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The collection includes scientific articles of participants of the International University Science Forum, the purpose of which is to present significant results of scientific research in the field of humanities, natural and technical sciences; the formation of a modern level of scientific knowledge, experience in transformation of theoretical science into the sphere of practical application of innovations; generalization of research and practical experience. The forum is a tool for establishing sustainable ties, as well as the exchange of experience between teachers and researchers of universities and research organizations.

Le recueil comprend des articles scientifiques des participants du Forum Scientifique International des Universités, dont l'objectif est la présentation des résultats significatifs de la recherche dans le domaine des sciences humaines, de la nature et de l'ingénieur; la formation du niveau contemporain des connaissances scientifiques, de l'expérience de la transformation de la science théorique au champ de l'application pratique des innovations; la synthèse de l'expérience des recherches scientifiques et pratiques. Le forum est un instrument permettant d'établir des liens durables et d'échanger des données d'expérience entre les enseignants et les chercheurs des universités et les organisations scientifiques.

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INNOVATION AND DIGITALIZATION OF ECONOMIC PROCESSES IN RUSSIA

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The article examines the theory of innovation and digitalization in relation to economic processes and the peculiarities of the implementation of these theoretical aspects in the context of Russian economic realities. Quantitative assessments of the main statistical indicators that determine the degree of digitalization and innovation of economic processes in Russia are presented. The author's interpretation of the collected assessments is carried out and, on its basis, a qualitative assessment of the passage of the processes of innovation and digitalization in the domestic economy is developed. Based on the results of the analytical work done, forecasts of the conceptual transformation of the phenomenon of economic processes in Russia under the influence of digitalization and innovation were prepared. The conclusions and suggestions contained in the article are based on an analysis of both domestic statistics itself and data obtained from the results of an international review of the phenomenon of digitalization and innovation of economic processes.

Keywords: national economy, innovation, digitalization, modernization, economic development.

From the point of view of studying digitalization and innovation, the economic process can be represented as a sequence of processes of production, distribution, redistribution, exchange and consumption of economic benefits produced in the previous period. Thus, to describe the digitalization and innovation of the economic process, a comprehensive statistical analysis of the degree of digitalization and innovation of each of the processes discussed above is required.

Digital technologies are a key growth point in the modern economy and are of priority importance for the formation of the most competitive,

from the point of view of modern economists, semi-structured production. Over the past twenty years, not a single innovation systemically significant for the economy is complete without the introduction of a digital component. The areas of using digital technologies in innovation are:

- organization of work with information flows, especially at the initial and final stages of each of the economic processes;
- mathematical virtual modeling of processes related to offline production and economic spheres;
- information support, algorithmization and automation of systems for managing economic processes, which increases their efficiency both by increasing the quality of execution and by reducing economic costs to ensure the maintenance of these processes;
- points of contact of economic processes with the external environment and points of contact of various economic processes occurring within one level of organization of the economic space.

In addition to the growth in the share of digitalization in the total volume of innovation in economic processes, it should be noted the importance of the digitalization factor in terms of providing support for the innovation process from the external environment.

Consider in Figure 1 objective indicators that can characterize the degree of digitalization and innovation of the economic process at each ego stage for a post-industrial society. The intensity of using the factors of innovative and digital development of the economic system at each subsequent stage of the economic process depends on the use of the corresponding groups of factors at the previous stages. At the same time, the influence of the factor grows in proportion to the position of the stage in the economic process.

Study of the experience of transforming economic processes in the United States in 1980 - 2019. indicates a direct correlation between the degree of development of digital infrastructure and the intensity of the innovation process. A pattern indicating the existence of a relationship between the infrastructure readiness of the external environment and the intensity of the innovation process is also observed in relation to the industrial society. However, for a post-industrial society, the emergence of which dates back to the end of the 20th century, one characteristic feature can be identified. The presence of digital infrastructure, among other things, can be used as both an economic and a social lift by those participants in the economic process who are focused on innovative development in conditions of insufficient quality infrastructure of the readiness of the external environment for other factors. A distinctive feature

of the Internet coverage is also the ability to use the strong competitive advantages of individual territories in the innovation process, in combination with competitive advantages borrowed from other territories. An example of such a compilation can be considered the work of multinational companies outsourcing part of the work to qualified workers from third countries, for example, work in call centers serving the needs of clients from the home country of the head office.

