice and collect materials for the organizations that the ombudsman is monitoring to take appropriate action.

The terms of reference of the Ombudsman are reflected in the Terms of Reference [2]:



The so-called values of the Ombudsman are also indicated there:

- **Impartiality**: we don't take sides;
- **Respect**: we are considerate and polite;
- **Inclusiveness**: we value diversity;
- **Fairness**: We are honest and act in good faith.

Today, Sue McAlister holds the post of Ombudsman for Prisons and Probation (since October 15, 2018). This charming woman has a rich track record. She was Director General of the Northern Ireland Prison Service from 2012 to 2016 (first woman to hold this post). Prior to that, he was the head of Her Majesty Gartree's

prison and Her Majesty Only's prison. In 2017, she was awarded the Order of the Bath for her services to the Prison Service of Northern Ireland (a British order of knights founded by George I on May 18, 1725!). [3] In the 2020/2021 Prison and Probation Ombudsman's Report, she stressed: «We have become a more inclusive organization, still independent, but more confident that we can work together with other services to improve our performance». [4]

In 2020/21, 4,010 complaints were received by the Prisons and Probation Ombudsman Service (14% less than last year). Of them:

3722 were about prisons (646 less than last year);

282 - about the work of the probation service (12 less);

4 - on the work of immigration centers (19 less);

2 - for training centers (1 more).

The importance of the service in question is reflected in the figures for the costs allocated to the funding of the ombudsman service for prisons and probation:

In 2017/2018 - £5,395,000;

2018/2019 - £5,158,000;

2019/2020 - £5,507,000;

2020/2021 - £5,627,000.

In 2019. The Strategic Plan for 2019-2022 was published, in which the main strategic goal was proposed: «effective and independent investigations that help to carry out oversight safer and fairer». [5]

Another important document was posted on the Ombudsman's website on 19.10.2021. – «Action Plan for 2021/2022». [6] Based on the fundamental principles that he enshrined:

• Racial inequality manifests itself in everyday situations and behavior. These are not necessarily overt or isolated incidents.

• People from all ethnic groups can equally benefit from the opportunities presented to them.

• If we are to effectively tackle racial inequalities, we need to achieve lasting organizational culture change.

• Black, Asian and ethnic minority personnel are not a homogeneous group. People from different ethnic backgrounds have different experiences and these complexities need to be considered.

• All people have multiple identities, and their overlap should be taken into account whenever possible.

This document is, in fact, a plan to ensure equal rights for racial and ethnic minorities and to eradicate racial inequality.

The effectiveness of the ombudsman for prisons and probation can hardly be judged by the pessimistic conclusion of the annual report: «Our research makes it possible to reveal the true causes of what happened and correct injustice. Our

recommendations allow us to determine further actions for organizations, including sometimes at the state level. Unfortunately, we continue to identify recurring problems and make the same recommendations, sometimes in the same establishments». [4]

I would like to believe that an independent appellate body in England is a reliable guarantor of the protection of the violated rights of convicts.

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INTERNATIONAL RESPONSIBILITY ISSUES IN WTO LAW

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Annotation. *Today, for the institution of international law, the following perception of responsibility is considered ingrained: it is understood as a complex of legal consequences with a negative character, which are the result of offenses by subjects of international law.*

It is important to note that with the formation and modernization of the international law, the imperative concept inherent in the content, features, and also in volume has passed a large-scale stage of evolution on a par with international law.

As for the concept of the WTO, here we are talking about an international organization that was created to solve trade problematic issues in accordance with the agreement of the developed largest trading countries around the world to minimize import and export barriers. The commencement of this World Trade Organization is January 1, 1995.

Thus, we can say that absolutely all typical concepts, principles, approaches and patterns that are specific to universal international responsibility are admissible in responsibility in WTO law. And also through the application of responsibility in this law, it is advisable to say that she is the founder of something special and extraordinary in the general law of international responsibility.

Keywords: *international law, WTO law, responsibility, violation of rights, World Trade Organization.*

A necessary and unique basis for international responsibility in general international law is the internationally wrongful act. This means, on the one hand, that international responsibility arises only for the commission of such an act, on the other hand, that any internationally wrongful act of a State entails its international responsibility.

The implementation of the various nature of international illegal actions or inaction by the participants of international law as a result definitely entails international responsibility - this is what Professor Anatoly Yakovlevich Kapustin

says in his not little-known scientific work.

Consequently, the occurrence of legal consequences will be an integral part of illegal acts. Primarily in Russian international legal science, the problematic issue related to the establishment of the content, as well as the nature of such legal phenomena, was interpreted as a form or type of international responsibility of many states.

G. Grotius understood offense as «any guilt, consisting both in action and in refusal to act, in addition to how people should act as a whole or in accordance with a certain position." By virtue of such guilt, a natural obligation arises in the presence of damage, namely compensation for damage».

As the great specialist in the field of international law Lukashuk Igor Ivanovich notes in his work, the uncommonness and exclusivity of international legal responsibility, as well as the system of international law, predetermined the importance of the formation of such a branch of law as international responsibility.

It is important to draw your attention to the fact that the norms on responsibility, established by the European Commission in a global meaning for states, demonstrate the systematization and rooting of already existing norms that are typical for us. However, more detailed commenting and clarification of their provisions, as well as the introduction of special complementary elements, made it possible to modernize the previously established legislation into a newer and more pragmatic system of international responsibility.

The Russian specialist in international law Lyudmila Petrovna Anufrieva already points out that the epochal epochal original doctrine of international responsibility, which took root in international law at the end of the 19th century - the beginning of the 20th century, and the very one that is topical to this day, appears in the guise of a reparations concept.

At the present stage of development of foreign economic and political relations, the analysis of the structure of international responsibility for violation of WTO regulations demonstrates particular interest. First of all, it can be explained by the fact that responsibility is characterized by a specific legal community, which delimits the structure from the very model of general international law.

This kind of specificity can be justified by the fact that the dispute settlement system regulated in the WTO tries to concentrate the forces of the opposing sides most of all on the process of minimizing violations of the positions of the relevant WTO agreement. At the same time, the need for compensation for damage caused at the time of violation of the above agreement is not recognized.

The establishment at the international level of such an organization as the WTO has become a pretext for introducing certain and fundamental innovations into international relations.

I would like to draw your attention to the position of Salia M.R. - at the present

stage of development of international relations there is a systematic approach to the very understanding of what the concept of «WTO law» is. In accordance with it, this list of rights includes WTO internal and international law.

This entire spectrum of relations, which is regulated by the internal law of the WTO, in principle, has no direct connection with international trade relations. It should be said that it is only a provisional nature of the activities of this organization.

It is worth noting that the issue of regulating relations within the boundaries of the Agreement on the rules and procedures for resolving WTO disputes (hereinafter - Agreement) related to retaliatory measures during the period when the decisions of the WTO Sopor Settlement Body (hereinafter - SSB) are not being implemented is extremely relevant today.

The founders of this Agreement made a rather interesting proposal for the implementation of an inherently non-standard design. In turn, it did not regulate the concept of «compensation for damage», which was a consequence of the application by the offender state of the contested measure. That is, we are talking about the fact that the sanctions themselves simply could not be temporary.

As for the design, its main difference was the following list of elements:

- the sanction in relation to the offender is understood as a special last resort, which can only be resorted to by the applicant state in the form of suspension on its part of concessions or other obligations within the boundaries stipulated by the WTO agreement;

- all applied measures are obligatory only of a temporary nature until the moment when the SSB decision is executed by the violator;

- these measures must also be of equal value in comparison with the violation. In this case, both the level of equivalence and the form of the considered sanctions should be proposed by the applicant party. However, if a situation arises and the violating counterparty disagrees with this position, which is in principle specific to this situation, all parameters will be set by means of arbitration created for this purpose. As evidenced by Articles 22.6 and 22.7 of the above Agreement;

- in practice, it is even permissible to apply sanctions in such a form as suspension of a concession or other obligation under another WTO agreement - cross-retaliation. Although it should be remembered that this procedure is permissible in the case when the suspension in outside sectors within the boundaries specified in the same agreement is, in principle, ineffective or impossible, and the circumstances of the case are sufficiently solid and serious - Article 22.3 of the same Agreement;

- after the revealed equivalence of sanction and liability, the applicant is obliged to obtain permission from SSB and WTO for their use. Such consent may not be issued on their part, but this requires the consent of all WTO member states.

The applicant State is no exception. Although in practice this procedure is rather unrealistic and impractical.

In keeping with all of the above, SSB's consent to the application of sanctions should be interpreted as pseudo-automatic. Which, in principle, distinguishes the authorization mechanism in the WTO from the GATT.

I would like to note that for modern lawyers and lawyers of the Russian Federation, this is a new, not fully studied vector, thanks to which they will be able to modify their competencies and practice. In the near future, this kind of legal assistance will be especially in demand, since we see that international relations and their development do not stand still.

WTO law is based on general international law, perceiving and applying its principles and provisions based on attribution of conduct to a state and its classification as illegal. At the same time, one should not forget about the peculiarities of the WTO law - the regime of liability for an act that is not an offense, but endangers the stability of the multilateral trading system, the balance of concessions, advantages and benefits of a WTO member.

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MANAGEMENT POTENTIAL IN THE DEVELOPMENT OF EDUCATION ON MASTER'S DEGREE

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Abstract. *The article indicates the importance of the use of management resources in the development of master's education. The author's opinion is stated that higher education, perceiving the development trends of modern society, should become a dynamic, flexible, system open for inter-sectoral dialogue. An example is given that reflects the feasibility of building a master's degree, taking into account the active use of educational and professional management, as a new approach adapted to the conditions of a specific social sphere (in this presentation - the branches of physical culture and sports).*

Keywords: *higher education, Master's degree program, management, the branch of physical culture and sports, educational and professional management.*

Introduction

The theme of the development of modern education is becoming more controversial every year. Experts from one of the largest and most reputable Russian media holdings, RosBusinessConsulting (RBC), noted in a special issue devoted to the consideration of modern educational trends that education today is not just a request for new ways and topics in education, it is "a new goal-setting in human life" [7]. Amazing opportunities are provided to explore oneself, one's capabilities, desires, needs through education. Therefore, not only the state, social institutions, but also each individual person becomes the customer of education [7]. The reasons for this phenomenon lie in the specific features of modern society, its dynamism, the accelerated development of integrated sociocultural trends. In our opinion, higher education is especially sensitive to global social trends. This is due to the high academic level of the educational environment and the aspirations not only to reflect advanced trends, but also to form them.

The purpose of the study is to consider the relevance of adapting the principles and mechanisms of management, the effectiveness of which has been proven in other industries, to the conditions of the social and educational space of master's

degree programms.

Materials and research methods

The material presented in the publication is based on the data of many years of pedagogical research devoted to the optimization of the training of masters in the field of physical culture and sports. A range of the following methods was applied in the work: general scientific (analysis, synthesis, comparison, systematization); pedagogical (observation, conversation, pedagogical experiment), sociological (questioning, interviewing, content analysis), verification and prognostic (strategic and tactical planning, forecasting, expert assessments, project modeling), methods of mathematical statistics and computer data processing [3].

Research results and their discussion

It becomes obvious that it is necessary to change the attitude towards education management, strengthening traditional principles and approaches with new conceptual guidelines because the modern educational process turns out to be complex, multivariate, directly focused on the search for individual trajectories of self-development.

The world practice, created by the efforts of foreign and domestic researchers, has accumulated a serious scientifically grounded experience in optimizing the process of training qualified specialists by the active application of the principles and mechanisms of management in the social and educational space of higher education. Currently, the concept of "management" is actively used in the practice of various social sectors. This is due to the potential of effective methods, means that management possesses as a modern management theory. The theoretical resources of management, its practical capabilities allow achieving high results in organizational, managerial, analytical, design and other types of activities.

An analysis of the works of national authors regarding the development of management ideas in Russian education made it possible to reveal a certain specificity. The parallel use in the literature of the combinations "educational management", "pedagogical management", "management in education" [1,5,6]. We introduced an independent concept of "educational and professional management", based on the study of different points of view, taking into account the specifics of the chosen object of research i.e. master's training. The use of which in the practice of university and postgraduate training of specialists we regard as correct and appropriate. "Educational and professional management" is considered as a special direction of management activity associated with the optimization of educational resources (institution, organization, team) in order to enhance the professional interest of future specialists, improve the quality of their specialized industry training, stimulate the demand for qualifications in the modern labor market. Using this definition allows you to preserve the importance of interdisciplinary and intersectoral approaches in improving the preparation of future masters.

Based on the study of scientific and methodological literature, regulatory sources on the research problem, monitoring of the state of master's training in the field of physical culture and sports at the present stage, an innovative model of training master's degree students was created, based on the application of the approach of educational and professional management. The aim of the work was to create a real practice-oriented model, different from a separate theoretical project. We believe that the chosen approach made it possible to achieve two main goals of educational activities in master's programs at industrial universities. Firstly, to achieve personal satisfaction of master's students with educational activities during the period of study, and secondly, to contribute to the increase in the social significance of master's education in each specific university and in the system of higher education as a whole [4].

In accordance with the general concept of the study, the stages of the practical implementation of research plans for the creation of an innovative model were outlined: preliminary analytical, structural and conceptual, organizational and practical, evaluative and prognostic. Each of the above stages was associated with certain technologies, which made it possible to solve consistently the planned tasks and implement the overall work concept. The technologies provided for each stage are systematized and reflected in the table (Table 1).

Table 1.

Technologies corresponding to the stages of creating an innovative model for managing master's training

Stages of creating a master's training management model	**echnologies corresponding to stages**
Pre-analytical	Conversations, discussions, business consultations, pedagogical communication in the format of round tables, webinars, scientific and theoretical, scientific and practical conferences.
Structural and conceptual	Design, ranking, modeling, discussion of alternative options for the development of experimental situations, construction of research problems.
Organizational and practical	collective and interpersonal interaction; individual and group consultations; conferences; creative workshops; business trainings; participation in a social and educational project.
Evaluative and prognostic	discussion of goals, objectives and results of joint activities; planning possible prospects for the development of conceptual ideas; social forecasting; foresight.

Consideration of the direction and content of the listed activities deserves the topics of independent publications. In the format of this presentation, we consider it necessary to dwell on highlighting certain qualitative results achieved because of the work done.

In the course of the research, under the management supervision of the Department for Humanities of Smolensk State University (formerly Smolensk State Academy of Physical Culture, Sports and Tourism), a single master's social and educational space was created, through whose efforts the following were successfully implemented: the implementation of individual and collective professional and creative projects of master students aimed at popularizing social values in the sphere of physical culture and sports; publishing of articles, recommendations, manuals focused on optimizing the training of masters in the industry; conducting thematic discussion platforms related to the development of sectoral master's education.

Conclusion

The results of the study made it possible to confirm the working hypothesis, in accordance with which it was assumed that the approach of educational and professional management, used in the social and educational space of master's degrees in higher educational institutions of physical culture, allows them to qualitatively improve their activities. The conclusions drawn from the results of the work revealed the possibility of transferring theoretically grounded and practically tested research results to other social spheres and objects.

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CHILD AND PARENTAL CONFLICTS AND THE HELP OF SPECIALISTS IN RESOLVING THEM

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Annotation. *In the article, the authors share their experience in providing psychological and pedagogical assistance to parents (legal representatives) of children to resolve the problems of parent-child relationships that arise in the family.*

Keywords: *psychological and pedagogical assistance, relationships, parents, children, problems, disobedience, behavior, specialists.*

Parents often face the problem of «uncontrollable» behavior of a preschool child. What led to this behavior? How should an adult behave? Which response algorithm should you choose? The specialists of the Center for Parental Education, created on the basis of Child Development Center Kindergarten No. 7 «Ulybka» in Birsk, who provide psychological and pedagogical assistance within the framework of the project «Modern School» of National project «Education». These are experienced psychologists, social educators, educators.

Conflicts with parents are most frequent due to violation of the rules of conduct established in the family. This is «communication» with a TV, computer, telephone; non-observance of the regime moments; indiscipline; ignoring household chores. Children test their parental nerves for strength in public places, suggesting that in

the presence of other people the boundaries of what is permitted will be expanded.

An uncontrollable child does not obey the rules and norms, resists the requests of adults, does not agree with the parents. The behavior of a preschooler who strongly protests, not being able (or not having the desire) to control his behavior, begins at an earlier age, at the first collision of the child's interests and his teaching the rules. This happens for the first time, as a rule, at the age of 1-2 years. The child, from recently obedient and problem-free, becomes disobedient, denying the requests and rules set by the parents.

Psychologists note that such a stage in the development of the child's behavior is necessary and important: thus, the quality of the personality is formed - separation from the mother and the rudiments of one's own opinion.

Unfortunately, the most common way to resolve conflicts is by force. And here we mean not only (and not so much) physical strength, but also the strength of parental authority, for example. Parents who are inclined to use this method in relations with children believe that it is necessary to «win» the child: if you give him free rein, he will «sit on his neck» and «will do what he wants». However, without noticing it, they show children a dubious example of behavior: «Always achieve what you want, regardless of the desires of the other».

Children are very sensitive to the manners of their parents and imitate them from early childhood. So in families where authoritarian methods are used, children quickly learn to do the same and sooner or later (most often already in adolescence) return the lesson taught to their parents, completely out of control.

Another option for forceful action is an explanation of why an adult expects a child to fulfill a certain requirement. And, although the child, after listening, agrees, he firmly assimilates another belief: «My interests and needs do not matter, you still have to do as they say».

We are sure that in both cases there is no question of mutual understanding and close relations between parents and children in the family.

We try to explain to parents that a 2-3-year-old child, when he shouts, loudly and strongly expresses his opinion, is not able to stop on his own, and even more so to analyze his behavior. He is absorbed in the process, not the goal and its achievement.

It is important for the parent at the moment to refrain from the strategy of «not paying attention to the tantrum». On the contrary, it is important for parents to start and maintain upholding their binding rules of conduct in society. Their observance should be achieved without suppressing the child, without aggression against him. These should be norms known to the child in advance, on which the adult insists, without changing their obligation depending on his mood. This lays the foundation for the child's ability to internally control his own behavior, and the behavior of the parents themselves forms a model of internal attitude to the rules.

The tactic of «indulging» an adult to all the wishes of a child in the absence of the need to comply with the rules can lead to uncontrollable and unrestricted behavior of a child in preschool age and will be aimed at the protracted clarification of the question of power - who will win whom in the «I want» battle.

In other words, if a preschool child does not know how to control his behavior in matters of rules and norms, this signals that he cannot keep his behavioral impulse.

Thus, in the main, the uncontrollable behavior of children is associated with their attitude to the rules - the baby must learn whether it is possible to violate them and what will happen if they are not followed. Much depends on the parental reaction to the child's manifestations.

We recommend that parents talk to the child about the feelings and emotions that he is experiencing, connect his behavior and the possible reason for the protest. Maintain calmness and a benevolent attitude, adequately express feelings, emotions to the actions of the child, thereby creating support for himself. It is important for an adult to remain someone for the child to come to for help or advice. The parent's attitude of being present without interference provides support, but does not take away the initiative.

The parent's calm, firm and respectful attitude to the implementation of the rules, the observance of boundaries helps to naturally form within the child the norms of behavior and morality.

To resolve conflicts for parents with older children - senior preschool, primary school, the Center's specialists suggest using tactics that involve several stages of communication in a conflict situation.

At the first stage, an adult needs not only to tell the child about his feelings in the current situation, to voice his wishes, but also to give the child the same opportunity: to express what is important to him, what he wants, what hinders him. This step will help the child make sure that the adult understands the problem and is willing to participate in finding a solution.

The next stage is devoted to finding an answer to the question: «How should we proceed?» At this stage, the adult and the child offer their own ways of solving the problem, no matter how unacceptable, from the point of view of everyone, they are.

Such a step towards resolving the conflict will help create an atmosphere of mutual understanding and mutual respect, and, having evaluated the pros and cons of the proposed ways of resolving the conflict, unanimously make the best decision.

However, making a decision alone is not enough, so the next stage is detailing the decision. The adult, together with the child, agrees and accepts a certain algorithm of actions.

And the last step is to check the implementation of the solution. At this stage, it is important to find out if the child is doing well, and if there are any problems. The child may need the effective help of an experienced adult.

This method of resolving conflict situations between adults and children initially implies the cooperation of generations, and, ultimately, fosters in the child the ability to conduct a constructive dialogue to negotiate with the opponent, which will undoubtedly become one of the strongest sides of his personality in the future.

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EXTENDED METAPHOR: EXPERIMENTAL STUDY

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Abstract. *The article presents the results of the experimental study of extended metaphor as one of the most complicated types of occasional use of English phraseological euphemisms. Non-native speakers with the level of advanced English – future specialists of English who already knew the mechanisms of creating extended metaphor participated in the experiment as informants. The results vividly show that the euphemistic function of English phraseological euphemisms is not diminished in case of extended phraseological metaphor. Besides, non-native speakers proved to be able to sustain the phraseological image and to create a sub-image or sub-images based on various associations clustering around the base metaphor of phraseological euphemisms under study.*

Keywords: *phraseological euphemisms, extended phraseological metaphor, base metaphor, sub-image, euphemistic function*

Introduction

The mechanism of the extended metaphor was considered in detail for the first time by the Latvian scientist A. Nachiscione in her monograph in 2001 [1]. According to the author's terminology, extended phraseological metaphor is characterized by the use of additional images, which are grouped around the basic metaphor of the transferred linguistic unit, thus, the imagery inherent in the phraseological unit unfolds. Calling additional images sub-images, A. Naciscione draws the attention of researchers to the fact that these sub-images are based on associative metaphors, which leads to the use of both basic and associative metaphors within the phraseological context. The undoubted merit of A. Naciscione is the deepening of knowledge about the extended phraseological metaphor and the consideration of its types in accordance with the correlation of one or more emerging sub-images with one or more basic components of the phraseological unit.

The complex procedure for creating a sub-image / sub-images allows attributing an extended phraseological metaphor to complicated stylistic techniques, as a result of which this type of transformation of phraseological units is considered

by scientists as one of the types of occasional configuration of the second degree [2; 3; 4; 5 et.al.]. An experimental study of extended phraseological metaphor has been described in a number of Ph.D. theses and publications [6; 7; 8; 9], and is also presented in detail in our article “Extended metaphor as one of the types of occasional use of phraseological euphemisms: an experimental study” [10].