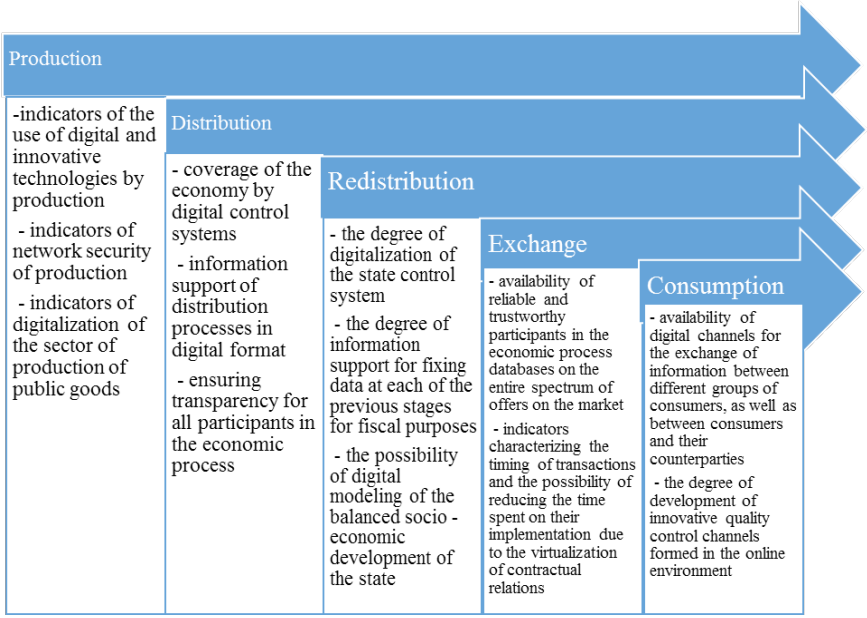

Figure 1 - Indicators of innovation and digitalization of the economic process

Source: developed by the author

Internetization as an indicator of the digitalization of economic processes and an indicator of the ability of the economic system to innovate includes three aspects related within the cycle of the economic process:

- coverage by the Internet of national production; this aspect can be determined based on the study of the digitalization indicators of individual national sectoral industries and the use of information and communication technologies in their auxiliary subsystems;

- coverage of the distribution and redistribution sphere by the global Internet space; this aspect includes the indicators provided by the Russian concept of e-government;

- digitalization of the consumer segment; this aspect can be characterized by measuring the degree of involvement of the national consumer in the digital process of exchange and consumption, taking into account the intensity of such involvement.

Although all three groups of indicators are important for the country's economy, in terms of the ability of the national economy to digitalize and innovate the economic process, the group of indicators characterizing the involvement of the consumer in the information space, since it is this indicator that determines the innovative potential of the economy. Even with rather high other indicators, the low involvement of the consumer means the impossibility of further development of the economic process due to the formation of the seller's market and the increase in its monopolization through the use of the asymmetry of information.

As of the end of 2019, about около of the country's population in Russia does not have access to the global network. The dynamics of the corresponding indicator is shown in Figure

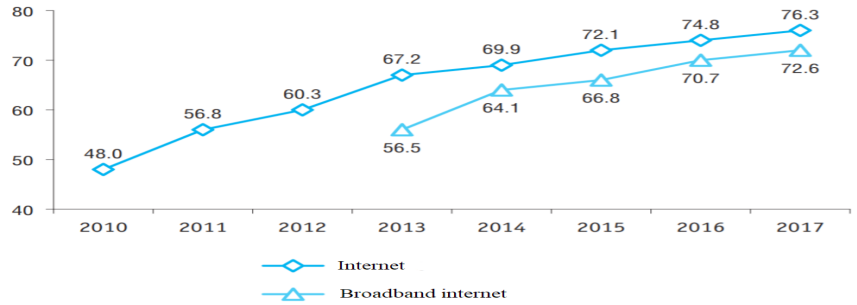

Figure 2 - Dynamics of indicators of the involvement of Russian households in the global Internet space, 2010 - 2017, as a percentage of the total population

Sorce: Цифровая экономика: 2019 : краткий статистический сборник / Г.И. Абдрахманова, К.О. Вишневский, Л.М. Гохберг и др.; Нац. исслед. ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2019. – 96 с. – 250 экз. – ISBN 978-5-7598-1927-1

The identified problem has a pronounced regional character, since more than 80% of the number of those who do not have access to the Internet falls on 20% of depressed (subsidized) domestic regions. Such a regional disproportion in the development of the national digital space creates secondary obstacles to innovative development, namely:

- insufficiently effective use of digitalization to involve Russian intellectual resources in the innovation process;

- rejection by the economic Russian space not covered by digitalization of an innovative product on a conceptual basis, which leads to the extension of the national economy.

A deeper study of the low degree of coverage of national households with the Internet and their involvement in online - interaction with other participants in the economic process reveals a relationship with indicators of the quality of life. Let's analyse to the infographic in Figure 3.

The lower than the world average involvement of households in the Internetization process is an obstacle to the introduction of new technologies in production processes, since low online consumer activity reduces competition and manufacturer's motivation to introduce innovations focused on the needs of the digital society.

This statement is based on data obtained from a review of the structure of countries - leaders in the use of digital technologies in the manufacturing segment. As an illustration, Table 1 provides data for the top 7 technologies - leaders and countries that occupy a leading position in these technologies.

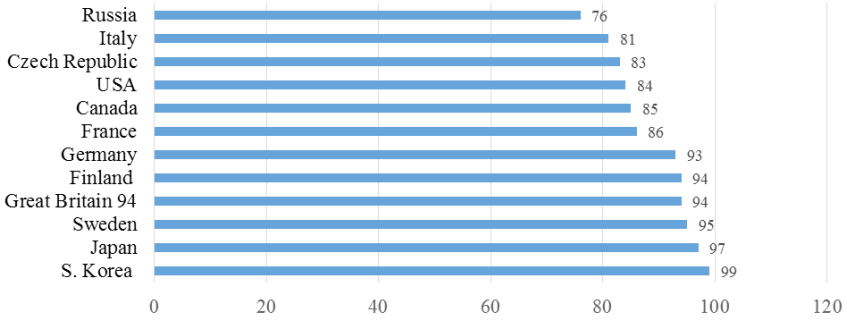

Figure 3 - Comparative characteristics of household Internet communications coverage indicators in countries of the world, as a percentage of the total, 2018

Source: Compiled by the author based on Rosstat data

In addition to the loss of competitive advantages by the national manufacturer, the insufficient involvement of the Russian manufacturer in the modernization of the economic process through the use of critical digital technologies, which are critical from the point of view of the 7-staged

economy, also creates a threat of systemic lag in the economy. Let us illustrate this thesis with the information presented in Figure 4.