Since the extended metaphor is the most complicated type of occasional use of phraseological units, its creative use can cause difficulties for informants, since, as D.V. Diaz points out: “its creation requires from informants well-developed figurative and logical thinking, the ability to creatively solve the set tasks, since mental reproduction of the prototype image and simultaneous pun of the direct and figurative meaning of phraseological units is required in creating a sub-image / sub-images” [7 : 143].

Purpose of the study

First of all, the purpose of the study was to identify the possibility of creating an extended phraseological metaphor as one of the most difficult types of occasional use of phraseological euphemisms by non-native English speakers, subject to certain conditions. When studying the creation of an extended metaphor, we were interested in the question of whether the euphemistic function is preserved in phraseological euphemisms under study.

Materials and methods

12 English phraseological euphemisms were selected for the experiment. Phraseological euphemisms refer to complex linguistic units that combine the characteristic features of both phraseological and euphemistic units. The characteristic phraseological properties of phraseological euphemisms are as follows: transference of meaning, separability, stability (lexical and grammatical) with the possibility of contextual transformations, imagery and high significance of connotation in the structure of their phraseological meaning. The attribution of these units to euphemisms is determined by the fact that they are units of indirect nomination, the main purpose of the creation of which is to soften and veil taboo or socially and morally condemned real denotations [11].

The informants were third-year students of the Department of Romance and Germanic Philology of Kazan Federal University, who attended the course "Fundamentals of English Phraseology" and are familiar with the mechanism of creating an extended phraseological metaphor. A prerequisite was a high level of knowledge of the English language as well as developed logical thinking.

Linguistic experiment is of paramount importance in our research. Besides, our research requires scrutinizing the meaning of each phraseological euphemism and its prototype in order to see the creation of the mechanism of extended metaphor used in the linguistic experiment, therefore semantic analysis is the inherent part of our work. Discourse analysis is necessary for the realization of metaphori-

cal links in the process of emerging a sub-image or sub-images. It is accompanied by the methods of observation and description.

Results and discussion

Not all informants were able to successfully cope with the most difficult type of occasional use of euphemistic units; in general, about 11% of incorrect responses were received.

In the overwhelming majority of cases, examples of the so-called linear metaphor were obtained, in which the sub-image or sub-images unfold in a linear development in the context [5]. The prevalence of examples of such type of extended metaphor was also pointed out by other researchers of phraseological material [7; 9].

Let us turn to the consideration of the informants' examples.

In the following example the image of "bonds of life", which connect a person with this mortal life is extended, they are characterized as "thin and vulnerable", therefore, it is easy to dissolve them and it won't take a lot of time. Информанту удалось не только сохранить поэтический образ, лежащий в основе основной метафоры эвфемистической единицы, но и создать не менее поэтические подобразы:

– Don't you think that his **bonds of life are being gradually dissolved**?

– And *these bonds are so thin and vulnerable that they could dissolve rather fast.*

As a result of such a skillful use of extended phraseological metaphor the euphemistic function of the phraseological euphemism is not only preserved but also gets an additional meliorative evaluation.

In the next example with the phraseological euphemism "below stair" – "employed as a domestic servant" firstly the whole image is metaphorically extended, and the sub-image of the space below stairs acquires a bit negative evaluation. The next sub-image is connected with the component "stairs", its metaphorical extension also gives us a meliorative picture of creaking stairs under the footsteps of the master of the house. The informant managed to show an image of a cruel master who created a gloomy atmosphere for a poor domestic servant in such a skillful way. Still the base metaphor doesn't loose its euphemistic function:

She worked there **below stairs** *but it was very dark at the bottom, and the stairs creaked constantly from the footsteps of her master*.

An interesting example was obtained while using the euphemistic phraseological unit "to angle with a silver hook", in which the main focus was on the material from which the hook was made for fishing. As a precious metal, silver is highly valued, and it was on this property that the euphemistic metaphorical transference of meaning of the phraseological euphemism was based. However, according to the informant, the silver turned out to be a fake, as a result of which the rod quickly

broke. Thus, in the example, sub-images of counterfeit silver and a broken fishing rod are successively created, at the same time, the image of the phraseological euphemism itself is of a meliorative nature:

He tried **to angle with a silver hook** *but the silver was counterfeit and the hook broke very quickly*.

Extended phraseological metaphor of the phraseological euphemism "lack of moral fibre" meaning "cowardice" is based on the metaphorical extension of two components "moral fibre", the sub-image is characterized by meliorative evaluation of the new image of a "fairy angel-guard". On the whole, the result is a picturesque metaphorical chain of the main image and the sub-image in a linear development:

I can't stand your **lack of moral fibre**. *It seems that your fairy angel-guard has forgotten to weave it for you*.

A rather interesting example was made by the informant with the help of a simultaneous use of phraseological pun and extended metaphor. The phraseological euphemism "to eat for two" with the meaning "to be pregnant" is employed both in its direct, literal meaning, and its transferred meaning. Then both of them are extended with the sub-image of a baby in the womb who needs a lot of healthy food:

She **eats for two** now. *And the second one sitting inside her asks for more and more food, healthy food*, you know.

The last example we cite demonstrates the opposition of the main phraseological euphemism image "below stairs" with the created sub-image "up the stairs", which allows the recipient to focus on the ingenuity of the original image of the phraseological euphemism:

Now she is **below stairs**. However, if she does her best, she *will quickly work her way up the stairs*.

Conclusion

The creation of an extended phraseological metaphor did not cause significant difficulties for non-native speakers of English with a high level of knowledge of the English language (Advanced) and developed logical thinking. When implementing an extended phraseological metaphor, a significant stylistic effect is observed as a result of the deployment of the basic image and the creation of a sub-image / sub-images in English phraseological euphemisms. The euphemistic function of phraseological euphemisms selected for the experiment is preserved, besides, in most of the examples obtained, the created sub-images are characterized by ameliorative evaluation, which contributes to an increase in the euphemistic charge of phraseological euphemisms within the phraseological context.

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EVALUATION OF THE EFFECTIVENESS OF INTENSIVE THERAPY FOR SEVERE BURN TOXEMIA IN CHILDREN OVER SEVEN YEARS OLD

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Abstract. *During the period of toxemia with a burn area of 2-3 degrees of 25.8±11.4% and 3B of degrees 22.5±6.6%, IF of 95.8 ± 19.1 units, school-age children showed a tendency to decrease in body temperature with intravenous infusion (-0.48), the introduction of protein preparations (-0.52), a greater number of different infusion media (-0.48), anti-inflammatory (-0.49), vasopressor (-0.44) therapy. An increase in glucose administration caused a trend towards a decrease in SBP (-0.42), while an increase in the administration of metabolites caused a tendency, on the contrary, to increase SBP (0.43).*

Keywords: *intensive care, severe burn toxemia, children*

Relevance

With extensive burns, the prognosis is always serious and especially unfavorable when 50% of the body surface is affected or more. Burns that cover more than 1/3 of the body surface are life-threatening for the child. Mortality among children with body burns has recently decreased to 1.86%; it remained relatively high in children under 3 years of age - 6.8% [1-5]. Due to the ambiguous approach to the expediency of the complex introduction of the multidirectional mechanism of action of drugs, there are no clear indications and contraindications in terms of individual characteristics of the reaction not only to trauma, but also to ongoing intensive therapy, including many drugs, the place of which in intensive care has not yet been clearly defined, often the decision is made by the doctor without a clear understanding of the dynamics and features of the pathogenetic mechanisms

of the development of organ failure in burn disease in children.

Purpose of the work

To assess the effectiveness of intensive therapy for severe burn toxemia in children over seven years of age.

Material and research methods

The clinical material is presented by the data of hourly monitoring of body temperature, hemodynamic parameters: systolic (SBP), diastolic (DBP) blood pressure, cardiac output (CO), mean peripheral vascular resistance (MPVR) in 28 children admitted to the republican scientific center for emergency medical aid (RSCEMA) due to thermal burns between the ages of 7.1 and 18 years. The main feature that determined the division into groups was the duration of intensive care in the conditions of the intensive care unit (ICU), due to the severity of the burn disease. In group 1, body temperature monitoring data were considered in 13 children (up to 10 days on average 7.3±1.1), in group 2 in 8 (11-20 days on average 12.7±1.2), 3 in 7 children (more than 21 days 28.8±4.8). This paper presents the results of studying the effectiveness of intensive care in children of group 3 (7) of school age.

Results and discussion

As presented in tab. 1, patients of group 3 were at the age of 9.7±1.5 years, due to the severity of the condition caused by the vastness of the burn surface of 2-3A degree on average 25.8%, 3B degree 22.5%, the duration of intensive therapy in ICU was 28.8±4.8 days.

Table 1.

Patient characteristics

	Age in years	boys	girls	Days at the ICU	Area and depth of burns		IF,units
					2-3A degree,%	3B degree,%	
Group 3	9.7±1. 5	4	3	28.8±4.8	25.8±11.4	22.5±6,6	95.8±19.1

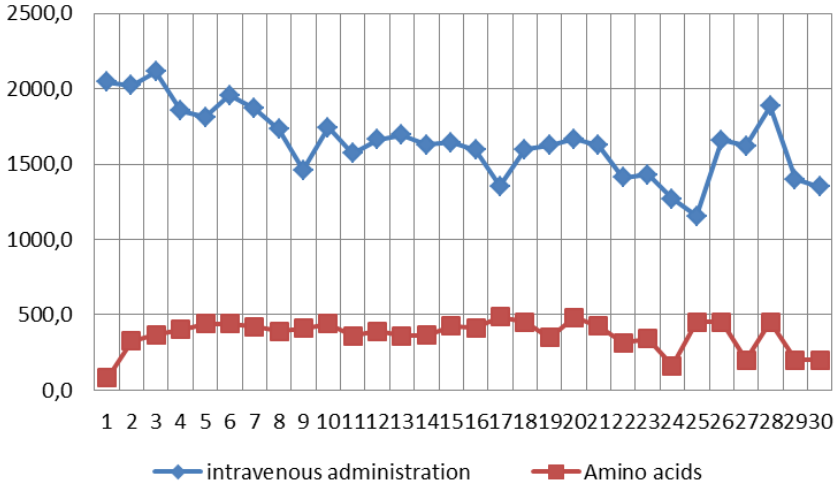

Figure 1. *Volume of intravenous infusion therapy, ml/day*

As can be seen from the diagram presented in fig. 1, changes in the volume of parenteral infusion only in the first 9 days tended to decrease by 500 ml per day, remaining on average at 1700-1200 ml/day on the following days. The infusion therapy included amino acid solutions in a volume of 400=500 ml per day.

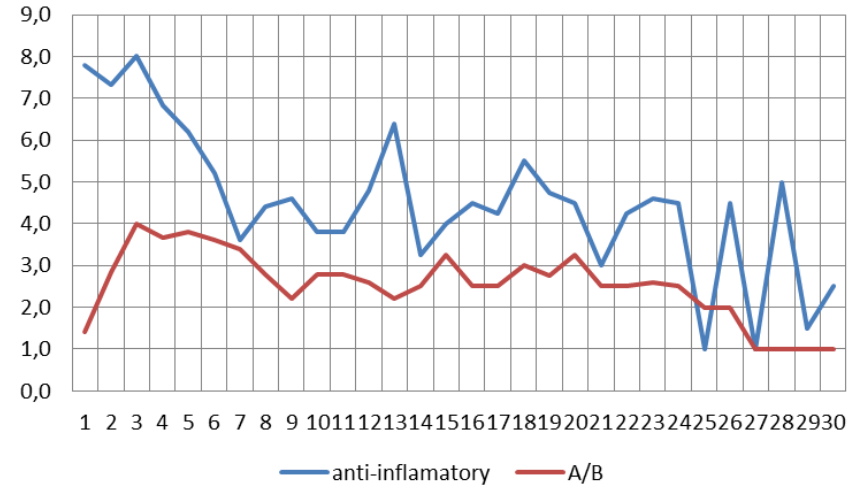

Figure 2. *Dynamics of antibacterial and anti-inflammatory therapy*

In the first 7 days, attention is drawn to the decrease in the volume of anti-inflammatory therapy from 7.8 in 1 day to 3.8 on day 7, possibly associated with the effectiveness of antibiotic therapy maximum for 3-7 days with a gradual limitation in the range from 3 to 1 in 27 days. Of particular interest is the instability of anti-inflammatory therapy on days 24-30 (fig. 2), which is most likely associated with a decrease in antibiotic administration in group 3 of school-age children.

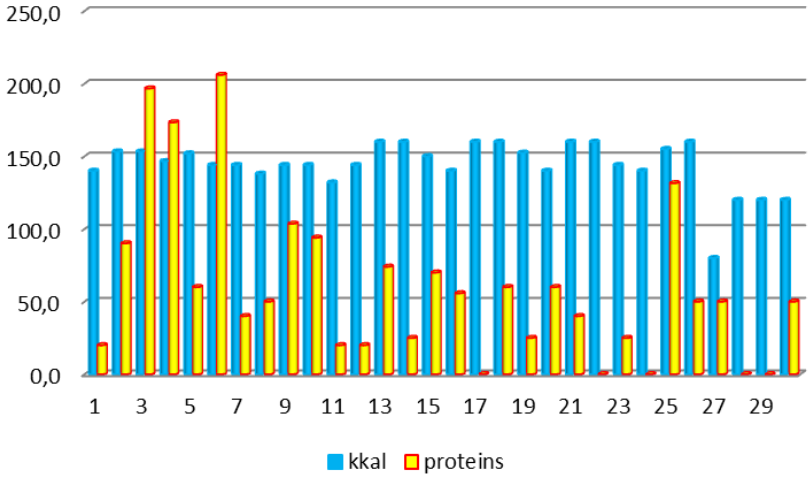

Figure 3. *Energy value of glucose in kcal and number of solutions in ml*

The energy value of the introduced carbohydrates was insignificant relative to the total volume of correction, nutritional support due to the prevalence of enteral reimbursement of energy costs in conditions of hypermetabolism, typical for the studied patient population. Thus, intravenously administered glucose averaged 150 kcal/day. The volume of injected protein preparations (albumin, FFP) was carried out under the control of the dynamics of the protein in the plasma. The need for hypoproteinemia stimulation was most pronounced on the 3.7th day (fig. 3).

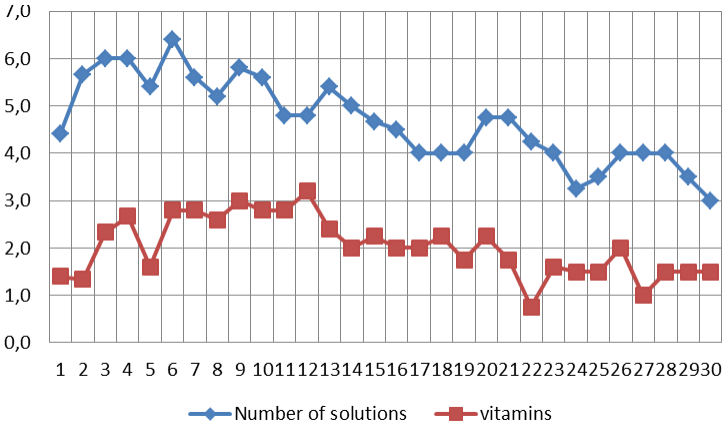

Figure 4. *Number of types of solutions and metabolites*

It is known that the introduction of solutions of various compositions is more effective than the introduction of a limited number of crystalloids. The changes in the need for the introduction of various infusion media and the frequency of administration of metabolic therapy throughout the entire acute period of toxemia turned out to be almost synchronous, that is, the greatest for 3-6 days up to 6 names of solutions and 3-fold administration of metabolite drugs with a gradual tendency to decrease by the 30th day of burn disease (fig. 4).

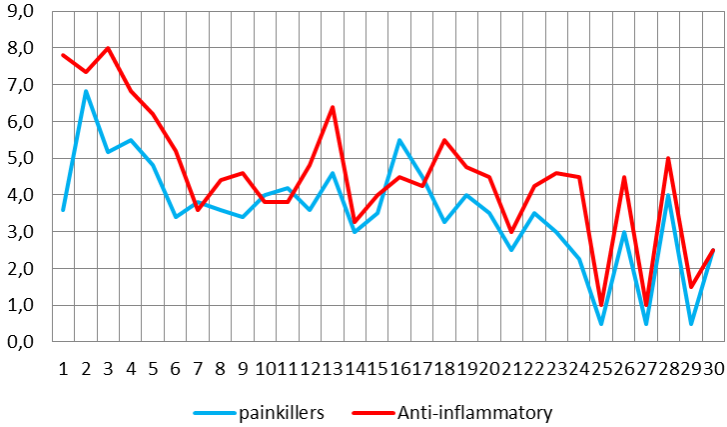

Figure 5. *Anti-inflammatory and sedative therapy*

Almost synchronous fluctuations in the volume of anti-inflammatory and sedative therapy were revealed (fig. 5). The maximum medicinal sedative protection falls on the first three days, increased again on the 13th day, gradually tended to limit with repeated bursts on the 24-28th day.

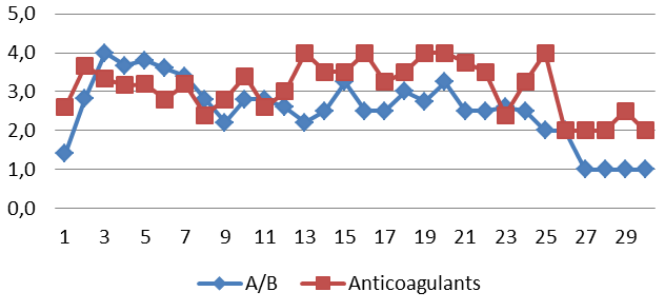

Figure 6. *Anticoagulant and antibiotic therapy*

A similar wave-like pattern was presented by changes in the volume of antibiotic therapy and the administration of anticoagulants (heparin), decreasing to a single administration of AB and two administration of heparin on days 28-30 (fig. 6).

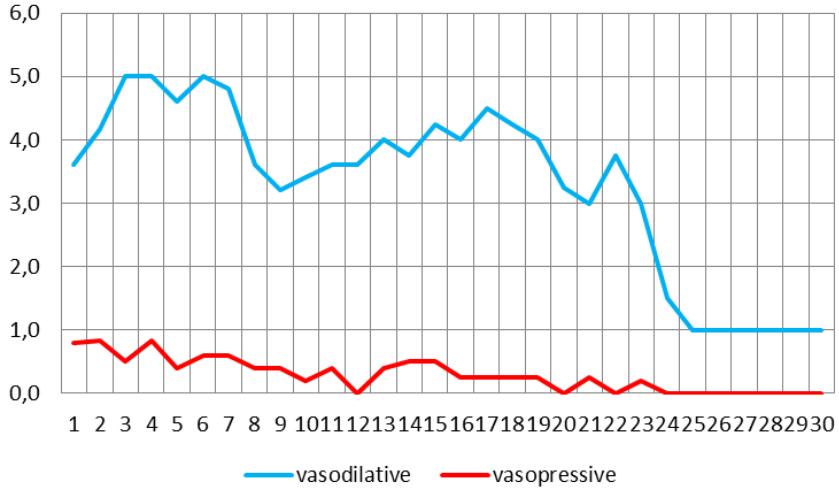

Figure 7. *Vasoactive therapy*

The introduction of vasodilating drugs was mandatory, which was more actively carried out in the first week after injury with a gradual decrease to a single injection on the 25th day (fig. 7). In parallel, the maintenance of hemodynamics was carried out with a cardiotonic dose of dopamine during the first 20 days of burn disease.

Thus, the complex intensive therapy of burn toxemia consisted, along with the syndromic correction of the systemic inflammatory response, adequate anesthesia, the fight against severe hypermetabolic syndrome in the implementation of preventive measures aimed at preventing the development of multiple organ failure, infectious complications, and timely correction of the energy deficit state.

Table 2.

Correlation of hemodynamics and body temperature with the main areas of intensive care for burn toxemia in children of the 3rd group aged 7.1-18 years

Parameters	T°C	SBP	DBP	CO	MPVR
Kcal intravenously (glucose)/day	-0.32	-0.42	-0.49	0.21	-0.03
Protein solutions, ml/day	-0.52	0.24	0.07	-0.30	0.20
Parenteral infusion therapy, ml/day	-0.48	0.12	-0.31	0.02	-0.48
Amino acids, ml/day	-0.14	-0.04	-0.01	0.00	-0.06
Number of types of solutions	-0.48	0.12	-0.28	-0.28	-0.27
Metabolites, frequency of administration/day	0.06	0.43	-0.03	-0.40	0.04
Anesthesia, frequency of administration/day	-0.23	0.06	-0.42	0.01	-0.45
Anti-inflammatory, frequency of administration/day	-0.49	0.17	-0.37	-0.19	-0.14
AB, frequency input/day	-0.29	0.15	-0.34	-0.14	-0.19
Heparin, frequency of administration/day	-0.02	-0.13	-0.48	0.48	-0.19
Cytoflavin, ml/day	0.31	0.11	-0.21	0.10	-0.21
Co-expanding, frequency of administration/day	-0.27	0.09	-0.49	0.05	-0.48
Dopamine/day	-0.44	0.08	-0.48	-0.01	-0.29

Evaluation of the correlations between hemodynamics and body temperature with the main components of intensive therapy for burn toxemia in children of group 3 at the age of 7.1-18 years made it possible to obtain a certain idea of the effectiveness of the therapy carried out in this group of patients. So, (fig. 8) re-

vealed a tendency to decrease body temperature (-0.44) with the introduction of a cardiotonic concentration of dopamine (3-4 μg/kg per minute). There was a favorable effect on thermoregulation of intravenous infusion (-0.48), administration of protein preparations (-0.52), a greater number of different infusion media (-0.48), anti-inflammatory (-0.49), vasopressor (-0.44) therapy. An increase in glucose administration (fig. 9) caused a tendency towards a decrease in SBP (-0.42), while an increase in the administration of metabolites caused a tendency, on the contrary, to an increase in SBP (0.43). The increase in metabolite therapy was accompanied by a tendency to decrease CO (-0.4). We understand the latter as a beneficial effect of the introduction of vitamin C, cytoflavin on cellular metabolism, which reduced the severity of the hyperdynamic orientation of changes in the circulatory function in conditions of mitochondrial insufficiency, one of the leading triggers of the hyperdynamic type of hemodynamics (fig. 11).