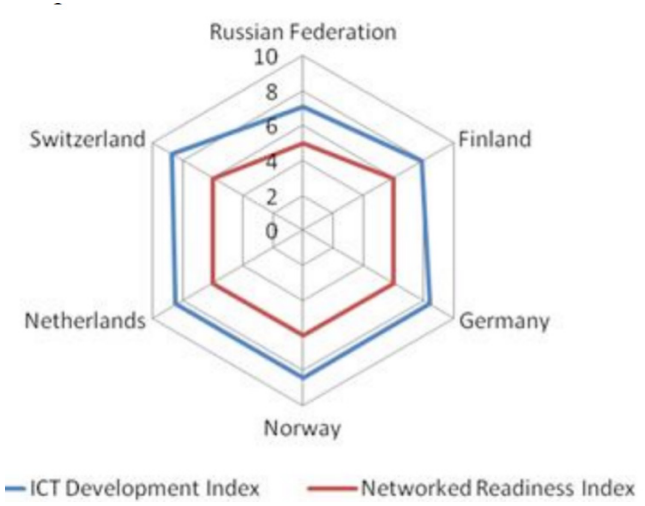

Figure 4 - Comparative characteristics of Russia and some European countries according to the key indices of the development of the digital economic space in terms of the global competitiveness indicator

Source: Afonasova, Margarita & Panfilova, Elena & Galichkina, Marina & Ślusarczyk, Beata. (2019). Digitalization in Economy and Innovation: The Effect on Social and Economic Processes. Polish Journal of Management Studies. 19. 22-32. Doi: 10.17512/pjms.2019.19.2.02.

Based on the data in Figure 4, it can be stated that Russia lags behind the leading European countries in two critical indicators at once. Taking into account the approximately identical position of the leading digital economies in Europe, Russia's falling out of the number of countries - leaders in terms of relevant indicators not only creates objective reputational and investment problems, but also leads to a revision of the attitude of the global innovator to the domestic innovation potential. Such a revision is significant from the point of view of economic development in the next Kondratyev cycle until 2060 and beyond, as such a revision is fixed in the software for an automated preliminary assessment of the attractiveness of an innovator originating from Russia.

Table 1 - structure of countries - leaders in the field of digitalization of industrial component of the economic process from the point of view use of innovative critical digital technologies, 2019

Digital adoption indicator	Countries with untapped potential
Tech companies' market cap as a share of GDP	Countries with very high untapped potential: Portugal, Poland, Slovenia, Iceland, Italy and the UAE. Then come Austria, Belgium, Denmark, Spain, France, the UK, Luxembourg, Malaysia, Norway, New Zealand and Singapore.
Cloud computing adoption	France, South Korea, Austria, Switzerland and Germany have clear untapped potential. Spain and Luxembourg are borderline.
Big data use	Spain, Sweden, South Korea and Austria have untapped potential. Estonia, the Czech Republic and Italy are borderline.
E-orders	France, Spain, Luxembourg, Austria, South Korea have untapped potential.
ICT specialists	France, Germany, Norway, Sweden and Austria have untapped potential. Australia, Spain and New Zealand are borderline.
Robots per 10,000 employees	Switzerland, Austria, Finland and the Netherlands have untapped potential. France and Canada are borderline.
User penetration in the mobile point-of-sale segment	France, the UK, Spain and the U.S. have untapped potential as measured by mobile payments penetration.

Источник: Georges Dib 2019 Enabling digitalization index // Economic research. – 2019. - №3 - https://www.allianz.com/content/dam/onemarketing/azcom/Allianz_com/economic-research/publications/specials/en/2019/20190911-TheView-EDI2019-final.pdf

Consider the most problematic areas of the digitalization and innovation process of the domestic economy. Consumer initiative appears to be weak in areas such as education, trade and the labor market, as shown in Figure 5.

The study of the practice of the behavior of sellers and buyers in the considered spheres of the country's economic life allowed the author to identify both subjective and objective reasons for the insufficiently high innovation and digital activity of the Russian economy.

Among the objective reasons for the lag of the national economy according to the criterion of innovation and digitalization of economic processes in the areas discussed in Figure 5, the following should be indicated.

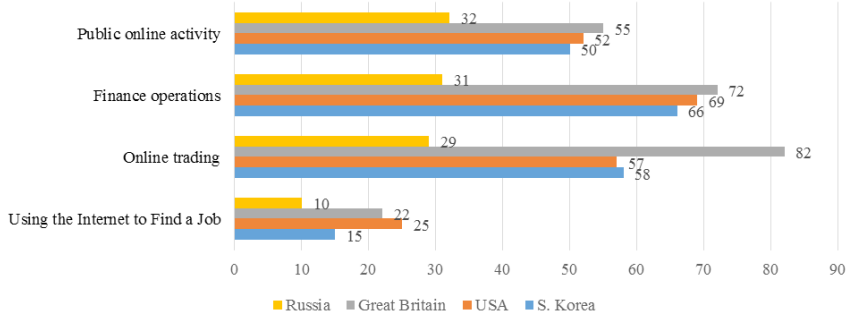

Figure 5 - Comparative characteristics of consumer activity in the countries - leaders in digitalization of the economy and Russia in certain areas of the economic space

Source: составлено автором на основе Цифровая экономика: 2019 : краткий статистический сборник / Г.И. Абдрахманова, К.О. Вишневский, Л.М. Гохберг и др.; Нац. исслед. ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2019. – 96 с. – 250 экз. – ISBN 978-5-7598-1927-1

1. Monopolization of certain segments of the national economy; such segments can be viewed as bottlenecks in the national economic five-step process. An example of behavior bearing signs of monopoly is the behavior of participants in the oil and gas market on the national Russian market; their increase in prices in order to maintain the rate of profit with a concomitant fall in prices for their products on the global market contributes to the outflow of national demand from other areas that are promising in terms of innovative development of the national economic system.