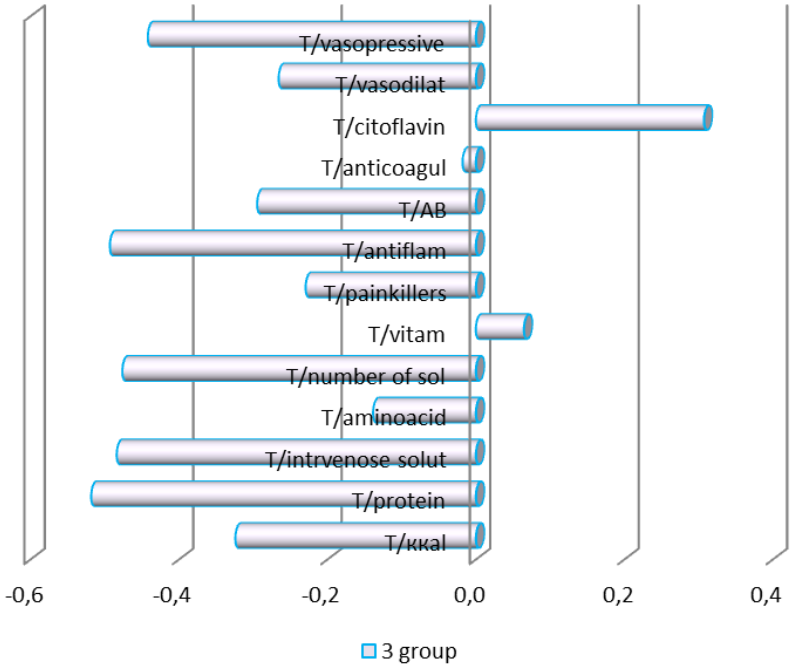

Figure 8. *Correlation links of body temperature*

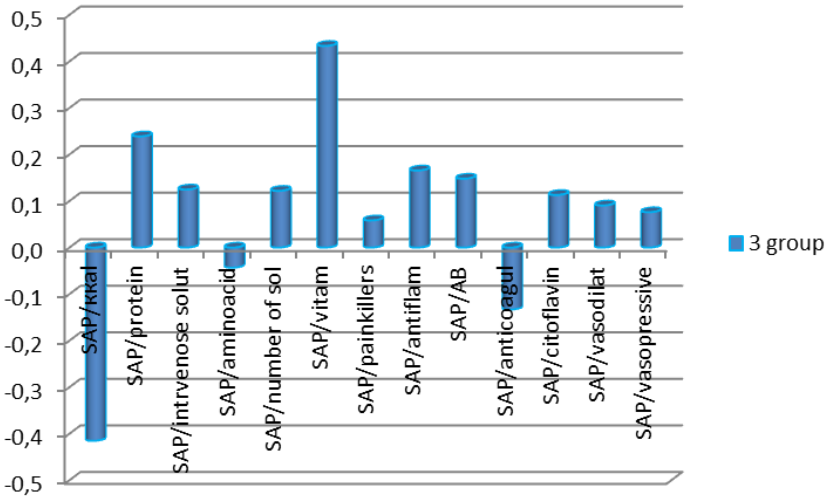

Figure 9. *Correlation links of systolic blood pressure*

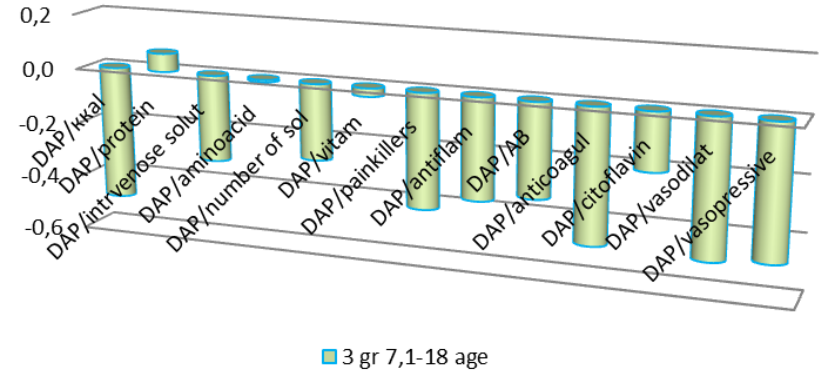

Figure 10. *Correlation links of diastolic blood pressure*

The prevalence of moderately pronounced negative correlations between the therapy and the parameters of DBP and MPVR coincide (fig. 10 and 12). The use of vasodilators and dopamine contribute to a decrease in DBP and a decrease in MPVR (-0.49 and -0.48, respectively). Sedative, anticoagulant therapy (-0.42 and -0.48) act in the indicated direction, improving the conditions for the work of the

heart. The latter explains (0.48) the positive effect of heparin administration on CO.

An interesting fact is that infusion therapy contributes to a decrease in MPVR and DBP (-0.48, -0.31) and a decrease in body temperature (-0.48) (tab. 2).

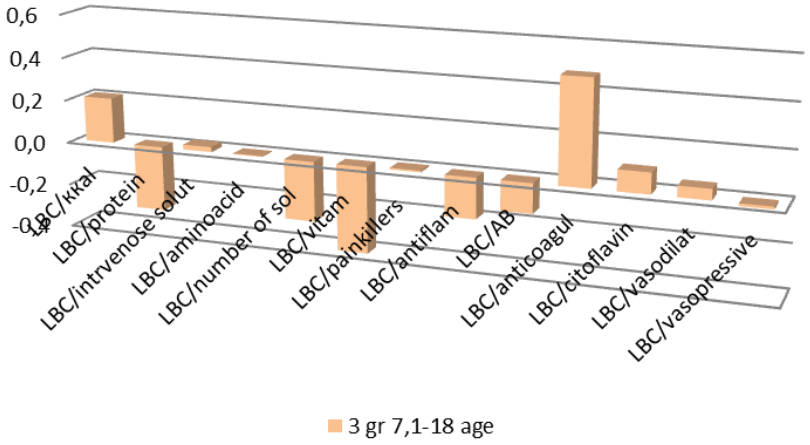

Figure 11. *Effect of intensive care on cardiac output*

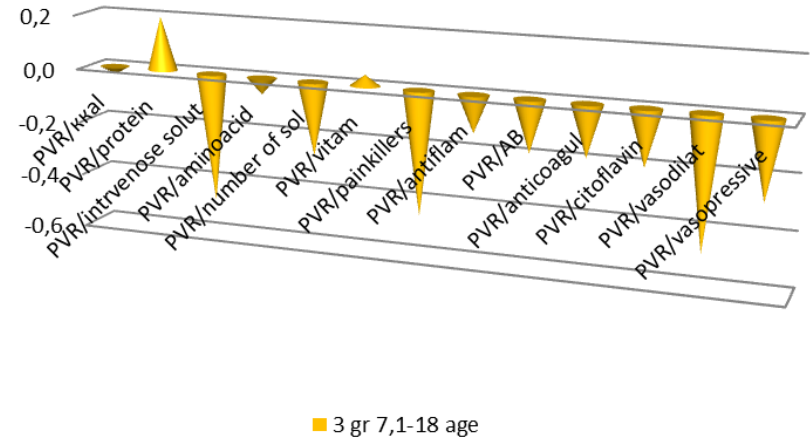

Figure 12. *Effect of treatment on MPVR*

Conclusion

During the period of severe burn toxemia, school-age children showed a tendency to decrease body temperature during intravenous infusion (-0.48), administration of protein preparations (-0.52), a greater number of different infusion media (-0.48), anti-inflammatory (- 0.49), vasopressor (-0.44) therapy. An increase in glucose administration caused a trend towards a decrease in SBP (-0.42), while an increase in the administration of metabolites caused a tendency, on the contrary, to increase SBP (0.43). The increase in metabolite therapy was accompanied by a tendency to decrease CO (-0.4).

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NOSOLOGICAL DISABILITY SPECTRUM AMONG THE ADULT POPULATION OF MOSCOW IN 2018-2020

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Abstract. *The article presents the structure of primary and repeated disability of the adult population by classes of diseases, according to ICD-X for 2018-2020. In the dynamics, there is a decrease in the number of people who were first recognized as disabled with a decrease in the level of primary disability. The leading classes causing primary disability are diseases of the circulatory system (35%), malignant neoplasms (33.8%), diseases of the musculoskeletal system and vascular pathology (6.7%). In the structure of repeated disability, the leading place is also occupied by diseases of the circulatory system (33.3%), malignant neoplasms (30.2%), diseases of the musculoskeletal system and vascular pathology (8%), mental and behavioral disorders (7.4), diseases of the nervous system (5.6%).*

Keywords: *primary, repeated disability, classes of diseases, specific gravity, level.*

Disability is one of the most important indicators of the health of the population, its socio-economic well-being (1-3). The modern stages of health protection and social protection of the population pose new challenges for medical and social expertise to address issues of establishing a group of disabilities and rehabilitation

of disabled people. By studying the results of the examination and re-examination of various categories of disabled people, their social and hygienic characteristics can be effective, the use of which will make it possible to introduce differentiated forms of medical, social and treatment-and-prophylactic examinations, including the rehabilitation of disabled people (4-5).

Purpose of the study: study of the dynamics, structure of primary and repeated disability of the adult population by classes of diseases of the ICD-X classification for 2018-2020 in a large metropolis.

Materials and methods: systematic research, based on the accounting and statistical form 7-Social Security FGI "FB MSE in Moscow" of the Ministry of Labor of Russia for 2018-2020. Research methods: data copying, descriptive statistics (extensive, intensive, absolute indicators, average), analytical and comparative analysis.

Results and discussion

Freshly recognized as disabled (FRD) among the adult population of Moscow in 2018 from all those sent for examination - 5130 people. The primary disability rate is 49.4+/-0.22 per 10 thousand of the adult population. The largest share in the FRD structure is made up of people with disabilities due to diseases of the circulatory system - 38.0%. Their total value is 19,576 people. The level of primary disability of this contingent of disabled people is 18.8+/-0.28 per 10 thousand of the population. The largest share in this class of diseases was made up of persons with disabilities due to cerebrovascular diseases. Their number was 10616 people, the level of primary disability is 10.2+/-0.29. The second place is taken by people with disabilities due to malignant neoplasms. Their number is 15825 people, their share is 30.7% with a primary disability level of 15.2+/-0.29. The third place is taken by people with disabilities due to diseases of the musculoskeletal system and vascular pathology - 35,900 people with a specific weight of 7.0% and intensive indicators of 3.4+/-0.08. In fourth place are people with disabilities due to mental and behavioral disorders. Their share was 5.1% in the FRD structure with a primary disability rate of 2.5+/-0.08. Fifth place is taken by people with disabilities due to diseases of the nervous system with a specific gravity of 3.7% and a primary disability rate of 1.8+/-0.31. The sixth place is taken by people with disabilities due to diseases of the endocrine system, their number is 1339 people with a share of 2.6% and a level of 1.3+/-0.09. In seventh place are people with disabilities due to diseases of the digestive system - 1021 people with a specific gravity of 2.0% and a level of 1.0+/-0.09 (tab. 1). The eighth and ninth places are occupied by people with disabilities due to diseases of the eye and its accessory apparatus, diseases of the respiratory system with a specific gravity of 1.6% and a level of 0.8+/-0.01. The smallest proportion is made up of people with disabilities due to occupational diseases (0.01%), the consequences of occupational injuries

(0.03%), due to tuberculosis (0.3%).

In 2019, the number of FRDs over 18 years old was 46,249 (decline rate - 10.2%). The primary disability rate decreased to 44.1+/-0.23 per 10 thousand of the adult population. Disabled people due to malignant neoplasms moved to the first place. Their number increased to 16020 people (growth rate + 1.2%). Their specific weight is 34.6% with a level of 15.3 =/- 0.28. The second place is taken by people with disabilities due to diseases of the circulatory system. Their number in dynamics decreased to 15,640 people (the rate of decline was 20.1%), their share was 33.8% at the level of 14.9+/-0.28. In this class of diseases according to ICD-X, the proportion of people with disabilities due to pathology of heart disease and cerebrovascular diseases also decreased to 10.5% and 18.2% to 4.6+/-0.07 and 8.0+/-0.04 respectively. People with disabilities due to diseases of the musculoskeletal system and vascular pathology still occupy the third place, in the dynamics there is a decrease in their share to 6.5% and the level to 2.9+/-0.08. In fourth place are people with disabilities due to mental disorders and behavioral disorders, there is a decrease to 2417 people with a share of 5.5% and a level of 2.3+/-0.09.

Table 1

Dynamics of primary disability of persons over 18 years old by disease class in Moscow in 2018-2020 (abs.,%, Per 10 thous. population, M+/-m)

Class of diseases according to ICD-X	Years								
	2018			2019			2020		
	abs	%	level	abs	%	level	abs	%	level
Total FRD	51530	100.0	49.4± 0.22	46249	100.0	44.1± 0.23	36216	100.0	34.5± 0.25
Tuberculosis	142	0.3	0.1± 0.03	87	0.2	0.1± 0.03	116	0.3	0.1± 0.03
Diseases caused by HIV	644	1.2	0.6± 0.02	633	1.4	0.6± 0.02	475	1.3	0.4± 0.02
Malignant neoplasms	15825	30.7	15.2± 0.29	16020	34.6	15.3± 0.28	13120	36.2	12.5± 0.29
Endocrine system diseases	1339	2.6	1.3± 0.09	1005	2.2	1.0± 0.09	738	2.0	0.7± 0.15
Mental and behavioral disorders	2611	5.1	2.5± 0.08	2417	5.2	2.3± 0.09	1772	1.9	1.7± 0.09
Diseases of the nervous system	1897	3.7	1.8± 0.31	1719	3.7	1.6± 0.09	1377	3.8	1.3± 0.09

Diseases of the eye and its adnexa	820	1.6	0.8± 0.08	875	1.9	0.8± 0.01	540	1.5	0.5± 0.04
Diseases of the ear and mastoid process	785	1.5	0.8± 0.01	900	1.9	0.9± 0.01	684	1.9	0.7± 0.15
Diseases of the circulatory system	19576	38.0	18.8± 0.28	15640	33.8	14.9± 0.28	12056	33.3	11.5± 0.29
Chronic rheumatic heart disease	87	0.2	01.± 0.03	97	0.2	0.1± 0.03	64	0.2	0.1± 0.03
Diseases with high blood pressure	250	0.5	0.2± 0.03	224	0.5	0.2± 0.03	137	0.4	0.1± 0.03
Cardiac ischemia	6718	13.0	6.4± 0.06	4872	10.5	4.6± 0.07	3635	10.0	3.5± 0.08
Cerebrovascular disease	10616	20.6	10.2± 0.29	8408	18.2	8.0± 0.04	6705	18.5	6.4± 0.06
Respiratory diseases	823	1.6	0.8± 0.01	694	1.5	0.7± 0.02	436	1.2	0.4± 0.02
Diseases of the digestive system	1021	2.0	1.0± 0.09	914	2.0	0.9± 0.01	781	2.2	0.7± 0.15
Diseases of the musculoskeletal system and vascular pathology	3590	7.0	3.4± 0.08	3005	6.5	2.9± 0.08	2427	6.7	2.3± 0.09
Diseases of the genitourinary system	692	1.3	0.7± 0.02	736	1.6	0.7± 0.02	558	1.5	0.5± 0.04
Consequences of injury, poisoning and other external influences	666	1.3	0.6± 0.02	586	1.3	0.6± 0.02	430	1.2	0.4± 0.02

Consequences of an occupational injury	13	0.03	0.01±	17	0.04	0.02±	19	0.1	0.02±
Occupational diseases	5	0.01	0.002±	8	0.02	0.01±	8	0.02	0.01±
Other	1081	2.1	1.0± 0.09	993	2.1	0.9± 0.01	682	1.9	0.6± 0.02

In fourth place are disabled people due to diseases of the nervous system, their number decreased to 17192 people, the rate of decline was 7.4%, the share was 3.7% with a level of 1.6+/-0.09. The fifth place is still occupied by people with disabilities due to diseases of the endocrine system with a specific weight of 1.2% and a level of 1.0+/-0.09. The sixth place is taken by people with disabilities due to diseases of the digestive system, their share was 2.0% with a stable indicator equal to 0.9+/-0.1. The seventh-eighth place in the FRD structure is occupied by people with disabilities due to diseases of the eye and its adnexa, diseases of the ear and mastoid process. In the dynamics, there is an increase in their share to 1.9% with a level of 0.8+/-0.01 and 0.9+/-0.01, respectively. The ninth place is occupied by people with disabilities due to diseases of the genitourinary system, with an increase in their number to 736 people and a specific gravity of up to 1.6%, with a level of 0.7+/-0.02. The tenth place is taken by people with disabilities due to respiratory diseases with a specific gravity of 1.5% and a level of 0.7+/-0.02. The smallest proportion were disabled, as in 2018, due to occupational diseases (0.02%), the consequences of occupational injuries (0.04% tuberculosis (0.2%).

In 2020, there is a decrease in the number of FRDs to 36,216 people (the decline rate is 21.7%), which is due to the medical and social examination in absentia during the pandemic of the new coronavirus infection COVID 19, the reduction of medical organizations and their redistribution to work with COVID 19 patients. The first place is still occupied by people with disabilities due to malignant neoplasms - 36.2%, with a level of 12.5+/-0.29 per 10 thousand of the adult population. In second place are people with disabilities due to diseases of the circulatory system, their share is 33.3%, the level is 11.5+/-0.29. In this class, the leading position is still held by persons with disabilities due to cerebrovascular diseases and coronary heart disease - 18.5% and 10.5%, respectively, with a level of 6.4+/-0.06 and 3.5+/-0.08. In dynamics, the proportion of people with disabilities increased to 6.7% due to diseases of the musculoskeletal system and vascular pathology. In dynamics, there is a decrease in the proportion of disabled people due to mental disorders and behavioral disorders to 4.9%, due to diseases of the endocrine system to 2.0%, due to diseases of the eye and its adnexa to 1.5%, respiratory diseases to 1.2%, diseases of the genitourinary system up to 1.5%, diseases caused by HIV up to 1.3%, the consequences of injuries, poisoning up to 1.2%.

During the study period FRD 133995 people, on average 44665 people per year with a tendency to decrease. The primary disability rate averaged 41.2+/-0.23. In the structure, the leading positions are taken by persons with disabilities due to diseases of the circulatory system - 35.0%, due to malignant neoplasms - 33.8%, due to diseases of the musculoskeletal system and vascular pathology - 6.7%. The smallest share is made up of persons with disabilities due to occupational diseases - 0.02%, the consequences of occupational injuries - 0.06%, tuberculosis - 0.27%, chronic rheumatic heart diseases - 0.2%, diseases with high blood pressure - 0.47%.

Re-recognized as disabled (RRD) among persons over 18 years old in 2018 amounted to 86,782 people. The rate of repeated disability is 83.2+/-0.17 per 10 thousand of the adult population. In the structure of RRD, the leading positions are taken by people with disabilities due to diseases of the circulatory system. Their number is 30403 people, the share is 35.0% with a specific weight of 29.2+/-0.26. In this class, the leading are the disabled due to cerebrovascular diseases - 19.2% and coronary heart disease - 11.7% with a level of 15.9+/-0.28 and 9.7+/-0.02, respectively. The smallest share is made up of people with disabilities due to chronic rheumatic heart disease (0.2%) and diseases with high blood pressure (0.5%), with a level of 0.2+/-0.03 and 0.4+/-0.02, respectively. The second place is taken by people with disabilities due to malignant neoplasms, their share in the RRD structure is 26.0% with a level of 21.6+/-0.27. In third place are people with disabilities due to mental disorders and behavioral disorders, their number is 8327 people with a specific weight of 9.1% and a level of 8.0+/-0.04. In fourth place are people with disabilities due to diseases of the musculoskeletal system and vascular pathology - 8.1% and a level of 6.8+/-0.06. In fifth place are disabled people due to diseases of the nervous system, their share was 5.0% with a level of 4.1+/-0.07. In sixth place are people with disabilities due to diseases of the endocrine system with a share of 3.0% and a level equal to 2.5+/-0.08. The smallest share was made up of persons with disabilities due to occupational diseases with an indicator of 0.03% and a level of 0.02, the consequences of industrial injuries - 0.1%, due to diseases with high blood pressure - 0.5%, due to diseases of the ear and mastoid process - 0.7%, due to tuberculosis - 0.3%, chronic rheumatic heart disease - 0.2%.

In 2019, the number of RRDs decreased to 78,228 people (a decrease of 9.9%). The level of repeated disability of the adult population from all causes is characterized by a decrease to 74.6+/-0.16. In the structure, people with disabilities are still in the lead due to diseases of the circulatory system, their number has decreased to 25,816 people (that is, a decrease of 15.1%). Their share is 33.0% with a level equal to 24.6+/-0.27. In dynamics, there is an increase in the proportion of disabled people due to cerebrovascular diseases up to 17.7% and disabled people due to coronary heart disease up to 10.8%. The second place is taken by people with

disabilities due to malignant neoplasms. Their number increased to 23974 people (growth rate + 6.3%). Their share in the RRD structure is 30.6% with a level of 22.8+/-0.27. In third place are people with disabilities due to mental and behavioral disorders with a specific weight of 7.9% and a level of 5.9+/-0.06. In fourth place are people with disabilities due to diseases of the musculoskeletal system and vascular pathology, their number in dynamics decreased to 5957 people (the rate of decline is 15.4%). The share of this contingent of disabled people is 7.6% with a level of 5.7+/-0.06. Fifth place is taken by people with disabilities due to diseases of the nervous system, their share is 5.1% with a level of 3.8+/-0.08. Sixth place - people with disabilities due to diseases of the endocrine system with a tendency to decrease the share to 2.8% and the level to 2.1+/-0.05. In dynamics, there is a decrease in the proportion in the structure of RRD of disabled people due to tuberculosis to 0.2%, due to diseases of the eye and its adnexa to 2.4%, respiratory diseases to 1.6%. At the same time, there is an increase in the proportion of people with disabilities due to diseases of the digestive system to 1.8%, due to diseases of the genitourinary system to 1.5%.

In 2020, the total number of RRDs increased to 104,256 people (a growth rate of + 33.3%), due to the re-examination under the "Temporary procedure for recognizing a person as a disabled person" on the basis of the Decree of the Government of the Russian Federation of 04.09.2020. № 467, dated 16.10.2020 № 1697 in connection with the pandemic of the new coronavirus infection COVID 19 (two-time automatic extension of the disability group for 6 months). The level of repeated disability is 99.2+/-0.03 per 10 thousand of the adult population. People with disabilities due to malignant neoplasms moved from second place to first, their number amounted to 35498 people (growth rate + 48.1%), the share is 34.0% with a level of 33.8+/-0.25. The second place is taken by people with disabilities due to diseases of the circulatory system with a specific gravity of 31.9% and a level of 31.7+/-0.25. The third place belongs to people with disabilities due to diseases of the musculoskeletal system and vascular pathology, their number in dynamics increased to 8645 people (growth rate + 45.1%), their share is 8.3% with a level of repeated disability 8.2+/-0.04. The fourth-fifth place was taken by people with disabilities due to mental and behavioral disorders, and diseases of the nervous system, their share in the RRD structure was 4.8% with a tendency to decrease and the level of 4.7+/-0.07. In sixth place are people with disabilities due to diseases of the endocrine system with a tendency to increase their number to 3140 people (growth rate + 43.5%). Their share increased to 3.0% with a level of 3.0+/-0.12 per 10 thousand of the adult population. In dynamics, there is an increase in the proportion of disabled people due to tuberculosis to 0.3%, disabled people due to high blood pressure to 0.4%, coronary artery disease up to 11.0%, disabled people due to diseases of the digestive system up to 2.1%, respiratory diseases up to 1.7%,

diseases of the genitourinary system up to 1.6%, the consequences of injuries, poisoning up to 1.8%.

For a three-year period, in terms of the average indicator, the first place is occupied by persons with disabilities due to diseases of the circulatory system, their share is 33.3%. The second place is for people with disabilities due to malignant neoplasms - 0.2% with a level of 26.6+/-0.27. In third place are people with disabilities due to diseases of the musculoskeletal system and vascular pathology with a specific gravity of 8.0% and a level of 6.9+/-0.12. The fourth ranking place is occupied by persons with disabilities due to mental and behavioral disorders, their share is 7.4% with a level of 6.2+/-0.32. Fifth place is taken by people with disabilities due to diseases of the nervous system with a specific gravity of 5.0 and a level of 4.2 + / 0.07.

Table 2

The structure and level of repeated disability of persons over 18 years old, taking into account the classes of diseases in Moscow for 2018-2020 (abs.,%, Per 10 thous. population, M+/-m)

Class of diseases according to ICD-X	Years								
	2018			2019			2020		
	abs	%	level	abs	%	level	abs	%	level
Total RRD	86782	100.0	83.2±0.17	78228	100.0	74.6±0.16	104256	100.0	99.2±0.03
Tuberculosis	252	0.3	0.2±0.03	176	0.2	0.2±0.03	261	0.3	0.2±0.03
Diseases caused by HIV	1078	1.2	1.0±0.09	902	1.2	0.9±0.008	1267	1.2	1.2±0.09
Malignant neoplasms	22555	26.0	21.6±0.27	23974	30.6	23.8±0.27	35498	34.0	33.8±0.25
Endocrine system diseases	2604	3.0	2.5±0.08	2188	2.8	2.1±0.09	3140	3.0	3.0±0.12
Mental and behavioral disorders	8327	9.6	8.0±0.04	6157	7.9	5.9±0.06	4975	4.8	4.7±0.07
Diseases of the nervous system	4314	5.0	4.1±0.07	4020	5.1	3.8±0.08	4992	4.8	4.7±0.07
Diseases of the eye and its adnexa	2230	2.6	2.1±0.09	1911	2.4	1.8±0.09	1926	1.8	1.8±0.09

Diseases of the ear and mastoid process	584	0.7	0.6±0.02	436	0.6	0.4±0.02	356	0.3	0.3±0.02
Diseases of the circulatory system	30403	35.0	29.2±0.26	25816	33.0	24.6±0.27	33297	31.9	31.7±0.25
Chronic rheumatic heart disease	194	0.2	0.2±0.03	161	0.2	0.2±0.03	214	0.2	0.2±0.03
Diseases with high blood pressure	408	0.5	0.4±9.7	262	0.3	0.2±0.03	392	0.4	0.4±0.02
Cardiac ischemia	10127	11.7	9.7±0.02	8453	10.8	8.1±0.04	11454	11.0	10.9±0.29
Cerebrovascular disease	16625	19.2	15.9±0.28	13872	17.7	13.2±0.29	16782	16.1	16.0±0.28
Respiratory diseases	1436	1.7	1.4±0.09	1250	1.6	1.2±0.09	1795	1.7	1.7±0.09
Diseases of the digestive system	1508	1.7	1.4±0.09	1422	1.8	1.4±0.09	2204	2.1	2.1±0.09
Diseases of the musculoskeletal system and vascular pathology	7042	8.1	6.8±0.06	5957	7.6	5.7±0.06	8645	8.3	8.2±0.04
Diseases of the genitourinary system	1052	1.2	1.0±0.09	1137	1.5	1.1±0.01	1616	1.6	1.5±0.09
Consequences of injury, poisoning and other external influences	1282	1.5	1.2±0.09	1054	1.3	1.0±0.09	1516	1.5	1.4±0.09
Consequences of an occupational injury	74	0.1	0.1±0.03	46	0.1	0.04±0.03	67	0.1	0.1±0.04
Occupational diseases	25	0.03	0.02±0.02	21	0.03	0.02±0.02	26	0.02	0.02±0.02
Other	2016	2.3	1.9±0.09	1754	2.2	1.7±0.09	2675	2.6	2.5±0.08

Conclusion

The study of the nosological structure of disability in the adult population in Moscow for 2018-2020 showed that the structure of those who were initially recognized as disabled and re-recognized as disabled due to diseases of the circulatory system (35.0%) with a tendency to decrease their share, disabled people due to malignant neoplasms (33.8%) with a tendency to increase their share, disabled people due to diseases of the musculoskeletal system and vascular pathology (6.7%) with a tendency to decrease their proportion. The smallest share is made up of persons with disabilities due to occupational diseases (0.02%), the consequences of occupational injuries (0.06%), tuberculosis (0.27%), chronic rheumatic heart diseases (0.2%), diseases with high blood pressure (0.47%). In the RRD structure, people with disabilities are also in the lead due to diseases of the circulatory system with a tendency to increase their share (33.2%), due to malignant neoplasms also with a tendency to increase their growth (30.2%), due to diseases of the musculoskeletal system (8.0%), due to mental and behavioral disorders (7.4%), due to diseases of the nervous system (5.0%).

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CLINICAL ETIOLOGICAL AND MRI FEATURES OF ENCEPHALITIS IN CHILDREN

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Abstract. *Localization of foci in the structures of the central nervous system on MRI in encephalitis (EN), determines clinical picture and depends on etiology. Objective: to improve the diagnosis of encephalitis in children by establishing clinical, etiological and MRI parallels. Materials and methods: 364 children 1 month up to 18 years old with EN were examined. MRI of the brain and spinal cord was performed, blood and CSF were examined for herpes viruses type 1-6, enteroviruses (EV), tick-borne encephalitis virus (TBEV), Borrelia burgdorferi (B.b.) and others. Results. Most common etiological agents of EN were herpes viruses type 1-6. Clinical and topical variants of EN were: leukoencephalitis (leukoEN) in 68.4%, polioencephalitis (polioEN) in 22.8% and panencephalitis (panEN) in 8.8%, as well as forms. LeukoEN was more often caused by varicella-zoster (VVZ) and Epstein-Barr viruses (EBV) or B.b., had foci in the white matter in 80.7%, sensitive, cerebellar and pyramidal symptoms, acute course with subsequent recovery without deficiency in 65.8% of cases, risks of exacerbations and progression as multiple sclerosis in 6%. PolioEN in 71.1% was caused by TBEV or EV, and characterized by foci in thalamus, basal ganglia, cortex, coma-sopor disorder, epilepsy, central paralysis and speech disorders, with neurological deficit in 83.1%, chronic case - by an increase of brain atrophy.*

PanEN were caused by cytomegalovirus in more than ½ cases, with subtotal total lesion of the white matter, involvement of other structures in ~1/3, chronical case of the disease with polymorphism of neurological symptoms and a rare complete recovery (15.6%). Cerebellar form of EF in 88.7% was associated with VZV, subcortical and brainstem - with TBEV and EV, cortical and limbic - HSV1-2, HHV-6. Conclusion. Clinical and topic forms of EN in children depend on etiology, have a different frequency of complications, the knowledge of which allows you to optimize the diagnostic process.

Keywords: *encephalitis, infections, clinical symptoms, MRI, children.*

Introduction

Encephalitis (EN) in children can develop in different age periods and present as group of syndromes of infection, which differ by clinic, etiology, cause of the disease and central nervous system (CNS) structures which were damaged. EN is one of the main social problems because they influence on patients life and health and their outcomes depend on the quality and speed of therapy start. Constant improvement of diagnostical process and therapy is required. One of the most important methods of EN diagnostics is MRI, which helps to make differential diagnosis by detection of topical brain damage, complications, presence of structural changes, their dynamics and outcomes. Moreover, MRI can help to think about etiological agent of the disease, as in most cases infectious agents have ability to infect definite CNS structures and cause similar clinical-neurological symptoms. Furthermore, knowledge of MRI features of EN in children, in case of neurons, axons, glia, brain stem, cerebellum, hemispheres (etc.) damage can help to make prognosis of focal damages, risks of complications, exacerbations and outcomes of the disease. Thus, these questions are studied very poor, especially in children, this is determine the actuality of our research study.

Purpose of the study – improvement of EN diagnostics in children by clinical, etiological and MRI parallels.

Materials and methods

We observed 364 kids age 1 months - 17 years with the diagnosis EN. We observed daily clinical picture during 4-8 weeks (length of hospitalization depended on disease severity, dynamics) and 1 year after discharge. In first 3 days of hospitalization we provided brain and spinal cord MRI 1,5 or 3 Tesla in SE, FSE, IR, FLAIR, DWI, SWI for PD, T1 and T2-weighting images in 3 planes with contrast (omniscan or magnevis 0,2 mg/kgt). In the dependence on clinical-radiological diagnosis all EN were divided into groups: with isolated (mostly white matter damage)- leucoencephalitis (leukoEN); white matter lesions - polioencephalitis (polioEN); in case of total or subtotal brain damage – panencephalitis (panEN). Acute case was diagnosed in cases with fast symptoms growth in 3-10 days, acut-

est – in fulminant symptoms growth, frequently with brain edema during 1 day; protracted case – in case of symptoms growth during more than 2 weeks-3 months, indulating character with periods of improvement and deterioration, chronical – in symptomatic progression more than 6 months. Protracted and chronical cases of EN were always confirmed by laboratory etiological diagnostics which testified constence of neuroinfectional process. Cronical case characterized by rary commoninfectious and meningeal symptoms, inflammatory signs in cerebral spinal fluid (CSF) combined with severe neurological symptoms. Etiological diagnostics included blood and CSF examination, and in some cases in other biological fluids by PCR and/or PCR real time on herpesviruses (1,2,3,4,5,6 types), parvovirus B19 (PVB19), enteroviruses (EV), Rubella virus (RV), Adenovirus, Influenza virus, Parainfluenza virus, Tick born encephalitis virus (TBEV), B. burgdorferi s.l. (B.b.), and serological and immunocytochemical methods. Specific antibodies IgM, G by enzume immunoassay on herpesviruses 1-6 types, TBEV, PVB19, RV, measles virus, B.b. Antibody level was detected in dynamics – at the disease onset and after 2-3 weeks. For herpesviruses 1-2, 5 and 6 types we detected avidity index (AI) as a marker of inflectional process duration. AI less than 50% was a marker of low-sighted antibodies, in cases of 2-6 weeks infection, IA more than 60% was a marker of high avid antibodies in cases of post inflectional process and in chronical infectious process. EBV infection was detected by specific IgM, IgG (EA, VCA, EBNA-1) antibodies detection by immunoblot. Antigens of herpesviruses 1-6 types, mycoplasma, chlamydia were detected by immunecytochemical examination of CSF leucocyte suspension. Influenza virus and parainfluenza virus were detected by hemagglutination inhibition reactions, adenovirus and enterovirus – by - complement fixation reaction. Diagnostical level was in case of antibody titers growth up to 4 times 2-3 weeks later. Statistics was made by programs of Microsoft Excel Office 365 for Windows 10. $P< 0,05$ was in significant differences.

Results and discussion

After deep data analysis, we detected that most patients with EN have white matter damage of hemispheres, focal lesions of cortex, subcortical structures, brain stem (polioEN) are very rare. In very rare cases we observed total/subtotal brain damage (panEN) (table 1).

Table 1.

Clinical topic options of encephalitis in the dependence on neuron and/or brain glia damage and the disease cause, n/%

The cause of the disease	Acute	Torpid	Prolonged	Chronical	Total
Leucoencephalitis	138/55,4	4/1,6	48/19,3	59/23,7	249/68,4
Polioencephalitis	41/49,4	18/21,7	10/12	14/16,9	83/22,8
Panencephalitis	3/9,4	1/3,1	6/18,8	22/68,7	32/8,8
Total	182/50	23/6,3	64/17,6	95/26,1	364/100

EN in ½ cases had acute cause, rarely – prolonged and chronical. Torpid symptomatic development was observed in 6,3% cases and was typical for polioEN. PanEN characterized by frequency of chronical case of the disease, which observed in ~ 2/3 of all cases. We have detected, that frequency of clinical topic variations and EN cause changed in the dependence on patients' age. The number of leukoEN increased by the age of 4-6 and 13-15 years old, and polioEN and panEN – in children of early age (table 2).

Table 2.

Frequency of clinical topic variations and the disease cause of encephalitis in children of different age groups, n/%

Age (years)	under 1 year	1–3	4-6	7-9	10-12	13-15	16-17
LeukoEN, n=249	5/2%	37/14,9	68/27,3	21/8,4	33/13,3	56/22,5	29/11,6
PolioEN, n=83	39/47	16/19,3	6/7,2	10/12	9/10,8	2/2,4	1/1,2
PanEN, n=32	15/46,9	12/37,5	1/3,1	0/0	2/6,3	1/3,1	1/3,1
Acute, n=182	20/11	42/23,1	62/34,1	16/8,8	11/6	20/11	11/6
Torpid, n=23	13/56,5	5/21,7	2/8,7	2/8,7	1/4,4	0/0	0/0
Prolonged, n=64	5/7,8	7/10,9	8/12,5	10/15,6	20/31,3	9/14,1	5/7,8
Chronical, n=95	21/22,1	11/11,6	3/3,2	3/3,2	12/12,6	30/31,6	15/15,7
Total, n=364	59/16,2	65/17,9	75/20,6	31/8,5	44/12,1	59/16,2	31/8,5

In children under 1 year the highest frequency of acute cause of EN was observed, and its risks decreased in patients of elderly age. Chronical case dominated in children of 13-17 years and on the first year of life, prolonged – in children 7-12 years old, and mostly was connected with persistent and onset of congenital infections.

Most frequent etiological agents were herpes viruses 1-6 types - 59.3%, rarely – tick-born agents, (Tick-born encephalitis virus и Borrelia burgdorferi) - 19%, and enteroviruses -14.6% (table 3).

Table 3.

Etiological characteristics of clinical topic variations of encephalitis in children, n/%

Etiology	LeukoEN, n=249	PolioEN, n=83	PanEN, n=32	Total, n=364
Herpesviral infections 1-6	179/71,8	17/20	20/62,5	216/59,3
Entero (nonpolio-), EV	25/10	22/26,5	6/18,8	53/14,6
B. burgdorferi, B.b.	30/12	0/0	2/6,2	32/8,8
Tick-born encephalitis virus (TBEV)	0/0	37/44,6	0/0%	37/10,2
Other agents*	15/6	7/8,4	4/12,5	26/7,1

* - rare encephalitis agents (parvovirus B19, chlamydia, mycoplasma, rubella virus, Influenza virus, parainfluenza virus, adenovirus and other.)

In leukoEN and panEN more often herpesviral infections were detected and in polioEN- TBEV. B. burgdorferi was an leucoEN agent in 12% cases and rarely in panEN (6,2%).

Varicella zoster virus was the most often agent among family Herpesviridae and caused, mostly, white matter damage in more than ½ panEN cases. Mono herpesviral infection was observed in 70,6% of leukoEN and 79,9% polioEN, and mixed herpesviral infection in- ½ all panEN cases.

In all clinical topical variations of EN we observed irregular hyper intensive lesions on T2, FLAIR and DWI MRI. LeukoEN and panEN characterized white matter lesions of the brain and polioEN – thalamus and cortex lesions (table 4).

Table 4.

MRI features in the dependence on clinical-topic variant and cause of EN in children, n/%

MRI-features	LeukoEN, n=249	PolioEN, n=83	PanEN, n=32
1. Lesions localisation:			
Cortex, subrortex	19/7,6	33/39,8	16/50
Thalamus	61/24,5	36/43,4	8/25
Basal ganglia	41/16,5	24/28,9	11/34,4
Brain stem	45/18,1	17/20,6	9/28,1
Cerebellum	121/48,6	6/7,0	10/31,3
Spinal cord	69/27,7	10/12	7/21,9

White matter of hemispheres	201/80,7	14/16,9	30/93,7
Hyppocampus	0/0	16/19,3	4/12,5
2. Lesions characteristics:			
- irregular form	220/88,4	74/89,2	32/100
- regular form	98/39,4	9/10,8	0/0
- lesions symmetry	8/3,2	10/12	28/87,5
- mass-effect	62/24,9	76/91,6	14/43,8
- contrast accumulation	151/60,6	45/54,2	6/18,8
- hemorrhagic area	11/4,4	12/14,5	0/0
3. Area of CNS damage:			
before 25% (1-9 lesions)	208/83,5	57/68,7	0/0
25-75%*	41/16,5	26/31,3	0/0
75% and more	0/0	0/0	32/100
4. Hyperintensive lesions (T2 and/or FLAIR and/or DWI) in:			
-acute end torpid course	142/100	59/100	4/100
-prolonged	48/100	10/100	6/100
-chronical	59/100	2/14,3	22/100
5. Frequency of cystic-glial changes on MRI 1 year later			
- cysts	22/8,8	25/30,1	0/0
- gliosis	78/31,3	27/32,5	22/68,8

*- multifocal brain and spinal cord damage or one and more brain lobes damage

LeukoEN and polioEN characterized by small damaged area (under 25%) with 1 - 9 lesions 3 - 30 mm, asymmetrical with contrast-positive areas in more than ½ cases. Subtotal-total symmetrical CNS structure damage with rare contrast accumulation was observed in patients with panEN. Hemorrhagic lesions were rare, and more often in torpid HSV 1-2, HHV-6, CMV and Influenza virus EN. Cysts were common 1 year later after polioEN and connected with HSV 1-2, and gliosis – with panEN. Chronical case of leukoEN and panEN was ccharacterizedby new lesions and./or growth of “old” lesions. In the case of chronical case of polioEN acute period lesions regressed totally with brain atrophy and internal and external hydrocephalus. This was a marker of inflammatory-demyelination lesions in leukoEN and panEN as a marker of progression and infection chronisation. Patients with polioEN had no new lesions but neuron apoptosis, which leads to brain atrophy, took place.

In ~ 1/2 all EN cases (48.9%) clinical features were similar with lesion localization in CNS structures. Cerebellar form of EN characterized by static and dynamic ataxia, in some cases – speech problems (chanted speech), nystagmus and hyper intensive lesions on FLAIR, T2 and/or DWI localized in cerebellum hemispheres and peduncles. In subcortical forms of EN with basal ganglia and thalamus lesions we observed hyperkinesis, epileptic seizures, hemiparesis, sometimes – akinetic-rigid syndrome. Limbic form of EN with lesions in mediobasal area of temporal lobes more often focal epiliptical seizures with temporal aura were observed. Cortical form of EN characterized by epileptical seizures and comatose-sopour consciousness disorders. Stem forms of EN were observed in leukoEN, polioEN. Thus in polioEN eye movement disorders dominated and in polioEN - other motor nerves nuclei damage with bulbar symptoms and nervous abducens and facial nerves involvement. In more than ½ patients we observed combined forms (cerebrospinal or cerebral), with white or grey matter brain lesions and multifocal clinical manifestations.

Flaccid spinal paralysis were rarely observed in patients with polioEN in case of front corns of spinal cord involvement. Epilepsy and extrapyramidal disorders were quite often symptoms in polio- and panEN, but leukoEN characterized by different disorders of superficial and deep sensitivity. Eye disorders as a result of retro bulbar neuritis and other structure damage was observed in patients with leukoEN, and hearing disorders in children with panEN. Pelvic organs dysfunction of conductor character was observed in all patients groups in case of spinal cord lesions.

Complicated course of EN with several complications took place in ½ patients. Brain edema with different levels of unconsciousness was one of the most common complications and in rare cased it lead to brain dislocation. In spite of total/subtotal brain damage in panEN rarely than in polioEN brain edema took place. Moreover mass-effect on MRI was less expressed, that was connected with slowly inflammatory changes in brain tissue in most amount of patients in this group. Sepsis and secondary bacteria- fungal infections, cerebral vessel or sinus thrombosis, occlusion hydrocephalia were more common in patients under 3 years old in any type of EN. These complications usually combined with brain edema which was a result of neuro-immune-endocrine disorders and lead to other complications.

A year later after EN 49,1% patients had no clinical deficit. Mortality was 1,4%, and unefficiency of the only therapy course with further symptoms progression was in 5,5%.

It is known that EN is quite rare but very severe infectious diseases in children manifestations and characterize by clinical etiological and topical polymorphism. Frequency of EN is 7-9 cases on 100 000 people and depends on different fac-

tors: infectional incidence rates in individual populations and worldwide (outbreaks, epidemia, pandemia); regional, climate and ecological factors; presence of transmitters, prophylaxis and therapy efficacy and in some cases, vaccination rate [1-4]. Moreover absence of vaccination, asymptomatic or erased infections, EN development ability not only in first onset infection but also after reactivation of persistent infections, frequently absence of specific antiviral therapy are quite actual risk factors of EN development, in spite of diagnostical and therapy perfection [5-6]. Therapy start and its complex in children with EN depend on clinical, laboratory, MRI results [7]. Our research has shown that we should take into consideration MRI lesions localization, white or grey matter damage as it is connected with etiology and clinical signs in patients with EN to make the better choice or the therapy to improve outcomes.