2. Insufficient provision of liquidity to the national innovation market against the background of relatively high risks and interest rates, as well as a significant tax burden. Reducing the tax burden for domestic IT companies in conjunction with a package of initiatives in the national tax, financial and innovation policy for the period 2020 - 2023. patronymic can be considered as an attempt to compensate for this negative factor.

3. Technological dependence of a Russian manufacturer on a foreign partner against the backdrop of a “weak” ruble policy and insufficiently attractive growth dynamics of the domestic market. This problem contributes to the refusal of the national innovator from creating pioneering, that is, one that does not have a close patented analogue of innovative products. Possible initiatives of a national innovator are constrained, on

the one hand, by pressure from transnational companies - leaders due to both explicit and institutional restrictions on access to necessary technologies, and on the other hand, by the lack of competition from other potential national and innovators.

4. Lack of the necessary scale, both in terms of the capacity of the primary market for an innovative product, and in terms of the presence of an institutional buyer. This problem is aggravated by the fact that representatives of the Russian IT industry, not having a full range of opportunities to present a complex innovative product made using digital technologies to the global market, are of interest to a foreign manufacturer of such a product as suppliers. The outflow of digital development potential from the national economy occurs both at the level of transferring the potential of national companies to outsourcing, and at the level of outflow of individual specialists in the IT sphere and related fields to the foreign labor market.

Along with objective economic reasons, a significant role as an obstacle to digitalization and innovation of economic processes in Russia in 2010 - 2020. played the behavioral, social and infrastructural factors discussed in Figure 6.

After the crisis of 2014 and the subsequent macro- and geo-economic events, significant attention is paid to the problems of developing the country's innovative potential and transforming the concept of economic processes taking place in it on the basis of digital technologies. The macro-level framework measures and targets until 2025 - 2030 required to achieve at the level of the national economy are presented in the state program "Digital Economy of the Russian Federation" approved by the Order of the Government of Russia dated July 28, 2017 No. 1632-r.

This program is chronologically oriented and provides for the following indicators of the development of the national digital economy for the period up to 2024:

- transformation of the regulatory and legal framework for regulating the development of the national digital space and the behavior of its participants;
- formation of the human resources of the digital economy and the scientific and educational potential of its reproduction;
- development of domestic scientific thought and applied digital technologies to ensure the technological parity of Russia with foreign countries for each of the critical innovation platforms;
- development of online and offline infrastructure of a single digital national information space and implementation of measures to accelerate the involvement of businesses and the public in digital economic relations;

- ensuring national information security and creating conditions for comprehensive information protection of the national innovator at the micro, macro and global levels of competition.

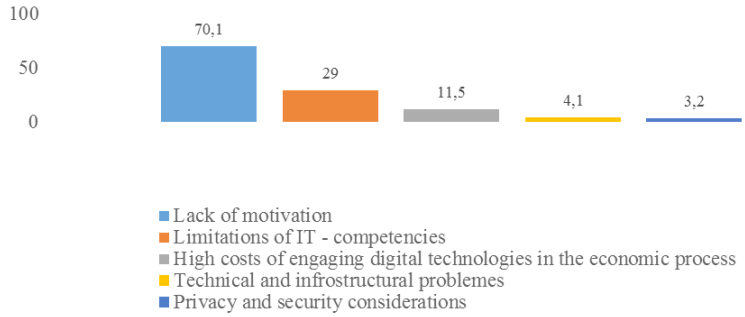

Figure 6 - Obstacles to digitalization and innovation of economic processes at the micro level (share of counterparties who faced problems in each category in 2019, as a percentage of the total)

Source: compiled by the author based on Цифровая экономика: 2019 : краткий статистический сборник / Г.И. Абдрахманова, К.О. Вишневский, Л.М. Гохберг и др.; Нац. исслед. ун-т «Высшая школа экономики». – М.: НИУ ВШЭ, 2019. – 96 с. – 250 экз. – ISBN 978-5-7598-1927-1.

Key target indicators for the development of the national digital space, relevant in terms of creating and maintaining an innovation-oriented transformation of a complex of national economic processes, are presented in Table 2.

Achievement of the set targets, according to the developers of the state program, will provide the minimum necessary starting opportunities for digitalization and innovation of economic processes at the level of functioning of the competitive mechanism of business development. The system of indicators provided for in the corresponding state program covers all five stages of the economic process considered in this article and therefore corresponds to the systemic demands of the task of digitalization and innovation of the national economy of the country.