Conclusion

Clinical topic variations and forms of encephalitis in children depend on etiology, patients age and connected with the course of neuroinfections process, complication frequency and outcomes of the disease, that can help to optimize diagnostical and therapy process.

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ROLE OF UMBILICAL CORD ABNORMALITIES IN PATHOGENESIS OF ACUTE INTRAPARTUM FETAL ASPHYXIA

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Abstract. *Timely diagnosis and correction of potentially preventable causes of stillbirth and perinatal mortality, which include umbilical cord abnormalities, are of particular relevance in the context of the demographic crisis. Therefore, the purpose of this study was to identify the role of umbilical cord abnormalities in the development of acute intrapartum fetal asphyxia and perinatal mortality in normal term delivery. To achieve this goal, an analysis was made of the causes of 200 cases of acute intrapartum fetal asphyxia in the Ryazan region for the period 2011–2020 with a clear definition of the criteria for inclusion and exclusion in the study. The work uses the methods of expert assessment, system-structural analysis and statistical data processing using the computer software package Statistica v. 11 (StatSoft, Inc., USA). The results of the study revealed a significant contribution of umbilical cord anomalies to the development of acute intrapartum fetal asphyxia (23.5%), the birth of children in a state of severe asphyxia and perinatal mortality, as well as extremely low prenatal diagnosis of umbilical cord anomalies (17.7%).*

Keywords: *umbilical cord abnormalities, acute intrapartum fetal asphyxia, stillbirth, perinatal mortality, umbilical cord prolapse.*

Introduction

Despite the constant improvement of medical technologies and an increase in the quality of obstetric and perinatal care, acute intrapartum fetal asphyxia and stillbirth continue to remain urgent problems of modern medicine [1, 2]. Therefore, the timely diagnosis and correction of potentially preventable causes of stillbirth and perinatal mortality is of particular relevance today. Such causes include umbilical cord abnormalities, which, according to various scientific data, account

for about 10% of the possible or probable causes of stillbirth, and are more common after 32 weeks of pregnancy [3-7]. According to R. Bukowski (2017) and H. Mantakas (2018) et al, the contribution of umbilical cord abnormalities to stillbirth can vary widely, and range from 8% to 65% [8, 9].

The human umbilical cord is a multidifferentiated, constantly growing, extraembryonic organ that ensures the connection of the fetus with the placenta and its life support in the dynamics of pregnancy and childbirth [3-5]. Umbilical cord abnormalities that can cause stillbirth include: entanglement around the neck and body parts of the fetus [8-11]; umbilical cord prolapse [3-5]; true nodes, torsion, or strictures with blood clots [3, 5, 8]; vessels previa [12-15]; marginal or membrane attachment [3-5, 16]; excessive or insufficient number of coils, pathology of Wharton's jelly, vessels and umbilical cord length [3-5, 17-22]. According to J.E. Lawn et al (2016), stillbirth is currently not declining, and continues to increase at an accelerated rate by 2030 [23]. Therefore, prenatal diagnosis of umbilical cord anomalies is an urgent task of modern obstetrics in the 21st century. According to many researchers, the role of umbilical cord abnormalities as a cause of intrapartum fetal asphyxia is insufficiently understood [3-5, 24-26], which determined the purpose of this study.

Purpose of the study was to identify the role of umbilical cord abnormalities in the development of acute intrapartum fetal asphyxia and perinatal mortality in singleton term delivery in cephalic presentation.

Materials and methods

A systemic structural analysis was made of 200 cases of acute intrapartum fetal asphyxia in the Ryazan region in 2011–2020. The analysis included every first 20 cases of this pathology in each year. The study inclusion and non-inclusion criteria were clearly defined (Table 1).

Table 1.

The study inclusion and non-inclusion criteria

Study inclusion criteria	Study non-inclusion criteria
• singleton delivery during full-term pregnancy (> 37 and < 42 weeks gestation) • fetus cephalic presentation • fruit weight less than 4000 g • normal size of mother's pelvis • the presence of normal indicators of non-stress test and (or) Doppler measurements of fetal hemodynamics, and (or) biophysical profile of the fetus before delivery	• multiple delivery, • premature or late delivery • large fetus • anatomically narrow mother's pelvis • placenta previa • absence of normal indicators of non-stress test and (or) Doppler measurements of fetal hemodynamics, and (or) biophysical profile of the fetus before delivery

The main study inclusion criteria: singleton delivery during full-term pregnancy; fetus cephalic presentation; normal size of the fetus and mother's pelvis; the presence of normal indicators of non-stress test and (or) Doppler measurements of fetal hemodynamics, and (or) biophysical profile of the fetus before delivery. The main study inclusion criteria: multiple delivery; premature or late delivery; large fetus; anatomically narrow mother's pelvis; placenta previa; absence of normal indicators of non-stress test and (or) Doppler measurements of fetal hemodynamics, and (or) biophysical profile of the fetus before delivery. A positive non-stress test and (or) normal Doppler measurements of fetal hemodynamics, and (or) biophysical profile of the fetus, before delivery were indirect confirmation of acute intrapartum development of asphyxia.

Methods of expert assessment (clinical, laboratory, instrumental and special research methods, delivery tactics, planning and management of labor) and systemic-structural analysis of the causes of acute intrapartum pathology used in the work. The source of information was the primary medical documentation - an individual card of a pregnant woman and a postpartum woman, delivery history, protocols of pathological and histological examinations of the placenta and fetus (in case of stillbirth). An expert assessment of the protocols for the management of childbirth, ultrasound examination (ultrasound) in the dynamics of pregnancy, the biophysical profile of the fetus (if any), postmortem and histological examination of the placenta, as well as the fetus (with stillbirth and early neonatal death). The results were statistically processed using the Statistica v. 11 (StatSoft, Inc., USA) using parametric and nonparametric statistics methods.

Results and discussion

The structure of the causes of acute intrapartum fetal asphyxia is shown in the figure

The first ranking place in the structure of causes of acute intrapartum fetal asphyxia was taken by the use of oxytocin in labor – 35.5%, the second – premature detachment of the normally located placenta – 31% ($p_{\chi 2}<0.05$). Umbilical cord abnormalities ranked third in the structure of the causes of acute intrapartum fetal asphyxia (23.4%) and were found 1.3-1.5 times significantly less frequently than the previous causes ($p_{\chi 2}<0.05$). Umbilical cord prolapse and labor activity discoordination were significantly less frequent than other causes of intrapartum fetal asphyxia, and amounted to 5.5% and 4.5%, respectively ($p_{\chi 2}<0.05$).

Emergency delivery methods used in all cases with acute intrapartum fetal asphyxia. In the first stage of labor, abdominal delivery was performed – 111 (55.5%) cases, in the second stage of labor, obstetric forceps accounted for 53 (26.5%) cases, fetal vacuum extraction – 36 (18%) cases. Labor outcomes presented in the Table 2.

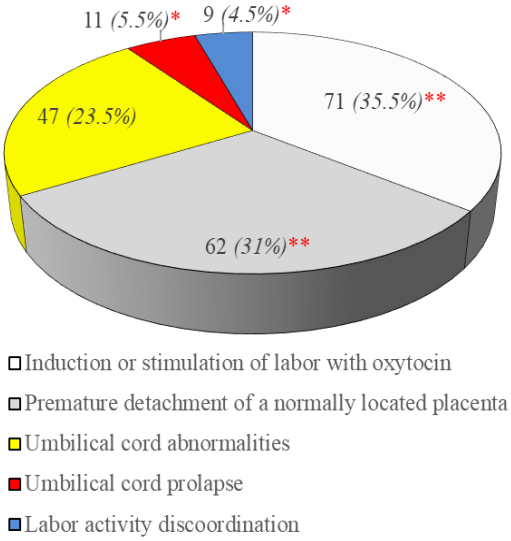

Figure. *The structure of the acute intrapartum fetal asphyxia. Statistically significant differences with the proportion of umbilical cord abnormalities according to the χ2 fit criterion (p<0.05):*
*** – statistically significant higher,*
** – statistically significantly lower*

Table 2.
Labor outcomes in acute intrapartum fetal asphyxia

Causes of acute intrapartum fetal asphyxia	**Labor outcomes, n (%)**				
	Newborn asphyxia		**IFD**	**END**	**discharged alive**
	moderate	**severe**			
Induction or stimulation of labor with oxytocin (n=71)	66 (93.0)*	5 (7.0)*	-	1 (1.4)*	70 (98.6)
Premature detachment of a normally located placenta (n=62)	42 (67.7)	17 (27.4)	3 (4.8)	2 (3.2)	57 (91.9)
Umbilical cord abnormalities (n=47)	24 (51.1)*	19 (40.4)*	4 (8.5)*	1 (2.1)	42 (89.4)
Umbilical cord prolapse (n=11)	8 (72.7)	2 (18.2)	1 (9.1)*	1 (9.1)*	9 (81.8) *
Labor activity discoordination (n=9)	7 (77.8)	2 (22.2)	-	-	9 (100)
All of the reasons (n=200)	147 (73.5)	45 (22.5)	8 (4.0)	5 (2.5)	187 (93.5)

Note: n (%) – the absolute number of cases and their proportion for each of the reasons; IFD – intrapartum fetal death; END – early neonatal death; * – statistically significant differences with the general structure of causes according to the criterion of matching $\chi 2$ ($p_{\chi 2}$ <0.05).

The largest proportion of newborns born in a state of severe asphyxia registered with anomalies of the umbilical cord – 40.4%. With premature detachment of a normally located placenta, it was 1.5 times less (27.4%, $p_{\chi 2}<0.05$), and with labor activity discoordination – it was 1.8 times less (22.2%, $p_{\chi 2}<0.05$). The highest specific weight of perinatal losses was registered with the loss of the umbilical cord loops (18.2%), with umbilical cord anomalies it was 10.6%, and with premature detachment of a normally located placenta – 8%, which was much more often than the average ($p_{\chi 2}<0.05$). There were no cases of perinatal mortality due to discoordination of labor.

Some researchers consider cord prolapse in the overall pattern of cord abnormalities [3, 4]. In our study, out of 11 cases of umbilical cord prolapse, in 3 (27.3%) cases there was a long umbilical cord (more than 70 cm), in 5 (45.5%) cases – polyhydramnios, in 3 (27.3%) cases – a combination of these pregnancy complications. Thus, there were no other anomalies of the umbilical cord during its prolapse in 7 (63.6%) cases. In 6 (54.6%) cases, the umbilical cord prolapse occurred during amniotomy (2 (18.2%) cases), or shortly after amniotomy (4 (36.4%) cases), which did not allow to exclude the iatrogenic cause of this pathology. Possible iatrogenic causes of umbilical cord prolapse could be insufficiently correct amniotomy and amniotic fluid removal, especially with polyhydramnios, as well as activation of women in labor after amniotomy in the absence of insertion of the fetal head [5]. Therefore, isolated umbilical cord prolapse, without a combination with other umbilical cord anomalies, we considered as an independent cause of acute intrapartum fetal asphyxia, separately from other anomalies of the umbilical cord. The results of the analysis of the structure of umbilical cord abnormalities in acute intrapartum fetal asphyxia presented in Table 3.

Table 3.

The structure of umbilical cord abnormalities in acute intrapartum fetal asphyxia.

Umbilical cord abnormalities	Among the umbilical cord abnormalities, n (%)	Share in the overall structure of reasons, %
Single abnormalities	13 (27.7)	6.5
Multiple abnormalities, including:	34 (72.3) *	17 *
The umbilical cord entwined around the neck and (or) fetus body parts	19 (40.4) **	9.5 **
Short umbilical cord, < 35 cm	7 (14.9) **	3.5 **
Long umbilical cord, > 70 cm	21 (44.7) **	10.5 **

Marginal attachment of the umbilical cord	17 (36.2)	8.5
Membrane attachment of the umbilical cord	7 (14.9) **	3.5 **
Excessive number of umbilical cord coils, > 8	13 (27.7)	6.5
Insufficient number of cord coils, ≤ 5	5 (10.6) **	2.5 **
Abnormal number of vessels, including: - *single umbilical artery* - *4 vessels of the umbilical cord, 2 arteries and 2 veins* - *umbilical artery aneurysm* - *false nodes of the umbilical vein* - *thrombosis of the umbilical vein*	13 (27.7) *5 (10.6)* *3 (6.4)* *2 (4.3)* *3 (6.4)* *1 (2.1)*	6.5 *2.5* *1.5* *1.0* *1.5* *0.5*
Pathology of Wharton's jelly, including: - *deficit* - *absence in the umbilical cord at the fetal end* - *edema* - *mucinous cysts*	15 (31.9) *5 (10.6)* *1 (2.1)* *4 (8.6)* *5 (10.6)*	7.5 *2.5* *0.5* *2.0* *2.5*
Average prevalence of umbilical cord abnormalities	13 (27.7)	6.5

Note: n (%) – absolute number of cases and their proportion; statistically significant differences according to the $\chi 2$ criterion ($p<0.05$): * - between the proportion of single and multiple umbilical cord anomalies, ** - in comparison with the average prevalence of umbilical cord anomalies.

The most common probable causes of acute intrapartum fetal asphyxia were a long umbilical cord and an umbilical cord entanglement around the neck and (or) parts of the fetal body (10.5% and 9.5%, respectively, $p_{\chi 2}<0.05$). Somewhat less often, acute asphyxia was recorded with the marginal attachment of the umbilical cord (8.5%), pathology of Wharton's jelly (7.5%) and umbilical cord vessels (6.5%), an excessive number of umbilical cord coils (6.5%). A short umbilical cord and sheathing of the umbilical cord (3.5% each, $p_{\chi 2}<0.05$), as well as an insufficient number of cord coils (2.5%, respectively, $p_{\chi 2}<0.05$), were significantly less likely among the probable causes. ($p_{\chi 2}>0.05$). It cannot be ruled out that such a rating of the probable causes of acute asphyxia among umbilical cord anomalies is due to their prevalence.

Multiple cord anomalies occurred 2.6 times significantly more often than single ones ($p_{\chi 2}<0.05$), and accounted for 34 (72.3%) cases. The number of multiple anomalies in one umbilical cord ranged from 2 to 5, on average 3.1 ± 0.11. Many researchers indicate the prevalence of multiple anomalies of the umbilical cord over single ones [3-6, 8, 10, 17].

In our sample, an insufficient number of umbilical cord coils and a deficiency of Wharton's jelly were always combined with each other (100%), as well as with

the sheath or marginal attachment of the umbilical cord. The frequent combination of these anomalies of the umbilical cord is noted by many authors, who conclude that there is an extremely high risk of acute intrapartum asphyxia of the fetus with a low location of the placenta along the posterior wall of the uterus [3, 4, 16].

In our study, all five perinatal deaths from umbilical cord abnormalities were associated with multiple abnormalities. In all cases of perinatal losses, the pathology of Wharton's jelly was revealed, in four of them - its deficiency in combination with an insufficient number of umbilical cord coils. In three cases, a combination of marginal or meningeal attachment of the umbilical cord, an insufficient number of coils, a deficiency of Wharton's jelly and a low location of the placenta along the posterior wall of the uterus turned out to be fatal. Of all the combined pathology, ultrasound diagnosed only the low location of the placenta. J.H. Collins (2014), I. A. Hammad et al. (2020), M. Arizawa (2021) [3, 4, 16]. In one case, the fatal combination was the twisting of the umbilical cord around the body of the fetus, an excessive number of spirals, a false node of the umbilical vein, and edema of Wharton's jelly. Of all the combined pathology, ultrasound diagnosed only a false umbilical vein node. Many authors point to obstructed blood flow with an excess of umbilical cord coils and its rapid decompensation with the addition of additional complications [17-22].

Of all 164 umbilical cord anomalies registered during histopathological examination, only 29 (17.7%) were diagnosed with ultrasound. The pathology of the number of umbilical cord vessels was always detected. The umbilical cord entanglement around the neck and (or) parts of the fetus was partly diagnosed. Sometimes the marginal and meningeal attachment of the umbilical cord, false nodes of the umbilical vein were diagnosed. Not diagnosed before delivery - pathology of the length of the umbilical cord and the number of coils of the umbilical cord, aneurysm of the umbilical artery, pathology of Wharton's jelly.

Conclusion

The results of the study lead to the following conclusions:

1. Umbilical cord anomalies accounted for 23.5% in the structure of probable causes of acute intrapartum asphyxia of the fetus and took third place after the use of oxytocin in childbirth and premature detachment of a normally located placenta (35.5% and 31%, $p_{\chi 2}<0.05$).

2. The highest specific gravity of severe intrapartum fetal asphyxia was found in cases of umbilical cord anomalies (40.4%, $p_{\chi 2}<0.05$). The largest share of perinatal losses was recorded in cases of cord loop loss, cord anomalies and premature detachment of a normally located placenta, in comparison with other possible causes (18.2%, 10.6% and 8%, respectively, $p_{\chi 2}<0.05$).

3. Out of 11 cases of umbilical cord prolapse in 7 (63.6%) cases, other abnor-

malities of the umbilical cord were absent, in 6 (54.6%) - it was impossible to exclude an iatrogenic cause, which made it possible to consider this pathology as an independent cause of acute intrapartum fetal asphyxia, separately from umbilical cord anomalies.

4. Multiple cord anomalies were detected 2.6 times significantly more often than single ones (72.3%, $p_{\chi 2}<0.05$) during postmortem examination. All perinatal deaths from umbilical cord abnormalities were associated with multiple anomalies.

5. Prenatal diagnosis of umbilical cord abnormalities by ultrasound was 17.7%. Improving the efficiency of prenatal diagnosis of umbilical cord anomalies will make it possible to correctly determine obstetric delivery tactics and significantly reduce the likelihood of developing acute intrapartum fetal asphyxia, severe neonatal asphyxia, stillbirth and perinatal mortality.

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THE EFFECT OF ANTIBIOTIC THERAPY AFTER CATARACT PHACOEMULSIFICATION ON THE DEVELOPMENT OF DRY EYE SYMPTOMS

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Abstract. *Modern ophthalmology has made significant progress over the past few years and, due to the intensification of vital activity, requiring high visual acuity, it quite successfully copes with the presence of cataracts by increasing the number of surgical interventions. Patients are at high risk for the development of inflammatory reactions in the postoperative period, as a result of which anti-inflammatory therapy is carried out.*

This article touched on the day-to-day problems of not only the practicing ophthalmologist. The characteristic features of patient management after cataract phacoemulsification with intraocular lens implantation have been analyzed.

Purpose*: investigate patient complaints about irritated conjunctiva and dry eye symptoms.*

Materials and methods

The study included 197 patients who underwent cataract phacoemulsification with intraocular lens implantation.

Results

All patients were randomized into 2 groups: with complaints of irritated conjunctiva and symptoms of dry eye syndrome - 53 patients (group 1) and without

them - 144 patients (group 2). The groups were assessed by age and gender. In both groups, the effectiveness of the effect of local antibiotics in the postoperative period was assessed. The necessity of prescribing antibiotic therapy after cataract surgical treatment was identified and substantiated.

Conclusion

The features of complications (dry eye syndrome) when prescribing local antibiotic therapy in patients in the early postoperative period after cataract phacoemulsification with intraocular lens implantation are described.

Keywords: *dry eye syndrome, phacoemulsification of cataract, drug support*

Antibiotic therapy is necessary in the postoperative period of eye surgery for trauma, cataract, glaucoma, etc. [2,3,4]. Age-related clouding of the lens - cataract refers to diseases of gerontological, senile age [3]. Patient satisfaction with the result of cataract phacoemulsification often depends on subjective sensations caused by the condition of the ocular surface after surgery [1,2]. Approximately 20% of patients at a follow-up examination one month after surgery present some kind of complaints caused by irritation of the conjunctiva as a result of the use of local anti-inflammatory and antibacterial therapy [5,6,7].

Objective - to study the effect of local antibiotic therapy on the development of conjunctival irritation and dry eye symptoms in patients after cataract phacoemulsification.

Materials and methods

The study included patients who received surgical treatment of cataracts, only uncomplicated phacoemulsification, with the central position of the IOL intracapsularly. We examined 197 patients who underwent phacoemulsification of cataract with IOL implantation from 2018 to 2020, of which 73 patients (37%) were men, 124 patients (63%) were women. The average age is 62.0 (62; 66) years (fig. 1). The results were analyzed using the Microsoft Office Excel 2007 computer program.

Results and discussion

The age structure in the studied group is shown in figure 1, and corresponds to the statistical data of patients operated on for cataracts on the territory of the Russian Federation.

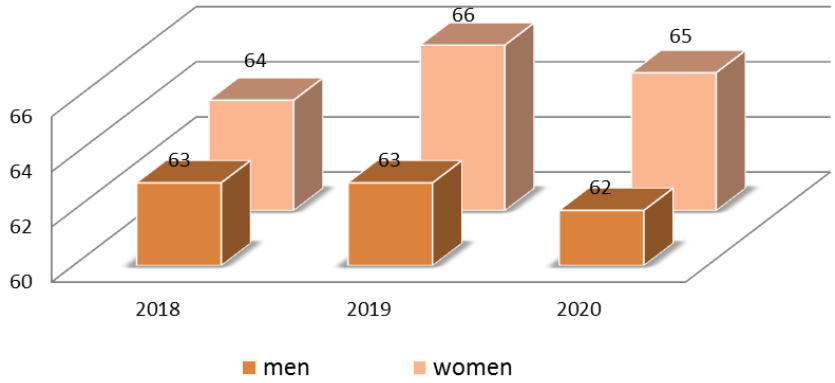

Figure 1. *Age structure of morbidity in the postoperative period of cataract extraction for the period 2018-2020*

All patients were prescribed antibiotic therapy (in accordance with clinical guidelines for the provision of ophthalmological care to patients with age-related cataracts) 1 cap - 3-4 times a day, in the operated eye in combination with 0.1% dexamethasone solution (Fig. 2).