Table 2. Key in terms of creation and maintenance of innovation-oriented transformation of the complex of national economic processes in Russia indicators

	2019	2020 (fact)	2024 (plan)
Digital economy employees	-	5	60
The number of Russian participants in the global digital market implementing projects with a capitalization of US $ 3 million	4	5	10
Number of national participants in global digital platforms	30	50	100
Minimum number of data centers	3	4	8
Capacity of national data centers, thousand rack places	-	45	80
Share of foreign companies in providing national Russian traffic,%	40	35	10

Source: developed by the author on the basis of the state program "Digital Economy of the Russian Federation", approved by the Order of the Government of Russia dated July 28, 2017 No. 1632-r

Summing up, it should be noted that at present the process of digitalization and innovation of economic processes in Russia is carried out both "from above", at the level of the system of state regulation of the economy, and "from below", at the level of individual enterprises. Along with this, the pace of digitalization seems to be insufficient. Without the escalation of the processes of economic support for innovatively active enterprises at the level of digital infrastructure development, Russia risks increasing the already outlined systemic lag behind the leading countries in the digital economy development ratings. At the same time, the most important development reserve is the actualization of the potential for involvement in the digitalization and innovation processes not only of the business itself, but also, first of all, of households, which will make it possible to rebuild the national competitive environment in accordance with the principles characteristic of the global market that promote digitalization and innovation of economic processes.

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EMPIRICAL STUDY OF THE DETERMINANTS OF INCREMENT VALUE OF RUSSIAN COMPANIES

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The authors carried out an empirical study using multivariate linear regression models. The aim of the study was to identify the determinants of growth in the value of Russian companies and to assess the tightness of the relationship between indicators reflecting: liquidity, turnover, financial stability and profitability with cost indicators. The empirical base of the study included 45 large domestic companies from seven economic sectors. Market to Book Ratio (MBR) was chosen as the resulting indicator reflecting the market value of the company, and 12 indicators characterizing

the financial condition were selected at the first stage as independent indicators reflecting the financial condition. The main source of initial data was the annual financial (accounting) statements of companies for the period from 2011 to 2018. The use of relevant diagnostic and modeling methods will be effective tools for identifying the factors of increment in the value of domestic companies. Knowledge of value drivers and operational impact on them will allow the management of Russian companies to take timely measures to ensure the proper level of return on capital invested by shareholders, and to increase the competitiveness of domestic companies based on the value approach.

Keywords: Russian public companies, Market to Book Ratio (MBR), empirical research, return on equity (ROE), multiple linear regression model, financial condition

Introduction

In the world science and practice of financial management for the third decade, one of the basic concepts of corporate governance is the concept of increasing the value of the company Value Based Management (VBM), which should be considered as the goal and the main rule of financial management [1, p. 115]. The VBM concept includes a set of methods, tools, measures, management processes in a company aimed at increasing its shareholder value [2].

The financial instability of the last decade, the growth of indicators of hostile takeovers and bankruptcies in the Russian economy, make the problem of increasing the value of domestic companies urgent and vital.

The important tasks of the empirical research carried out were:

- identifying the features of the implementation of the VBM concept in imperfect markets;

- identification of key factors that have a significant impact on the growth of the value of Russian public companies;

- assessment of the tightness of the relationship between cost indicators and coefficients that comprehensively characterize the financial condition of the company.

Methods of correlation-regression analysis and multivariate linear regression models were used as the main tool for analysis, assessment and modeling.

Materials and methods

The empirical base of the study was made up of 45 large domestic public companies from seven sectors of the economy: oil and gas, metallurgy, mining, power, chemical and petrochemical, development and

construction, telecommunications and transport. The study used panel data on domestic non-financial companies for the period from 2011 to 2018. The main source of the formation of the initial data was the annual financial (accounting) statements of companies.

In order to determine the type and assess the tightness of the relationship between the resulting (dependent) variable and the explanatory variables (regressors) characterizing the financial condition of the company, the authors used multiple linear regression models. The general view of the multiple linear regression model is represented by the following formula [3, p. 193]:

$$Y_i = \beta_0 + \beta_1 * x_{1i} + \beta_2 * x_{2i} + ... + \beta_k * x_{ki} + u_i,\ i=1, 2,\ldots,n, \quad (1)$$

where

Y_i – i-th dependent variable observation;

X_{1i}, X_{2i}, …., X_{ki} – i-th observation of each of the k regressors;

β_0 – free member;

β_i – slope factor at variable X_i;

u_i – regression error.

In the course of the empirical study, the task was set to statistically test the following hypotheses:

Hypothesis 1. Indicators of the market value of domestic public companies have a significant relationship with ratios reflecting the capital structure.

Hypothesis 2. Indicators of the market value of Russian public companies have a significant connection with indicators characterizing the business activity and working capital of the company.

Hypothesis 3. The return on equity of domestic public companies has a significant relationship with indicators of capital structure, solvency and working capital turnover.

Statistical hypothesis testing was carried out in stages in the Ms Excel environment using the capabilities of the "Data Analysis" add-on.

When testing all three hypotheses at the first stage of the study, we used the same composition of independent regressors reflecting the company's financial condition: x_1 - autonomy coefficient; x_2 - financial leverage ratio; x_3 - coefficient of financial stability; x_4 - equity capital flexibility ratio; x_5 - coefficient of provision of reserves with own sources of formation; x_6 - coefficient of provision of reserves with own and long-term borrowed sources of formation; x_7 - coefficient of provision of reserves by common sources of financing; x_8 - coefficient of turnover of current assets; x_9 - accounts receivable turnover ratio; x_{10} - accounts payable turnover ratio; x_{11} - current liquidity ratio; x_{12} - the intermediate liquidity

ratio.