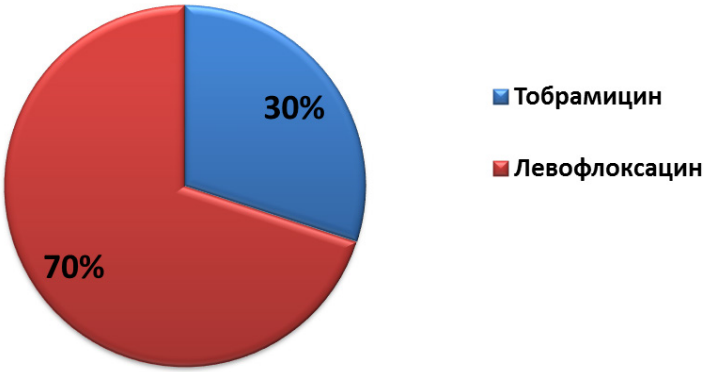

Figure 2. *Use of topical antibiotics in the postoperative period of cataract extraction (%) in patients with irritated conjunctiva and symptoms of dry eye, for the period 2018-2020*

The choice of antibiotic depended on the patient's wishes (many of them were guided by the price of the drug).

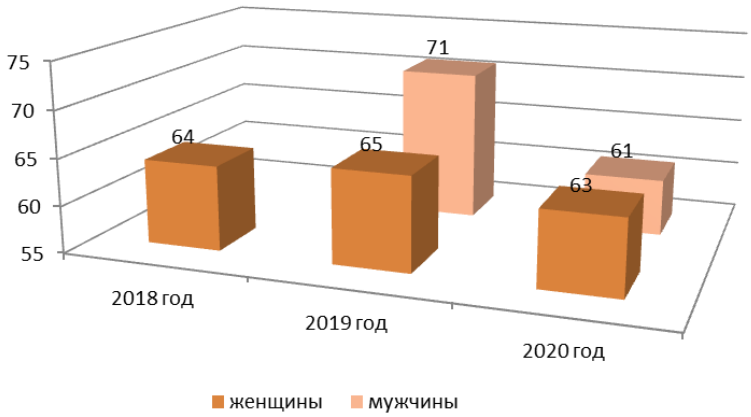

Figure 3. *Age structure of morbidity in the postoperative period of cataract extraction in patients of group 1 for the period 2018-2020*

A month after the operation, the follow-up examination revealed the patient's complaints (feeling of a foreign body, discomfort, burning sensation, sticking of the eyelids, redness of the operated eye, in comparison with the paired eye). Of these, 53 people (group 1), men - 17 patients (32%), women - 36 patients (68%). The average age of patients in group 1 is 66.0 years (61; 71) (fig. 3).

The remaining 144 people (group 2) had other complaints (decreased visual acuity of the pair's eye, symptoms of secondary cataract) (fig. 4).

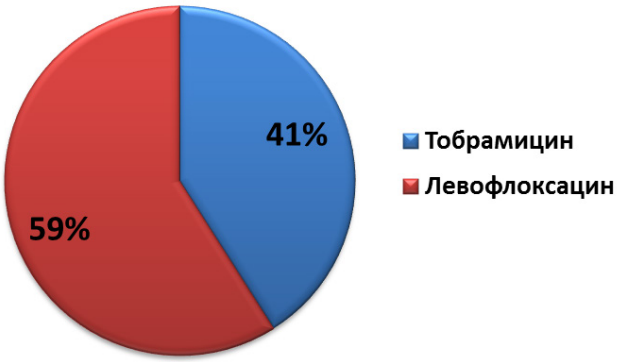

Figure 4. *Use of local antibiotics in the postoperative period of cataract extraction (%) in patients of group 2 for the period 2018-2020*

The gender structure of patients in group 2 is as follows: men — 56 patients (39%), women — 88 patients (61%). The average age of patients in group 1 is 64.0 years (61; 66). Thus, patients of group 1 tend to increase age (over 66 years) and women (68%).

In group 1 (table 1.), patients were prescribed:

• Tobramycin 0.3% solution in 2018 - in 17%, in 2019 - 6%, in 2020 - 7%, which amounted to 30%;

• Levofloxacin 0.5% solution - in 2018 - 2%, in 2019 - 40%, in 2020 - 28%, which was 70%.

Table 1.

The use of antibiotic therapy (%) in the postoperative period of cataract extraction in group 1 for the period 2018-2020

	2018 year abs.(%)	**2019 year abs.(%)**	**2020 year abs.(%)**	**Total abs.(%)**
Tobramycin	9(17)	3(6)	4(7)	16(30)
Levofloxacin	1(2)	21(40)	15(28)	37(70)
total	10(19)	24(46)	19(35)	53(100)

In group 2 (tab. 2.), patients were prescribed:

• Tobramycin 0.3% solution in 2018 - 32%, in 2019 -5%, 2020 - 4%, which amounted to 41%;

• Levofloxacin 0.5% solution in 2018 - 2%, in 2019 -34%, 2020 - 23%, which amounted to 59%.

Table 2.

The use of antibiotic therapy in the postoperative period of cataract extraction in group 2 for the period 2018-2020 (%)

	2018 year abs.(%)	**2019 year abs.(%)**	**2020 year abs.(%)**	**Total abs.(%)**
Tobramycin	46(32)	7 (5)	6(4)	59 (41)
Levofloxacin	3 (2)	49(34)	33 (23)	85 (59)
total	49 (34)	56 (39)	39 (27)	144(100)

Ciprofloxacin 0.3% was also used, but the number of patients was too small (4 patients), so it was not included in the comparison. The patients did not complain when using ciprofloxacin.

Thus, in both groups, patients used more levofloxacin, which is associated with the pharmacological orientation of ophthalmologists.

The dynamics of antibiotic use is presented in tables 1, 2.

Table 3.

The use of Tobramycin 0.3% solution in the postoperative period of cataract extraction

	2018 year abs.(%)	**2019 year abs.(%)**	**2020 year abs.(%)**	**Total abs.(%)**
1 group	9(12)	3(4)	4(5)	16(21)
2 group	46(62)	7(9)	6(8)	59(79)
total	55(74)	10(13)	10(13)	75(100)

There was a tendency to a decrease in complaints characteristic of dry eye syndrome in patients of group 1 (12%, 4%, 5%), respectively, relative to all patients taking tobramycin in the post-operative period.

The opposite trend (an increase in complaints characteristic of dry eye syndrome) is observed in patients taking 0.5% solution of levofloxacin in patients of group 1 (1% -17% -12%, respectively).

Table 4.

The use of Levofloxacin 0.5% solution in the postoperative period of cataract extraction

	2018 year abs.(%)	**2019 year abs.(%)**	**2020 year abs.(%)**	**Total abs.(%)**
1 group	1(1)	21(17)	15(12)	37(30)
2 group	3(3)	49(40)	33(27)	85(70)
total	4(4)	70(57)	48(39)	122(100)

Thus, the results of our study show that the appointment of tobromycin helps to prevent the occurrence of dry eye complaints in patients of gerontological age, regardless of gender.

Clinical case

Patient G., 72 years old, applied for an appointment a month after the phacoemulsification of cataract with implantation of an artificial lens with specific and paraspecific complaints of the dry eye syndrome [1,2]: sensation of dryness in the eyes, discomfort, burning, lacrimation, foreign body feeling, photophobia in the operated eye.

From the anamnesis: the patient for 3 weeks in the operated eye instilled Tobramycin 0.3% solution + Dexamethasone 0.1% solution. An objective examina-

tion revealed signs of conjunctival xerosis in the form of the absence of the normal glossy shine of the bulbar conjunctiva (milky color), exacerbation of chronic meibomian blepharitis. Schirmer's test was 7 mm.

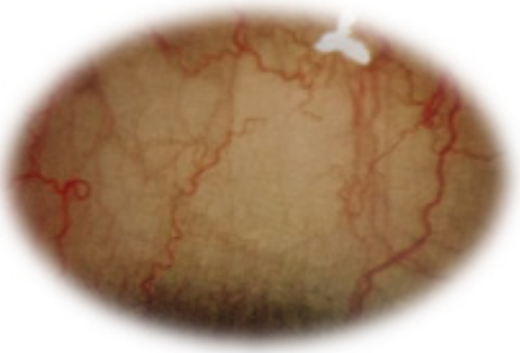

Figure 5. *Biomicroscopy of the bulbar conjunctiva of patient G. 72 years old*

Diagnosed with Artifakia, II degree dry eye syndrome, exacerbation of chronic meibomian blepharitis of the right eye, incomplete complicated cataract of the left eye.

Against the background of the prescribed therapy (Octalmol afterburner, Vizomitin, Massage of the eyelids №2, Gilan) after 2 weeks, the patient noted the leveling of complaints characteristic of the dry eye syndrome, improved tear production - Schirmer's test 9 mm.

At follow-up examination after 3 months, there was no deterioration in indicators.

Conclusions

In our retrospective study, we studied the complaints of patients during a follow-up examination one month after cataract surgery. The study group consisted of 197 people, of whom (53 cases) 27% complained of dryness of the operated eye and irritation of the conjunctiva.

In 2018, oblast ophthalmological dispensary surgeons in most cases after cataract phacoemulsification prescribed a combination of tobramycin + dexamethasone, and since 2019 they have preferred a combination of levofloxacin with dexamethasone in order to minimize the side effects of local antibiotic therapy.

When a combination of tobramycin with dexamethasone was prescribed, complaints were presented in 30% of cases, while complaints of levofloxacin with dexamethasone were presented in 70% of the total number of patients with com-

plaints of irritated conjunctiva and symptoms of dry eye syndrome. At the same time, the use of levofloxacin in this group of patients was 2 times higher than the appointment of tobramycin for 2018-2020.

Ciprofloxacin 0.3% was also used, but the number of patients was too small (4 patients), so it was not included in the comparison. The patients did not complain when using ciprofloxacin.

Based on the above analysis, we consider it advisable to use tobromycin in the postoperative period, as well as to shorten the period of antibiotic therapy in the presence of complaints.

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FEATURES OF ADAPTATION OF ATHLETES TO ANAEROBIC LOADS ACCORDING TO DATA OF VARIATIONAL PULSOMETRY AND PSYCHODIAGNOSTICS

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Abstract. *The results of the study of the anaerobic performance of biathlon on the basis of an individual analysis of vegetative regulation of the heart rhythm are presented. High rates of short-term speed-power work for sportsmen with domination of the central level of activity of regulatory systems are revealed. With an increase in the duration of work in the anaerobic regime, the indicators of maximum anaerobic power and endurance are significantly higher in athletes with a moderate autonomic regulation loop. Biathlonists with a predominance of the sympathetic link of vegetative regulation were characterized by the highest possible indicators of situational and permanent danger, which indicated an anxious-depressive symptomatology during work. Athletes with III and IV types have moderate and low reactive and personal anxiety with elements of a lack of inclination to experience anxiety and anxiety without sufficient grounds.*

Keywords*: athletes, heart rate variability, anaerobic working capacity, situational and personal anxiety.*

Introduction

Analysis of scientific and methodological literature [1-2], a survey of coaches and athletes in this sport showed that the issues of increasing anaerobic working capacity are not given due attention. This is due to the fact that traditionally the physical fitness of biathletes is assessed using functional tests and tests to de-

termine the maximum oxygen consumption. A retrospective analysis of special literature has shown [3] that there are very few works evaluating the special performance of athletes in terms of speed, speed-strength abilities, maximum anaerobic power and endurance in this sport, which actualizes research in this direction. Among the means [1, 4] that can give a true assessment of the functional state of the body and its adaptive potential, in our opinion, the leading role is played by the analysis of heart rate variability. The development of modern physiological research allows a more complete analysis of the indices of the autonomic circulatory system, a new look at their interpretation and adaptation of an athlete to changing conditions of functioning. Moreover, from the point of view of physiology [5], the central nervous system is subjected to maximum loads in biathlon. It is impossible to completely separate emotional stress from the tone of autonomic functions. This is why psychological testing is also relevant in this sport.

Purpose of the work: to assess the anaerobic performance of biathletes at a physical culture university on the basis of determining the individual typological characteristics of heart rate variability, the degree of situational and personal anxiety in a state of relative rest and after bicycle ergometric testing.

Materials and methods

The research was carried out on 15 young men with specialization "Biathlon" of the Smolensk State University of Sports, Smolensk, Russia. For the representativeness of the sample of subjects, anthropometric data (body length, body weight), sports specialization, qualification (1st category-CMS), age (18-20 years) were taken into account. Preliminarily, in the course of the pilot study, the types of autonomic regulation of the heart rate were determined using the "Varicard 2.51" apparatus of the LLC "Institute for the Introduction of New Medical Technologies RAMENA" (Ryazan, Russia) according to the method of N.I. Shlyk [3]. To determine the special performance, the modernized method of bicycle ergometric testing [2] "Ergomedic 894E Peak Bike" from "Monark Exercise AB" (Sweden) was used. The Spielberger scale (adapted into Russian by Yu.L. Khanin) was used as a means of assessing situational and personal anxiety.

Results and discussion

In a state of relative rest, sportsmen recorded different frequency of occurrence for four types of HRV: I - 27%; II - 13%; III - 46%; IV - 14%. According to the obtained data, in comparison with other types of HRV (Table 1), the highest speed abilities according to the studied indicators were found in individuals with a predominance of a moderate central level of activity of regulatory systems. So, the maximum frequency of movements in type I is 3.3% more than in type III and 5.5% compared to type IV.

Table 1.

Indicators of the speed component of muscle contractions in biathletes with a predominance of I-IV types of activity of regulatory systems (M±m)

Indicators	I-type, n=4	II- type, n=2	III- type, n=7	IV- type, n=2	p<0,05
F max	181,25 ±0,30	178,85 ±0,26	175,54 ±0,23	171,80 ±0,20	1-3;1-4; 2-3;2-4;3-4
t 70%	1,850 ±0,010	1,878 ±0,012	1,903 ±0,015	1,945 ±0,020	1-3;1-4; 2-3;2-4;3-4
N max	302,70 ±1,60	297,90 ±1,52	290,11 ±1,45	282,70 ±1,40	1-3;1-4; 2-3;2-4;3-4

Note: F max - maximum frequency of movements; t 70% - the time to reach it; N max - absolute power of work

The dynamics of anaerobic performance indicators, which are similar in direction and magnitude of the shift, depending on the typology of the heart rhythm, is also characteristic of strength abilities.

Table 2.

Indicators of the maximum anaerobic power of biathletes with a predominance of I-IV types of activity of regulatory systems (M±m)

Indicators	I- type, n=4	II- type, n=2	III- type, n=7	IV- type, n=2	p<0,05
MT	74,3 ±0,40	68,56 ±0,30	78,70 ±0,50	78,50 ±0,36	1-2;1-3;1-4; 2-3;2-4
A	8905,11 ±22,70	8630,40 ±20,50	9245,08 ±27,30	9080,60 ±25,08	1-2;1-3;1-4; 2-3;2-4;3-4
N max	717,60 ±2,25	713,40 ±2,03	734,88 ±2,55	727,90 ±2,40	1-3;1-4; 2-3;2-4
Not	7,99 ±0,02	8,39 ±0,02	7,83 ±0,02	7,71 ±0,02	1-2; 1-4; 2-3;2-4
KV	0,952 ±0,015	0,949 ±0,017	0,970 ±0,005	0,964 ±0,010	1-3;1-4; 2-3;2-4
turnovers	36,20 ±0,12	35,02 ±0,08	37,50 ±0,16	37,01 ±0,14	1-2;1-3;1-4; 2-3;2-4

Note: MT is body weight; A is the amount of work; N max - absolute power; Not - relative power; KV - coefficient of endurance

An increase in the duration of work up to 15 seconds made it possible to assess the parameters of the maximum anaerobic power of biathletes with different types of autonomic regulation of the heart rate. The inclusion of glycolysis in energy supply along with the creatine phosphate mechanism changed the reactivity of the executive system and life support systems of the body of biathletes with different types of regulation. In general, biathletes with a predominance of the autonomous regulation mechanism showed statistically high indicators in terms of the total volume of work, absolute power of work, endurance coefficient compared to biathletes with a dominance of the central mechanism of heart rate regulation (Table 3). At the same time, in athletes with a moderate predominance of the autonomous regulation circuit (type III), the highest indicators are recorded. In particular, the volume of work performed was by 3.8%, significantly more than in type I, by 7.1% than in type II ($p < 0.05$) and by 1.9% unreliably higher than in type II. IV type of regulation ($p > 0.05$). An increase in the duration of work in the anaerobic mode up to 45 seconds testified to the relatively high indices of anaerobic working capacity in biathletes with a moderate and pronounced dominance of the autonomous regulation mechanism in comparison with athletes with a dominance of the central mechanism. An accelerated "efficiency" of the transition to the glycolytic path of energy supply is observed, as a result of which the volume and power of the work increases statistically reliably. The analysis of the research results showed that physical activity changed the ratio of the activity of the central and autonomous circuits for controlling the heart rate. The degree of these shifts is different and depends on the type of autonomic regulation.

Table 3

Indicators of anaerobic endurance of biathletes with a predominance of I-IV types of activity of regulatory systems (M±m)

Indicators	I- type, n=4	II- type, n=2	III- type, n=7	IV- type, n=2	p<0,05
MT	74,3 ±0,40	68,56 ±0,30	78,70 ±0,50	78,50 ±0,36	1-2;1-3;1-4; 2-3;2-4
A	14952,30 ±41,10	14870,20 ±39,40	15305,89 ±45,50	15208,80 ±43,10	1-2;1-3;1-4; 2-3;2-4
N max	366,30 ±1,55	360,80 ±1,50	380,11 ±1,90	374,20 ±1,78	1-3;1-4; 2-3;2-4
Not	4,77 ±0,02	4,81 ±0,02	4,32 ±0,02	4,30 ±0,02	1-3;1-4; 2-3;2-4
KV	0,946 ±0,018	0,940 ±0,020	0,965 ±0,008	0,962 ±0,012	1-3;1-4; 2-3;2-4
turnovers	104,57 ±0,08	103,80 ±0,10	108,50 ±0,14	107,65 ±0,12	1-2;1-3;1-4; 2-3;2-4

The analysis of the research results showed that physical activity changed the ratio of the activity of the central and autonomous circuits for controlling the heart rate. The degree of these shifts is different and depended on the type of autonomic regulation. It was found that the organism of biathletes with type III (20%) regulation (table 4) reacted to physical activity with moderate variation of the studied parameters.

Table 4 .

Indicators of variation pulsometry of biathletes with type III autonomic regulation before and after exercise on a bicycle ergometer (M±m)

Indicators	III type		*p<0,05
	before FA (n=7)	after FE (n=3)	
	1	2	
Heart rate	69,25±2,02	70,47±2,11	-
RMSSD	70,50±1,80	62,60±1,45	*
PNN50	45,02±1,75	30,11±1,40	*
TP	5670,40±70,45	4511,40±62,70	*
HF	2005,11±53,66	1601,80±42,15	*
LF	1950,27±50,80	2290,30±56,22	*
AMo	24,50±0,35	29,16±0,23	*
SI	40,55±2,07	63,19±2,30	*
LF/HF	1,40±0,05	2,54±0,35	*
VLF	1520,06±62,50	986,76±65,43	*

Note: 1) before physical activity; 2) after exercise

Thus, among the characteristics of the autonomous regulation circuit, the studied parameters decreased: RMSSD - by 11.20%, pNN50% - 33.11%, HF - by 20.11% (in all cases, $p < 0.05$). Shifts of different magnitude were also noted in the indices of the sympathetic heart rate control circuit. In particular, AMo increased by 19.02%, LF - by 17.43%, LF / HF - by 81.42% (in all cases, $p < 0.05$-0.01). In athletes of this group, physical activity caused a decrease in activity on the part of cortical control structures with a decrease in the VLF value by 35.08%, ($p < 0.05$). The body's resistance to physical activity is confirmed by an unreliable 1.76% increase in heart rate for physical activity ($p > 0.05$). Representatives of other types of heart rate regulation showed its multidirectional dynamics in response to bicycle ergometric testing. In particular, in type I, the values of the autonomous control loop decreased, with a rapid increase in the activity of cortical centers, which indicated an increase in centralization and depletion of energy resources. In athletes with type II regulation, the activity of the autonomous link significantly decreased

against the background of the increased contribution of the humoral control center, which reflected the excessive tension of autonomic functions during testing. For biathletes with type IV, the minimum values of the autonomous and cortical division of regulation on the load are characteristic, with a tendency to increase the activity of the sympathetic link. At the final stage of the research, the situational and personal anxiety of athletes was assessed depending on the typological characteristics of heart rate control according to the Spielberger-Khanin method.

Table 5.

Dynamics of the level of anxiety of biathletes before and after physical activity on a bicycle ergometer with different types of autonomic regulation (M±m)

Type		Reactive anxiety	Personal anxiety
I	before FA (n=4)	49,25±1,45	42,05±1,50
	after FE (n=2)	44,11±1,30	40,40±1,41
	%	-10,43	-3,92
	W	20	45
	p	<0,05	>0,05
II	before FA (n=2)	60,25±1,70	44,30±1,55
	after FE (n=6)	48,40±1,48	42,50±1,35
	%	-19,66	-4,06
	W	22	50
	p	<0,05	>0,05
III	before FA (n=7)	40,80±1,25	35,78±1,20
	after FE (n=3)	35,55±1,14	33,06±1,10
	%	-12,86	-7,60
	W	24	60
	p	<0,05	<0,05
IV	before FA (n=2)	28,50±1,03	29,40±1,05
	after FE (n=4)	25,20±0,90	28,10±1,01
	%	-11,57	-4,42
	W	19	48
	p	<0,05	>0,05

Note: up to 30 points - a low level of anxiety; 31-44 points - moderate level of anxiety; 45 or more points - high level of anxiety

Data analysis (Table 5) showed that before physical activity, type II biathletes had the highest reactive anxiety value of 60.25 ± 1.70 points and this indicated anxiety-depressive symptoms. The subjects, having a stable tendency to perceive a wide range of situations as threatening and to react to such conditions with a state of anxiety, at the time of testing experienced a certain tension, anxiety and nervousness. High values of this indicator were also noted in persons with type I regulatory systems, 49.25 ± 1.45 points. Athletes with type III are characterized by moderate values of reactive anxiety 40.80 ± 1.25 points, which testified to their less dependence on perceiving stressful or seeming situations as dangerous or threatening and reacting to them with anxiety (i.e., an increase in reactive anxiety). At the time of testing, the athletes were in a relatively calm emotional state. Athletes with the IVth level of cardioregulation have a low threshold of stress anxiety of 28.50 ± 1.03 cu, no tendency to experience anxiety and anxiety without sufficient grounds. As for the level of personal anxiety, in persons with the first and second types of HRV, its highest values close to its high range were found: 42.05 ± 1.50 and 44.30 ± 1.55 points, respectively. This circumstance testified that respondents with low stress resistance are prone to groundless experience of anxiety and anxiety, having low emotional resistance and frustration tolerance, and in a stressful situation, they lost their calmness and composure. Athletes with the third type of cardioregulation have a moderate level of personal anxiety of 35.78 ± 1.20, and those with the fourth type have low values of constant anxiety of 29.40 ± 1.05 points. Low psychasthenia is the result of an active repression of high anxiety by a person in order to show himself "in the best possible light" (N.V. Mazanko, 2012). The greatest decrease in situational anxiety by 19.66%, as a psychological state, was noted in persons with type II heart rate variability. Less pronounced changes by 10% -13% were found in I, III and IV types of activity of regulatory systems (in all cases, $p < 0.05$). A statistically significant decrease in personal anxiety, as a stable characteristic of a person, was found only in athletes with type III regulation by 7.6% ($p < 0.05$).

Conclusion

Evaluation of anaerobic performance of biathletes based on an individual analysis of autonomic regulation revealed that the highest level of speed and strength abilities for all studied parameters was observed in individuals with a predominance of a moderate central level of activity of regulatory systems. At the same time, most of the parameters of maximum anaerobic power and endurance in athletes with a predominance of a moderate autonomic regulation circuit were higher than all the studied types. Physical activity changed the ratio of the activity of the sympathetic and vagotonic links to control the heart rate. The degree of these shifts was different and depended on the type of autonomic regulation. A

stable relationship was revealed between the body mass index of athletes and the individual typological characteristics of cardioregulation. When determining the state of vegetative homeostasis and its specific features, it is necessary to take into account the psychoemotional status of athletes.

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STATUSES OF PHYSIOLOGICAL PATTERNS OF MICROPOPULATIONS OF MODERN STUDENTS OF THE NIZHNY NOVGOROD REGION

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Abstract. *The physiological status of students in the Nizhny Novgorod region was observed longitudinally in the context of anthropometric, physiometric, hemodynamic constants. Objective physiological patterns of both absolute values of indicators of age-sex groups and age-sex dynamics are shown: body length, body weight, chest circumference, systolic, diastolic blood pressure, heart rate. Integral indicators of anthropometry demonstrated the objective dynamics of intrapopulation modifications.*

Keywords: *plastic physiological constants, pattern, trend, population, regulatory framework.*

Introduction

An important problem of modern age physiology is the study of changes in the adaptive capabilities of the younger generation and the impact of natural anthropogenic risk factors on their health [Agajanyan N.A., Severin A.E., 2004, 2021, Baranov A.A., Kuchma V.R.2019, 2021, Bezrukikh M.M., Sonkin V.D.2019].

Purpose of the study to establish spatial and temporal patterns of status dynamics of physiological patterns of micropopulations of modern students of the Nizhny Novgorod region.

Materials and methods

A study of plastic physiological constants in a range of factors, such as total body size, was carried out using the absolute values of functional indicators in the

regional retrospective, as well as modern children and adolescents in combination with the actual environmental conditions of the Nizhny Novgorod region, a specific region of the subject of the Russian Federation, the Volga Federal districts.

The degree of freedom of the analysis carried out for 18810 children and adolescents of 1944-2021, with the addition of our own observations in 2011/21, 11400 children and adolescents of 7-17 years of age.

Results and discussion

They showed 75-year dynamics of anthropometric and 50-year dynamics of all indicators of physical development of students in the Nizhny Novgorod (Gorky) region in the context of checking the results of their own research with the published results of similar generalizing studies 1944/45 (schoolchildren age 8 - 15 years) [Spitkovskaya Z.A. 1945], in 1966/67 [Dorozhnova K.P. 1970] and 2011/12. (schoolchildren age 7 - 17 years old) [Bogomolova E.S. 2021].

The convergence of conditions and lifestyles, nutrition, ecological environment, information loads as inevitable modern trends have shown their reflection in a linear and non-uniform vector of modifications of their increments over the observed period among students of the Nizhny Novgorod region as a subject of the Volga Federal District.

Since 1944, the body length among students of the region has increased by 11-13% by 2021, while body weight has increased by 24-42%. For peers of the megalopolis of Nizhny Novgorod, the growth over the specified period is shown somewhat lower, due to the higher initial values of the mid-forties of the last century.

During the observed period, the age of the first intersection of the growth curves of length and body weight in modern peers has decreased by almost one year. Among the contemporaries of the region, the intersections are shown at the age of 11-14 according to the indicated indicators, and among the inhabitants of the metropolis, respectively, at the age of 11-13 / 12-13.

It was revealed that from the age of 14 living in the region until the completion of growth processes versus 13 years in urban boys, an excess of the total body size begins in relation to girls.

Indicators of morphofunctional development in their contemporaries' age dynamics are characterized by a high correlation with total body size (at $R = 0.75$-0.92), an average correlation with physiometry (at $R = 0.42$-0.85), low - with hemodynamics (with $R = 0.21$-0.40). While maintaining the population patterns of growth and development of organisms of children and adolescents for the period from the forties of the last century to this year, with significant increases (at $p < 0.05$) in anthropometry indicators, an acceleration of the growth rate with its rejuvenation from three to four years of their maxima , with an increase in the regression coefficient (Rx / y) by 18.7%; partial sigma (σR) by 96.7% with the peak of population acceleration in the late sixties and early seventies of the last century.

The anthropometry indicators of children and adolescents in the region, for the period under study, show a tendency for the average values of peers to converge both in the city and in the countryside, due to a more intensive, significant ($p < 0.05$) rate of increase by 10% among schoolchildren of the region 7-17 years old.

It was determined that against the background of the preservation of the age-related patterns of ontogenesis of growth processes in the observed students of the region, objective trends in the dynamics of both physiometric and hemodynamic parameters from 1970 to 2021 were established: the vital capacity of the lungs increased by 0.17-0.35 liters, statistically significant only for individual intra-age -sexual groups; Hand dynamometry in most intra-age groups, moderately statistically significantly decreased at 7/11 and at 16/17 by 0.5 / 2.0 kilograms. Indicators of systolic and diastolic blood pressure during the observation period significantly increased by 10/19 mm. rt. Art .; the increase in diastole exceeded the increase in systole in most of the observed age-sex groups. In the context of hemodynamics, the mean values of the heart rate changed in a mosaic manner and in most groups was statistically insignificant.

The dynamics of values (BPS) score of puberty [Maksimova T.M. Bogomolova E.S. 2012]. statistically significant is determined by both age and environmental conditions of the territory, the administrative-territorial feature. BPS is lower in pupils in the periphery of the region; higher for those living in the south of the region or on the right bank of the Volga River, that is, the conditions of the biosphere and geography. In the south of the region, boys with a lag in the level of biological development are 1-2 times less and 1.5-2 times ahead. In girls, the predominance of the lead is more significant with the relative equality of the percentage of lagging behind.

Conclusion

Students living in the southern territories of the right bank of the Volga River, in general, show a more optimal pattern of physical development groups (at $p < 0.05$) with a higher percentage of normal physical development of 74.2% versus 70.3% in the north of the region, and a statistically significant increase in the average values of normalized indicators of physiological constants, relative to their peers living in the northern territories of the Nizhny Novgorod region (at $p < 0.05$).

As a result of a comprehensive study, the obtained indicators are systematized by age and sex, centered, taken as the basis of regional standards for the physical development of children and adolescents of 7-17 years of age in the present period of the evolutionary development of the population.

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NEW TYPES OF SUBSTATIONS FOR VOLTAGE 6-10/0.4 KV IN DISTRIBUTION NETWORKS OF DECENTRALIZED POWER SUPPLY OF THE REPUBLIC OF SAKHA (YAKUTIA)

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Abstract. *In the future, the zone of decentralized power supply of the Republic of Sakha (Yakutia) will remain due to the large distances between settlements and weak transport infrastructure. The voltage of 6-10 kV and 0.4 kV distribution networks is highly susceptible to distorting loads caused by the widespread use of converters and electric motors. Consumers will be provided with electricity from local low-power energy sources, mainly diesel power plants using distributed generation, including renewable energy sources, which will further worsen the performance of electrical energy in distribution networks due to fluctuations in the parameters of these sources. Therefore, it is necessary to create and introduce new types of devices in distribution networks. For a comprehensive solution to the problem of reactive power compensation (voltage stabilization), balancing and dynamic filtering of voltage in distribution networks, a new technical solution is proposed based on a thyristor stabilizer of parameters.*

Keywords: *Distribution networks, distributed generation, RES, intelligent substation*

Introduction

The electric power industry of the Republic of Sakha (Yakutia) includes a zone of centralized and decentralized energy supply. Centralized power supply covers 36% of the territory of the republic, where 85% of the population lives. The decentralized power supply zone includes the vast territory of the republic with a large number of autonomous power plants that supply individual villages and mining

enterprises. The zone of operation of autonomous energy covers an area of 2.2 million km^2 (64%) with 15% of the population living in the republic.

In the future, the zone of autonomous power supply will remain due to the large distances between settlements and weak transport infrastructure, which does not allow significantly expanding the centralization of power supply. Consumers will be supplied with electricity from local low-capacity energy sources, mainly diesel power plants. The absence of large consumers in this territory makes it inexpedient to build energy sources of large installed capacity. The exception is large consumers in the development of promising fields.

As part of the implementation of the Decree of the President of the Russian Federation dated 05.07.2018 № 204 "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024", the "Plan for the modernization of ineffective diesel (fuel oil, coal) generation in isolated and hard-to-reach territories" was adopted, approved by the Deputy Chairman of the Government of the Russian Federation D.N. Kozak 08.15.2019. In June 2020, an Agreement was signed between the Government of the Republic of Sakha (Yakutia) and PJSC "RusHydro" "On cooperation in the implementation of projects to modernize diesel generation", which provides for the preservation of fuel savings in electricity tariffs in order to return investments under energy service contracts. Based on this Agreement, projects for the modernization of diesel generation using RES generation and energy storage systems will be implemented.

Electricity supply to consumers in local energy systems with RES generation in general ensures reliable energy supply and leads to a decrease in diesel fuel consumption. Local power systems with RES generation will be built using the principle of controlled power systems with automatic control of both production and transport and consumption of electricity.

The voltage of 6–10 kV and 0.4 kV distribution networks is highly susceptible to distorting loads caused by the widespread use of converter devices and electric motors (a large consumer is the public utility sector), asymmetric distribution of consumer loads. As a result, conditions are created in the electrical network under which the deviations of the supply voltage at the terminals of electrical receivers exceed the permissible values established for them by GOST R 54149-2010. Voltage is subject to fluctuations and flicker, sinusoidal distortions, and unbalance. The voltage deviations in the network exceed 10%, in some places the voltage drops in the network reach 40%, mainly due to the length of the distribution networks; the phase load asymmetry reaches two times; excess of harmonics, multiples of 3 (3, 15, 21), reaches 6.5%; total sinusoidal distortion is greater than 8%.

The inclusion of distributed generation in the network, including renewable energy sources, can further degrade the characteristics of electrical voltage in the distribution network due to fluctuations in the parameters of these sources.

Purpose of the study – creation and implementation of new types of devices in distribution networks.

Materials and methods

A comprehensive and optimal solution to such problems is feasible with the use of flexible alternating current transmission system (FACTS), as well as new technologies of active-adaptive networks (Smartgrid). The main idea of controlled AC power transmission is to create distribution networks that provide operating characteristics in the process of operation that meet all regulatory requirements, specified indicators of quality, efficiency and reliability of transmission and distribution of electrical energy.

Many developers and scientific communities are engaged in the development and improvement of voltage regulation and stabilization methods [1–7].

The disadvantages of the traditionally used means of ensuring the quality of electricity initiate the development of one of the most effective specialized devices for controlling the voltage parameter based on elements of high-current converting equipment.

Results and discussion

For a comprehensive solution to the problem of reactive power compensation (voltage stabilization), balancing and dynamic filtering of voltage in distribution networks, a new technical solution is proposed based on a thyristor parameter stabilizer [8] developed by V.P. Larionov Institute of the Physical-Technical Problems of the North of the SB RAS. The block diagram of an intelligent substation is shown in fig. 1.

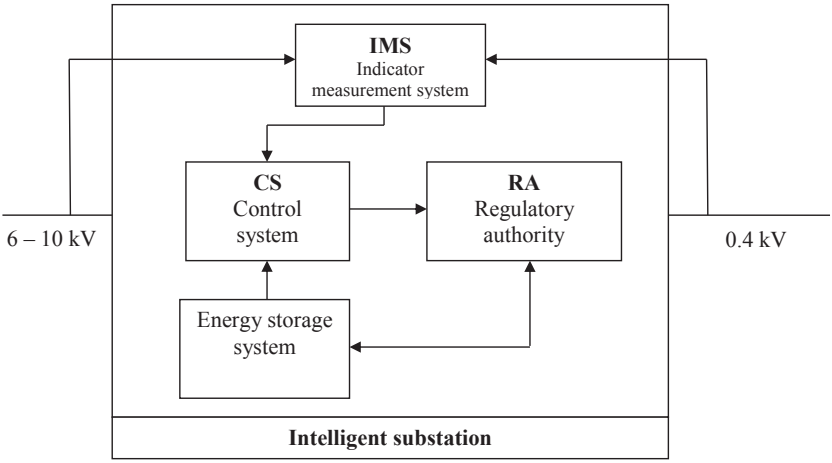

Figure 1. *Structural diagram of an intelligent substation*

An intelligent substation based on a thyristor stabilizer of parameters is designed to perform the following functions:

- voltage stabilization due to reactive power compensation;
- suppression of the reverse voltage component (voltage balancing);
- filtering higher voltage harmonics in static and dynamic modes;
- damping of transient processes.

To ensure the static and dynamic stability of the systems, it is advisable that the substation works in conjunction with electric energy storage devices. The use of energy storage devices is a promising direction in the development of the electrical distribution network, which significantly increases the reliability of this network.

Conclusion

Based on the considered problems, a comprehensive solution in the field of the development of intellectualization of substations is the creation of a new type of substations for distribution networks as a single complex that uses, along with traditional substation equipment (transformers, switching and measuring equipment, control, protection and automation systems) new technologies to improve the reliability and quality of power supply in the context of the emergence of distributed generation, including renewable energy sources.

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PRODUCT DESIGN TAKING INTO ACCOUNT THE ANALYSIS OF THE CAUSES OF NONCONFORMITIES

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Abstract. *One of the tasks required to find food products on the market is to reduce the risks of production and sale of products that do not meet the requirements established by regulatory and technical documentation. Designing quality indicators, recipes and production technology, taking into account data on the causes of non-conformities, can significantly reduce the risk of producing and selling low-quality products.*

The objects were: complaints and opinions of consumers about the quality of structured dairy products, production technology and formulation of yoghurt and curd product, requirements for their quality and production processes. The research methodology included qualimetric forecasting methodology, quality tools and technologies; methodology for the development of elements of the management system.

An approach is proposed for the design of products and their production processes on the basis of an analysis of the reasons for inconsistencies in the quality of products sold. The choice of structured dairy products as an example for testing the proposed approach has been substantiated. Data on claims on the quality of structured dairy products from trade enterprises and consumers' opinions

about the defective products found by them have been identified, systematized and analyzed. The main causes of nonconformities in structured dairy products were identified, described and ranked by frequency of detection, and recommendations were developed to minimize the risks of inconsistencies, including modes of technological processes, sanitary state of production, and product formulations. Revealed and ranked according to the degree of contribution to the formation of stable quality of the finished product, the components of the recipes, proposed ways to ensure the "quality stock" of the sold products by designing the recipe.

The proposed approach allows you to correctly highlight the focus in the design of products and production processes and reduce the risks of manufacturing and selling low-quality products.

Keywords: *product design, manufacturing processes, quality, food safety, nonconformities, defects, dairy products*

Introduction

According to the scientific concept of design and forecasting of food safety and quality indicators [1], the formation of food quality and safety indicators includes two large blocks: modeling (design) of processes and modeling (design) of product quality, which are based on a set of requirements, imposed on products and processes both by the regulatory authorities [2,3] and the needs of the market [4,5].

The principles of qualimetry of food products [2] are based on the fact that the quality of products is considered as the degree of satisfaction by products of the desires of consumers [3,4,5], subject to compliance with the mandatory requirements for product conformity in terms of identification indicators and safety indicators [6].

The sale of food products that do not meet safety requirements is unacceptable. It is also unacceptable to sell products that do not meet the established requirements for identification indicators [2,5,6,7].

The initial requirements in the design of food products is the design of products and processes of its production, ensuring the minimization or complete elimination of risks of production and sale of products with inconsistencies with the established (regulatory and technical documentation) and anticipated (incl. consumers) requirements [1,8, 9]. In this mechanism, an important role is played by the availability and recording of data on the feedback of product manufacturers and consumers (both end buyers and trade enterprises) [1, 10]. Analysis of data on the types of nonconformities of products, the frequency of their detection, places of detection of inconsistencies in the movement of goods and sales and other information about the post-production stages of the product life cycle plays an important role in the formation of the initial requirements for quality indicators and

"safety margin" of products [11,12,13].

It is especially important to design products taking into account the data on discrepancies identified at the post-production stages of the product life cycle for dairy products, in particular, structured dairy products as the most popular among the child population and in the structure of a healthy lifestyle [4, 10].

The aim of the study was to design products based on the example of structured dairy products, taking into account the analysis of the causes of non-compliance with the established requirements.

Materials and methods

The objects of research in the work were:

- a set of requirements of regulatory and technical documentation for the quality and safety indicators of raw materials and structured dairy products, as well as for their production processes;
- complaints about the quality of structured dairy products (cottage cheese, curd product, curd cheese, yoghurt, yoghurt product, pudding) sent to the distribution center;
- technology [14] and formulation of structured dairy products (yoghurt [15] and curd products [16]).

When designing structured dairy products based on the development of the scientific concept of modeling and predicting food safety and quality indicators, in terms of analyzing the causes of non-conformity of products with established requirements, and the qualimetric forecasting methodology [4,17], the following were used:

- research methods and methodology: qualimetric forecasting methodology [4], incl. the method of questioning [4, 18] taking into account the data [19], qualimetric scales [4,17], expert qualimetry [4,17], organoleptic analysis [20,21];
- quality tools and technologies: checklist [22], matrix diagrams [4,10,17];
- methodology for the development of elements of the quality management system [23,24] and security [25,26].

The data obtained were processed by methods of mathematical statistics using an Intel (R) Core (TM) i7 personal computer using Microsoft Excel and SAP software.

Research results and their discussion

The proposed approach to product design, taking into account the analysis of the causes of nonconformities, includes the implementation of four large elements (analysis of the causes of complaints and defects, assessment of product quality by consumers, search for ways to improve products and processes, and the design of quality and safety itself: i.e., product quality design and design process quality) scientific concept of design and forecasting of indicators of food safety and quality [1].

To analyze the reasons for the discrepancies, an array of statistical data on quality claims received by the distribution center of Moscow from trade enterprises of 6 federal districts of the Russian Federation (Central, Southern, Privolzhsky, North Caucasian, North-West and Ural) was collected and analyzed from January 2015 to December 2019. It was found that over 5 years, out of 1477 cases of complaints about the quality of dairy products requiring refrigerated storage were identified. 33 cases of detecting inconsistencies in structured dairy products with flavoring fillers, of which 11 cases were cottage cheese, 7 was a curd product, 6 were curd cheese, 4 were yoghurt, 3 - yoghurt product and 2 - pudding. The reasons for claims for structured dairy products were (Figure 1): labeling inconsistencies (20 cases), bloated packaging (6), liquid separation (5), inappropriate taste (2) and odor (2). Some of the complaints were for products in which several types of non-conformities were found simultaneously.

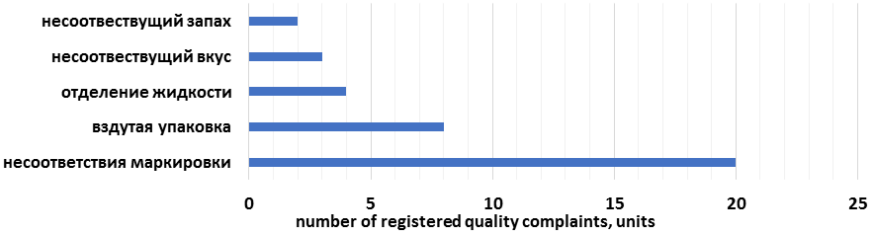

Figure 1. *Frequency of detection of nonconformities in structured dairy products (complaints)*

Conducted consumer opinion surveys showed that 64% of 100 surveyed respondents encountered at least once in their life structured dairy products of inappropriate (unacceptable) quality: 23% of respondents - cottage cheese, 22% - curd products, 21% - yoghurt products, 12% - yoghurts, 10% - curd cheeses and 7% - puddings. Moreover, two-thirds of these respondents, after discovering low-quality products, decided not to buy this brand of products anymore and/or to avoid the trading company where the marriage was acquired.

It was found that since structured dairy products are often purchased by children, the consumer makes additional increased requirements for product safety: 17% of the respondents named "product safety" as a criterion for evaluating products. And according to the Noriaki Kano model [27], safety belongs to the group of basic indicators, which the respondents should not talk about, but which are taken for granted in the products [10,27,28]. The survey showed that consumers most often encountered the following inconsistencies in structured dairy products (expressed in the "consumer language"): expired product, packaging deformation,

stratification and separation of liquid, bloated packaging, unpleasant (spoiled) odor, leakage, presence of film or plaque, unpleasant (spoiled) taste, etc. (Figure 2).