As the resulting (dependent) indicator for testing the first two hypotheses, the MBR indicator was chosen and a general multiple linear regression equation was drawn up.

In the course of statistical testing of the first two hypotheses at the first stage of the correlation-regression analysis, regressors were selected that have a significant relationship with the MBR indicator and are not multicollinear. Then, using the "Regression" tool, the regression equation was constructed and the values of the regression statistics presented in Table 1 were obtained.

Table 1

Regression statistics for the first econometric model

Regression statistics	
Multiple R	0,6091149
R-square	0,45919798
Normalized R-square	0,34873467
Standard error	2,28171547
Observations	360

According to table 1, the multiple correlation coefficient of the regression model was 0.6091, which indicates the average strength of the linear relationship between the dependent variable and the set of independent regressors. The coefficient of determination (R-squared) indicates that approximately 46% of the variation in the value of the MBR coefficient is explained by factors included in the econometric model. At the next stages, the significance of the regression equation was checked using the Fisher test and the statistical significance of the coefficients of the regression equation was checked using the Student's test. Finally, the uniformity of the sample was checked using the Goldfeld-Quandt test and the hypothesis of homoscedasticity was accepted with a 95% probability for the variables x_2, x_5, x_9, and x_{10}.

As a result of testing the first two hypotheses, the final linear regression equation of the form was obtained:

$$Y=-0,049 + 0,314x_2 - 0,002x_5 + 0,106x_9 + 0,1170x_{10} \quad (2)$$

From the constructed regression equation, it follows that there is a relationship between the MBR indicator and independent regressors characterizing the capital structure and business activity of the company.

To test the third hypothesis, the return on equity (ROE) indicator was chosen as a dependent regressor; the composition of independent regressors remained the same. During the step-by-step testing of the

third hypothesis, the quality of the regression equation, the significance of the coefficients of the regression equation, and the homogeneity of the sample according to the previously specified criteria and tests were checked. Regression statistics based on the results of testing the third hypothesis are presented in Table 2.

Table 2

Regression statistics by model

Regression statistics	
Multiple R	0,628432476
R-square	0,483554386
Normalized R-square	0,376674227
Standard error	0,481781701
Observations	360

As a result of statistical testing of the third hypothesis, the final regression equation of the following form was obtained:

$$Y=0,101 + 0,097x_4 + 0,004x_{10} + 0,148x_{12} \quad (3)$$

From this regression equation, it follows that the third hypothesis is confirmed and that there is a relationship between the resulting return on equity (ROE) and independent regressors characterizing the capital structure, business activity and solvency of companies.

Results and discussion

Based on the results of an empirical study of 45 large domestic public companies over the past decade, important tasks of the practical implementation of the cost approach should be noted.

The obtained results of hypothesis testing do not contradict the generally accepted theoretical basic concepts of financial management.

The final regression equation based on the results of testing the first two hypotheses reflects a significant direct relationship between the selected MBR cost indicator and the company's financial leverage ratio. This confirms the fact that in conditions of imperfect markets, the structure of the company's capital affects the implementation of the main goal - increasing its value, and it must be optimized [3, p. 12]. If a company unnecessarily increases the amount of borrowed funds, then the likelihood of default risk increases, which will negatively affect market prices. In the opposite situation, when the company attracts more of its own funds, its weighted average cost of capital turns out to be higher than that of its competitors, and this will also not contribute to the growth of its market value [5].

With regard to the feedback of the MBR indicator with the ratio of the

provision of reserves by own sources of formation, it is also understandable. An increase in the value of working capital at the expense of its own, more expensive sources of financing, leads to an increase in the weighted average cost of the company's capital and, accordingly, reduces its cost [6].

Statistical testing of the second hypothesis was confirmed, which follows from the form of the constructed regression equation. An increase in the turnover of receivables and payables always positively affects the results of the company's financial and economic activities, and, accordingly, contributes to an increase in its market value.

A statistical test of the third hypothesis also gave a positive result. The regression equation reflects a significant direct relationship between the ROE indicator and the coefficients: maneuverability of equity capital, accounts payable turnover and intermediate liquidity.

A direct significant relationship between the ROE indicator and the accounts payable turnover ratio is also understandable. This fact can be interpreted as follows: the high rate of turnover of accounts payable allows companies to avoid additional costs associated with overdue accounts payable, which certainly increases net profit and return on equity [7].

The next important factor was the intermediate liquidity ratio. An increase in the value of this ratio implies: either an increase in the company's current assets, or a decrease in short-term liabilities. However, it should be noted that the relationship between the return on equity and the company's liquidity will be direct only up to a certain point. After reaching a certain limit value, a further increase in the intermediate liquidity indicator will reduce the profitability of the company [8, p. 493]. This could be due to excess cash or inventory in excess of current needs.

Findings

The practical implementation of the value-oriented concept of VBM in the conditions of imperfect markets presupposes the ability of the management of public Russian companies to justify management decisions in terms of increase in shareholder value, comprehensively assess the company's financial condition, make the most of the internal financial potential and actively maneuver financial resources [9, p. 68].

According to the results of the conducted empirical research, it can be seen that in the implementation of the task of increasing the company's value, management is faced with some contradictions. For example, financial leverage is a factor that increases ROE and MBR, and from the point of view of ensuring the solvency and financial stability of companies, it is a decreasing factor [10, p. 24]. Finding a reasonable compromise

between indicators characterizing: return on equity, financial stability, liquidity and solvency of the company is one of the important problems of financial management. This problem should be solved by each company individually. Owners and management need to rank their priorities [10, p. 80].