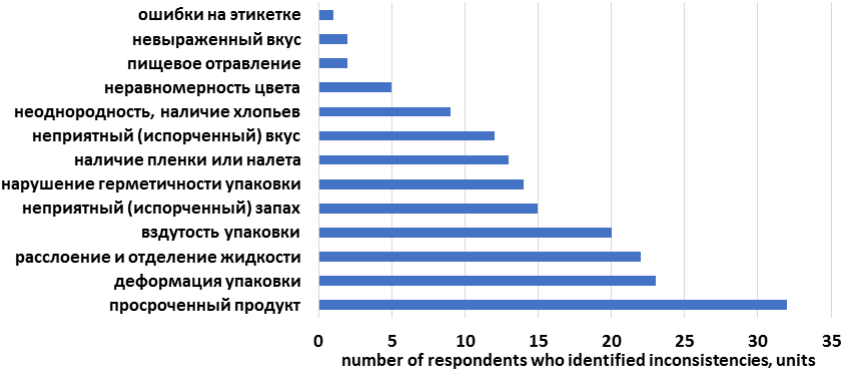

Figure 2. *Frequency of detection of structured dairy nonconformities by consumers*

The analysis of the received data on complaints and opinions of consumers testifies (table 1), that the main reasons for inconsistencies are microbiological spoilage, violations of production technology and equipment operation modes, violations of storage and transportation conditions of products, sanitary state of production, untimely extraction of expired products from trade, personnel competence. The main mechanisms for reducing the risk of inconsistencies are strict adherence to the established requirements: for the production and distribution of finished products. The efficiency of compliance with the established requirements increases due to the development and implementation of the HACCP principles that are binding on all participants in the production and distribution of food products [29,30].

Table 1.

Recommendations for minimizing the risks of non-conformity in structured dairy products

№	Number of cases of detection of claims/ consumers	Name of nonconformities	The main reasons for inconsistencies	Recommendations for minimizing the risks of non-compliance
1	8/20 2/15 3/12 -/2	bloated packaging, unpleasant inappropriate smell, unpleasant inappropriate taste, food poisoning	microbiological damage to the product: violation of production technology, sanitary state of production, violation of storage conditions	compliance with technological modes of production, improvement of the sanitary state of production, compliance with storage conditions, selection of technological and recipe solutions to reduce the risks of microbiological spoilage
2	-/23 -/14	deformation of the packaging, violation of the tightness of the package	mechanical damage during the movement of goods	neat transportation and movement of goods
3	-/32	expired product	untimely extraction of expired products from trade	improve control over the shelf life of products in the sales area
4	4/22	stratification and separation of liquid	violation of storage regimes, lack of moisture-binding ingredients in the formulation	compliance with storage regimes, correction of the formulation (selection of moisture-binding ingredients)
5	20/1	inconsistency of labeling	the competence of the developer of the labeling, the operation of the marking equipment	selection of qualified personnel, control over the operation of marking equipment, selection of reliable suppliers
	-/13	the presence of film or plaque	microbiological spoilage or violation of technology	see item 1
	-/9 -/5	heterogeneity, presence of flakes, color unevenness	violation of production technology, violation of storage conditions	compliance with technological modes of production, compliance with storage conditions, selection of technological and recipe solutions
	-/2	unexpressed taste	violation of production technology	compliance with technological modes of production, selection of technological and recipe solutions

In addition to the implementation of mandatory measures for production and distribution of goods, two methodologically different methods can be used to reduce the risks of inconsistencies. The first method consists in the development and implementation of elements of the technological risk management system [10,17] in traceability, including for the types of inconsistencies identified. Using the risk qualimetry methodology [17], we have formed information-matrix models for structured dairy products, which are the basis for scientific justification in the design of production processes, which allows us to identify technological operations and their modes that reduce the risks of product inconsistencies.

The second way to ensure the quality and safety of products is to design production technology and product formulations. In particular, the introduction into the formulation of components that increase the "safety margin" and shelf life and reduce the risks of the most undesirable inconsistencies, as well as the selection of technological modes that reduce the risks of producing products with inconsistencies.

The need to form a "margin of safety" in the products manufactured by the enterprise is due to the fact that losses and losses (image - in the eyes of consumers, financial and organizational - fines, orders of regulatory authorities, litigation, etc.) are borne primarily by the manufacturer of products. But he cannot provide full control over all participants in the distribution of goods to the final consumer. The manufacturer must guarantee the quality and safety of products, but cannot guarantee compliance with the requirements for storage and transportation of products outside the manufacturer [10]. It is necessary to form a "margin of safety", which allows to increase the safety of products in case of minor violations in the process of commodity circulation.

Based on the risk qualimetry methodology and the developed information-matrix models for the formation of quality and safety indicators for structured dairy products, we have developed recommendations for the design of the quality of structured dairy products and their production processes, as reflected in STO №00492931-002-2020 dated 12.14.2020 "Management procedure for inappropriate products". In particular, mechanisms have been developed to increase the "safety margin" of structured dairy products, primarily through a set of measures to improve the sanitary safety of production, higher requirements for feedstock and an increase in the temperature of heat treatment.

Matrix diagrams of the components of the formulation of structured dairy products have been developed, which make it possible to identify and describe the relationship between the components of the formulation and the degree of their influence on the identified basic nonconformities of products. The coefficients of importance of the components of the formulation (m_i), were determined, describing the contribution of the main components of the formulation in ensuring stable

quality indicators of structured dairy products: depending on the type of dairy product, m_i of the structurant varied from 22.1 to 27.5%, the milk base - 21.7-26.2%, antioxidant - 10.3-14.3%, flavoring filler - 9.3-12.3%. It was found that the "safety margin" can be increased due to the structure-forming and moisture-binding components of the formulation, as well as antioxidants. The introduction of antioxidants into the structured milk matrix allows not only to increase the nutritional value and impart functional properties to the product, but also to reduce the risks of microbiological spoilage and the occurrence of a number of defects in the finished product. For pasteurized yoghurt and curd products, recommendations have been developed for the introduction of preservative ingredients, as well as an increase in temperature to 92±2ºC of heat treatment of the mixture before filling in combination with an additional introduction of a protein stabilizing component (for example, Stabisol MS 60 in an amount of up to 0.8%).

Conclusion

Analysis of the causes of nonconformities in structured dairy products made it possible to identify the most sensitive bottlenecks in the processes of formation of product quality and safety, the purposeful management of which will reduce the risks of releasing nonconforming products on the market. The main types of reasons for nonconformities of structured dairy products have been established, recommendations have been developed for the design of processes and quality indicators for products with a "safety margin". The components of the recipe were identified and ranked according to the value of their contribution to the formation of the stable quality of the finished product. Based on the results obtained, recommendations were developed for the design of the formulation of structured dairy products, as well as their production processes.

Designing products, taking into account data on the reasons for complaints from trade enterprises and negative reviews from product consumers, allows you to correctly place emphasis in the design of processes, recipes and indicators of food quality, and thereby reduce the risks of launching low-quality products on the market.

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FIELD EMISSION MULTI-EMITTER CATHODE-MODULATOR UNITS

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Abstract. *A solution to the problem of creating an alternative to existing light sources is considered, consisting in the development of environmentally friendly energy-saving cathodoluminescent light sources of a new generation based on the glow of a phosphor under the action of electrons obtained by field emission from an autocathode with a large number of emission centers. The study of design optimization was carried out, as a result, for the creation of cathodoluminescent light sources, it was proposed to use a field-emission multi-emitter cathode, including a number of separate cathodes made of polyacrylonitrile carbon fibers located on one common flat surface. The technical feasibility of using these cathode-modulator units in finger cathodoluminescent lamps has been substantiated.*

Keywords: *emission electronics, field emission, field-emission cathodes, carbon field radiating cathodes*

Introduction

Currently, it is important to create stable cathodes that can operate for a long time in high vacuum conditions (10-6 - 10-7 mm Hg). The advantages of autoelectronic cathodes in comparison with other sources of free electrons are known: no heating; high current density of field emission; resistance to temperature fluctuations; low sensitivity to external radiation; inertia; high steepness of volt-ampere characteristics [1].

Field emission is sensitive to changes in the geometry of the cathode and the state of its surface, which is the main difficulty in the development of stable field-emission cathodes. The operation of the autocathode in the device is accompanied by cathode sputtering of the material, a change in the shape of the emitting surface, a change in the number and location of microprotrusions, a change in the electron work function, heating of the cathode, and mechanical stress. These effects can

cause deterioration of the basic parameters of the autocathode and a specific electronic device.

Purpose of the study

At present, there are no optimized designs of lamps with field emission cathodes ready for industrial operation. Therefore, the key task is to develop a prototype of a highly efficient field emission cathode-modulator assembly.

According to the principle of operation, light sources can be divided into two main classes: transmission and reflection. The best efficiency results can be obtained with reflective light sources. In this case, the losses are due only to insignificant absorption in the output glass and the degree of transparency of the cathode matrix.

The most important parameter of lamps is light output. Therefore, it is proposed to focus on the choice of cathode materials as a key factor that determines the efficiency of such an integral characteristic as light output.

Materials of autocathodes intended for work in high vacuum conditions must have a specific set of properties, such as low values of the work function of electrons and the coefficient of cathodic sputtering, as well as high values of mechanical strength, electrical conductivity and thermal conductivity. In addition, an optimal electro-optical system with an autocathode should have minimized control voltages, miniature dimensions, and a focused electron flux at the output [2].

Studies of carbon materials have shown their promise, in particular, it is proposed to use polyacrylonitrile carbon fibers. A feature of this type of autocathodes is the presence of a fibril structure of carbon fiber [3]. Emission centers in this type of autocathode are numerous microprotrusions formed by fibrils and their aggregates protruding onto the end surface of the fiber [4]. During operation, the destruction of individual microprotrusions does not lead to a significant change in the emission current, since the average number of microprotrusions remains constant [5]. This determines the high stability of the emission current and the long service life of these cathodes under high vacuum conditions.

Materials and methods

Carbon fibers are produced according to principles similar to those used in the synthesis of glassy carbon. The most common method nowadays is pyrolysis and subsequent high-temperature processing of polymer fibers. Recently, methods have been developed for producing carbon fibers from cheaper pitch raw materials. In both cases, the fibrous form is imparted to the product at the stage of pretreatment, and this form does not change during pyrolysis [6].

When calculating the current-voltage characteristic, the simple Fowler-Nordheim theory is poorly applicable to multi-emitter systems. Therefore, for a more accurate expression of the field emission current, it is recommended to use the Murphy-Good theory [7]. For testing, a stand with a digital oscilloscope is used,

thanks to which the data is transferred to a computer, where they can be further processed.

The emission parameters of the cathode are stabilized during training by increasing the current load, after which the investigated field emission cathodes are practically not subject to degradation. Forming consisted in the plasma-chemical treatment of autocathodes from carbon fiber bundles by a corona discharge in air [8]. This method of forming makes it possible to significantly improve the emission properties of autocathodes: bundles of fibers that have undergone corona treatment in air give a stable emission current when operating in vacuum, and emission centers are evenly distributed over the working surface of the cathode.

Thus, forming the cathode consisted of operating the cathode at a constant current of 100 μA for 5 hours. To give the fiber bundle a shape that reduces the influence of electrostatic forces deflecting the peripheral fibers of the bundle, it is necessary to use the plasma-chemical method of etching a bundle of carbon fibers by a corona discharge in air.

The cathode-modulator assembly consists of the following elements: a stamped modulator cylinder, a vitrified carbon fiber beam cathode, and a rear contact shell.

The reliability and service life of multi-emitter cathodes is determined by the service life of its individual emitters [9]. Initially, emitters have the same shape of cylinders with an end surface formed as a result of fiber cleavage in a direction perpendicular to its axis, with microprotrusions of the order of 0.01 - 0.1 μm located on this plane [10]. After prolonged bombardment with residual gas ions as a result of cathode sputtering, the lateral and end surfaces of the fiber are disrupted in the form of a large number of depressions of the order of 0.5 μm, and the edge is blurred and the fiber is sharpened. In further work, an intensive development of the microrelief of the surface of autocathodes occurs and the surface reaches a certain equilibrium configuration, the most resistant to bombardment and the effect of an external field. This configuration is close to spherical with a uniform distribution of microprotrusions over the surface.

Results and discussion

While using several cathodes, one can expect an improvement in the uniformity of irradiation of the anode, since their areas of illumination will overlap, and the currents will be averaged [11]. The most obvious option is to use multiple cathodes in parallel.

The degree of overlap in this multi-cathode configuration is high. Previously considered designs included cathode assemblies, in which a separate modulator corresponds to each cathode. This design has proven itself well in single-cathode devices, and in the case of multiple-cathode systems, it makes it easy and convenient to control the cathode currents separately. However, it contains too many details and is inconvenient from a technological point of view. To increase adapt-

ability for all cathodes, one modulator with a common ground can be used [12].

Then a number of experiments were carried out. A structure with 4 cathodes made of polyacrylonitrile fiber and anode glass coated with an orange phosphor was mounted, at a distance of about 2.5-3 cm.This cathode-modulator unit was installed in a vacuum chamber, where at a pressure of 10-7 Pa, on the cathodes and the anode potentials of 2-3 kV and 10 kV, respectively, were applied.

Focusing was checked during the experiments. Situations were recorded in which the maximum and minimum of the beam are reached.

Then, one additional cathode was connected in series and the change in the emission pattern was observed. It was hypothesized that with the addition of additional cathodes, additivity will be observed, and light flares will remain.

As a result, the hypothesis with additivity was confirmed. As a result, we got the addition of emission patterns. We also obtained experimentally that when the cathodes are directed at an angle to one point, the illumination is enhanced. At the same time, the effect was obtained when the field of each cathode affects the fields of other cathodes. Such deviations from theoretical calculations appear due to the inhomogeneity of the field and its high value at a small distance between the cathodes [13].

Conclusion

The results of the study confirmed the hypothesis that a multi-emitter system of beams of polyacrylonitrile carbon fibers is a promising material for a field-emission cathode. It should be noted that the field-emission current is formed simultaneously by numerous nano-protrusions on the surface of the beam fibers.

The deflection of peripheral fibers in the beam under the action of electrostatic forces plays a significant role in the instability of operating voltages and the distribution of the field-emission current density. The problems of material sputtering and changing the shape of the emitting surface are solved by corona treatment. Stability problem
emission is solved by current training.

The practical significance of the study lies in the possibility of using the results obtained for the development of new efficient field cathodes for ultraviolet lamps, which provide a high current density and a good time of stable operation. The simplicity of the design and the low cost of the element base of the cathode-modulator unit increase the likelihood of commercial success in the creation of such emitters.

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INTEGRATION OF INFORMATION MODELING TECHNOLOGIES

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Abstract. *The author of this article makes an attempt to highlight the role, significance and main problems of integrating information modeling technologies. This is especially true for the innovative development of the construction industry.*

The author of the article notes that this issue was repeatedly raised in the highest echelons of power, but did not find proper understanding due to the ineffective allocation of budgetary resources.

The author of the article points out that due to higher growth rates in comparison with traditional sectors of the economy, the IT industry can provide more significant advantages in the construction services market. The information technology market, as before, remains one of the newest and actively developing markets in the world economy.

Keywords: *integration, technology, information modeling, construction, strategy, technology, construction project.*

Introduction

The raised problem is of paramount importance for the innovative development of the country's construction industry in the future. The acceleration of scientific and technological progress in the field of industry and the production of goods is inseparable from innovation. The construction industry is no exception here.

The introduction of a system of information modeling technologies in the construction industry will allow minimizing construction costs, raising the quality of the facilities being built to a new level and reducing their estimated cost.

The goal of the strategy is to reduce the construction and maintenance costs of the building, as well as reduce carbon emissions. The means of achieving the set goals was the obligatory use of information modeling technologies.

Purpose of the study – to investigate the main points and features of the integration of information modeling technologies in the conditions of construction of facilities.

The introduction of information modeling technologies has become especially

important in recent years, since there is an increase in the results of the scientific and technological revolution in the world, which gives a huge impetus to growth and opportunities for the accelerated development of the construction industry.

The category of countries with an extremely low level of their development includes countries that are not able to finance modernization, which have experienced structural regression in industry and construction, the lack of adaptive measures to the changed conditions of expanded production in the world, countries that have not previously restructured established sectors of the economy. The main vector for the development of developed capitalist economies is a regularly updated system of innovative technologies, including in the construction industry, which indicates the ability to switch to the rails of its accelerated development.

Weak financing and non-renewal of fixed assets entail a chronic lag in the construction industry from global trends, which further intensifies and goes into a more neglected crisis stage of underdevelopment.

Today, any large construction project involves the involvement of dozens of contractors and hundreds of pieces of equipment, thousands of people, hours and hundreds of gigabytes of information.

For many years, construction problems were raised for consideration at the highest levels of government and were resolved whenever possible. But the global financial crisis, as well as the extremely unsatisfactory economic situation in Russia, had an extremely negative impact on such an area as construction.

The transition of the construction industry to information modeling has become part of state policy, but so far the application of these technologies is difficult, mostly due to the fact that today there is a significant technological and economic lag in the construction industry from foreign ones, and the difference is so enormous that such a lag can lead to a collapse in the construction industry, we can already observe that most regional companies are simply not able to implement serious investment and construction projects.

The next integration problem is the top managers of companies playing a key role in the implementation of investment and construction projects due to the fact that information modeling technologies imply full transparency, both technical and economic, before investors, and in part even give the consumer of construction products an understanding of the design and construction process, and, accordingly, understanding the formation of the final cost of goods, which will negatively affect the shadow structure of the construction industry.

The opponents of information modeling technologies are people directly interested in the chaos in the construction complex of the Russian Federation, which has gained threatening momentum today.

Integration of information modeling technologies will allow to revive, in a short time, the construction complex of the Russian Federation. Nevertheless, the

need for the integration of information modeling systems is becoming stronger, it is known that the higher the percentage of implementation of an investment and construction project, the more difficult and expensive it is to make changes.

Information modeling systems include a fundamentally new system for organizing information, for its implementation it is necessary to have:

1) software;

2) the regulatory framework;

3) perspective shots.

Recently, the construction industry has been increasingly facing the following challenges:

- 30% of projects do not meet deadlines and budgets;
- 30% of the project cost is lost due to insufficient connections between information systems;
- 40% of the time is spent on searching and verifying information during design.

Economically developed and developing countries today face a huge number of problems in the construction industry. These are both universal problems faced by construction organizations all over the world, and specific ones dictated by the peculiarities of countries.

Today, BIM technologies are most actively introduced into the construction industry. They are successfully used in the USA, Great Britain, Singapore, Finland, Norway, China and a number of other countries. With the improvement in living standards and increased awareness of energy conservation and environmental protection, people began to modernize the building, and the requirements for improving the comfort of the living environment also became more significant.

Modern energy-efficient and environmentally friendly buildings allow not only to protect the environment and minimize pollution, but also to save resources as much as possible throughout the entire life cycle. Therefore, active assistance in the construction of energy-efficient buildings is not only a benchmark for sustainable development, but also a strategic direction for the country's future development.

The most promising, reliable and meeting all the requirements way to achieve these goals is the use of BIM technologies. The concept of BIM technology is in the stage of deep development and is distinguished by the use of information technology in the construction industry. The areas of application, methods and specificity of the concept are rethought by different experts and scientists from different points of view with different fields of research. BIM technologies are interpreted in different ways: as integrated building models, virtual building models and models of individual buildings. That is why, at present, the definition of BIM technology does not have a uniform interpretation at the international level.

BIM technology is a project that is linked to a database and must be based on an information model.

BIM technology is the process of detailed creation and further use of basic digital value models for subsequent design, construction and further project management.

BIM technology has many features such as visual analysis, collision checking and construction schedule simulation. With the established BIM model, solar radiation, solar radiation, ventilation and lighting of buildings can be modeled to determine the most appropriate location and spacing of buildings, and to formulate reasonable structural design schemes and scientific approaches that effectively reduce the energy consumption of a building.

Integrating Building Information Modeling (BIM) with real-time data from IoT devices is a powerful paradigm for applications that improve construction and operational efficiency. Numerous applications enable real-time data streams from the rapidly expanding set of IoTs for high-fidelity BIMs. However, research on the integration of BIM and IoT is still in its early stages, it is necessary to understand the current situation of the integration of BIM and IoT devices. The implementation of an investment and construction project implies making a profit, the most important is the economic effect from the integration of information modeling technologies. Considering the fact that information modeling technologies imply a model-oriented design system, the life cycle of an information model begins at the stage of forming a project idea and allows you to meaningfully transfer all ideas to visual and tabular-schematic images, which allows, at an earlier stage, to present a project for investors.

The task of a modern initiator of an investment and construction project is to get the maximum possible amount of money from an investor for the implementation of more expensive and large-scale projects, because the more expensive and large-scale the project, the more working capital is present in it, and, accordingly, the initiator's more profit and the amount of taxes paid to the budget increases. A huge share among investors and initiators of investment and construction projects in the construction complex is occupied by the state and state structures. That is why the state is the main initiator of the integration of information modeling technologies.

Thus, more attention should be paid to the issue of integrating information modeling technology and the life cycle management system for capital construction objects using information modeling technology should be expanded to include a complex of objects covered by renovation projects. Also, it is important to cover the issue of planning the resource base for current and major repairs in order to extend the life cycle of buildings, as well as the scope of investment attractiveness and efficiency of projects for the renovation of residential quarters using informa-

tion modeling for the state and for business entities in the medium and long term.

Conclusion

Thus, it can be argued that the transition to information modeling technologies in the Russian Federation is inevitable. There is a high probability that the state in the near future will introduce the mandatory use of BIM technologies everywhere, in particular in construction, and then the percentage of organizations using this technology will noticeably increase.

The most promising, reliable and meeting all the requirements way to achieve these goals is the use of BIM technologies. The concept of BIM technology is in the stage of deep development and is distinguished by the use of information technology in the construction industry.

It was determined that the integration of information modeling technologies will allow to revive, in a short time, the construction complex of the Russian Federation. Nevertheless, the need for the integration of information modeling systems is becoming stronger, it is known that the higher the percentage of implementation of an investment and construction project, the more difficult and expensive it is to make changes to it.

If we talk about the state, then without its participation the implementation of renovation projects is essentially impossible. And with the help of information modeling, it becomes possible to assess the effect of budget investments in the implementation of a project.

That is why a potential assessment of the attractiveness of the renovated territories is necessary, which can be done as successfully as possible using information modeling.

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