Companies strive to achieve such a ratio of equity and debt capital, which will provide a minimum level of WACC. At the same time, it is important that the company's profitability is not lower than this indicator.

The next important task during the implementation of the cost approach is to find the optimal proportions between the non-circulating and circulating capital of the company [12, p. 85]. This will ensure the sustainable development of the company and, at the same time, prevent loss of solvency and financial insolvency.

Regular monitoring of business activity indicators, finding effective levers to increase the turnover of receivables and payables will also help to increase the return on equity and increase the company's market value.

Conclusion

The use of modeling methods, knowledge of the tightness and type of relationship, will allow the management of domestic public companies to more reasonably assess the consequences of decisions made in terms of value increment. At the same time, the practical application of multivariate regression models will allow the management of companies to simultaneously solve problems: ensuring solvency, maintaining financial independence, increasing profitability and competitiveness based on the cost approach.

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INNOVATIONS ET RÉFORMES DE LA FORMATION PEDAGOGIQUE EN ANGLETERRE

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L'article est consacré au problème de la formation pédagogique en Angleterre, aux réformes en cours et aux innovations pendant des 70 dernières années. Pendant toute la période historique, la formation pédagogique en Angleterre a formé un modèle de formation pédagogique en plusieurs étapes, orientée à la composante pratique de l'enseignement. L'orientation aux étudiants, la réalisation de la diversité de la formation pédagogique et des étudiants, la contribution à leur croissance personnelle ont fait l'objet d'apprentissage à tous les stades du développement jusqu'aux années 80s. Par la suite, l'éducation anglaise également avait tendance de stimuler l'emploi sur le marché du travail. Tous ces changements sont visibles par le changement de nom du département national de l'éducation. Grâce à ces changements, nous pouvons observer des changements dans l'idéologie anglaise d'éducation, attribuant à l'éducation un rôle externe et instrumental. La promulgation du nouveau programme national d'enseignement a fait de l'éducation pédagogique un sujet de contrôle de l'état. Et de l'ITE initiale à l'ITT actuelle, de plus en plus la formation pédagogique en Angleterre met l'accent sur la pratique pédagogique. Quoi qu'il en soit, les nombreuses années des réformes et des innovations du système éducatif anglais représentent le modèle global de l'enseignement supérieur et correspondent aux normes de qualité élevées.

Mots - clés et expressions: système éducatif anglais, école supérieure, élève, formation, collège pédagogique, formation pédagogique, formation des enseignants, étudiant, réformes et innovations, université, programmes éducatifs, professeur, école.

L'établissement de la formation pédagogique en Angleterre, s'appuyait sur les traditions educatives à une histoire de centaine d'années, tout a commencé dès la création d'un système de la formation pédagogique à la fin du XVIIIe siècle. En 1836 le premier collège britannique des professeurs de Glasgow a apparu, et en 1840, le premier collège pédagogique anglais de Baitsly. Grâce à l'expérience accumulée par les générations, un siècle plus tard, une école pédagogique publique locale a été créée. Outre les changements dans le domaine social, influencés par les processus économiques et culturels, le cours des réformes visant à développer le système de formation pédagogique en Angleterre variait selon le parti au pouvoir.

Sans aller plus loin dans l'histoire anglaise, bien que ce soit les traditions médiévales de l'enseignement universitaire qui ont créé les bases de la formation du personnel enseignant, et à partir des années 1940s, des réformes ont été menées pour développer et former l'éducation pédagogique, c'est-à-dire pendant les années 70s jusqu'à nos jours. En fin, un modèle moderne en plusieurs étapes de formation pédagogique et un système national de gestion et d'évaluation de la qualité de la formation pédagogique ont été mis en place.

Aujourd'hui, la formation du personnel enseignant est assurée dans les universités, les écoles polytechniques et les collèges. Actuellement, en Angleterre, sans compter les études de doctorat, il existe un modèle éducatif de bacalauréat <Bachelor 3+1>, ainsi qu'un modèle de maîtrise <PGCE 4+1>. Le premier est principalement destiné à la formation pédagogique du primaire et le second est destiné à la formation pédagogique du secondaire. Les diplômes d'études supérieures et les diplômes de bacalauréat sont délivrés et attribués à la fois par les collèges et les universités.

Cependant, bien que les institutions énumérées soient diffèrentes dans les traditions d'apprentissage établies, les matières et les contenus structurels, elles ont toutes un système en étapes avec la possibilité de mener des recherches. Les programmes de formation pédagogique sont conçus pour accorder une grande attention à l'expérience pratique des étudiants qui choisissent eux-mêmes de s'engager à la formation pédagogique, training (teacher training) plutôt qu'à l'enseignement pédagogique académique (teacher education). En tous cas, les deux

premières années sont réservées aux matières de base et les deuxièmes aux matières de profilage. Le programme de cours mixtes, qui comprend 2-3 spécialisations, devient préférable. Un large choix de cours modulaires et de cours facultatifs est proposé pour obtenir et accumuler des points, ce qui facilite l'obtention d'un diplôme et d'un diplôme de haut niveau professionnel. Il existe des systèmes dits de crédit qui permettent aux enseignants de choisir leur propre itinéraire d'apprentissage, en utilisant toute l'expérience accumulée précédente. La formation pédagogique en Angleterre devient aujourd'hui un phénomène largement populaire et répandu, une direction prometteuse, mais elle a des particularités pratiques. Il faut noter que les établissements d'enseignement supérieur surveillent tout au long de l'année le travail des diplômés de l'école et sont également tenus d'impliquer des enseignants talentueux dans le processus éducatif de l'université.

La réforme de la formation pédagogique en Angleterre au cours des 70 dernières années peut être divisée en trois étapes. Le contenu de la formation des enseignants commence par l'auto-sélection des institutions et des écoles différentes, et maintenant avec une seule gestion de l'éducation et son évaluation.

Changement du système de l'école normale (40s – 70s au XXe siècle)

Au début du XXe siècle. les autorités locales de l'éducation et des collèges pédagogiques privés en Angleterre étaient principalement responsables de la formation pédagogique et de la formation dans les collèges pédagogiques des universités, des instituts et des collèges.

Les collèges pédagogiques ont passé des cours de deux, trois et quatre ans, tandis que la formation des professeurs du primaire déroulaient principalement dans le cadre des cours de deux ans des collèges pédagogiques. Les disciplines d'enseignement obligatoires étaient principalement celles-ci: la méthodologie d'enseignement et de pratique, la physiologie (anatomie) de la santé, le sport, la musique, la lecture, l'art et d'autres matières. Il existe également des cours d'anglais, d'histoire, de géographie, de mathématiques et des sciences naturelles. Si l'étudiant envisage d'enseigner dans le secondaire, il doit choisir quatre cours en plus des disciplines obligatoires. En outre, les étudiants doivent passer un stage dans une école primaire accréditée par le Ministère de l'éducation, qui dure généralement de 6 à 12 semaines.

Après la Seconde guerre mondiale, il était stratégiquement important et nécessaire pour l'Angleterre de réanimer des industries détruites. Le rapport McNair, publié en mai 1944, a formulé un certain nombre des problèmes liés à la formation pédagogique en Angleterre. À cette époque,

des recommandations ont été faites, notamment sur la nécessité de réformer le programme d'études et le système de formation pédagogique:
– que l'école normale devrait renforcer les programmes d'études universitaires afin de contribuer au développement de la personnalité et des capacités des étudiants, ainsi que d'élargir le contenu des disciplines et de diffuser son importance dans toutes les régions du pays. Depuis lors, les professeurs du primaire sont principalement formés dans les collèges pédagogiques de “l’organisation régionale de formation des enseignants”, également sur une base de deux ans, comme il est généralement recommandé par le système entier éducatif anglais.

À la fin des années 1950s, au début des années 1960s, des disciplines de psychologie et de sociologie ont été ouvertes dans les universités, ainsi que des cours du développement de la théorie de la pédagogie. En 1964, à la suite du rapport Robbins, le gouvernement a adopté une recommandation visant à remplacer les facultés d'éducation et les collèges d'éducation locaux par un "collège d'éducation" et à exiger que les enseignants qualifiés suivent un programme de quatre ans de baccalauréat en éducation (Bachelor of Education). Le programme, la théorie de l'apprentissage et les moyens d'enseignement pour le baccalauréat en éducation doivent être approuvés par le Conseil Scientifique de l'université. Le contenu de la formation comprenait principalement:

1. Cours de base. Les cours d'enseignement supérieur de choix personnel de l'étudiant et les cours de matières qui sont prévus pour enseigner, ce qui représente de 22% à 50% de la durée totale du programme.

2. Théorie de la pédagogie, divisée en disciplines obligatoires et par choix, constituante 33% au minimum du temps total en quatrième année d'études.

3. Méthodes pédagogiques.

4. La pratique pédagogique exige généralement que les élèves suivent 140 jours de demi-journée d'enseignement dans le primaire et le secondaire. A la quatrième année du baccalauréat en éducation, un programme de recherche scientifique de base est étudié et un stage pédagogique formel est organisé.

Au cours de ces 30 années, la formation pédagogique s'est progressivement stabilisée. La formation se compose également d'une formation initiale de deux ans au programme de quatre ans adopté par le système éducatif et tout l’ensemble du processus d'apprentissage est orienté de la pratique partielle à la théorie académique partielle. En raison

des changements dans le système et le programme, le nombre et la qualité des enseignants en Angleterre à cette époque se sont améliorés, et jusqu'au début des années 70s la formation pédagogique des enseignants se composait de quatre parties principales: pédagogique, études professionnelles, cours de recherches et stages suite aux disciplines académiques principales [4]. C'est à partir de cette époque dans le domaine de l'éducation que le baccalauréat (Bachelor of Education) est entré dans l'histoire de la formation pédagogique anglaise, qui se poursuit à ce jour.

Restructuration des établissements pédagogiques (70s-80s au XXe siècle)

Dans les années 1970s, le parti conservateur a remporté les élections générales et le développement de la formation pédagogique en Angleterre est passé à la deuxième étape du développement. En janvier 1972, le rapport de James a été publié, qui décrit le contenu, la structure et l'état des élèves dans la formation pédagogique en Angleterre. À cette époque, simultanément au rapport la critique du système actuel de formation pédagogique stipulait:

- la plupart des études théoriques dans les programmes de formation pédagogique n'ont rien à voir avec les étudiants moins expérimentés, ce qui rend l'enseignement primaire surchargé;
- un trop large éventail de disciplines;
- confusion entre les programmes individuels et les cours professionnels des étudiants et beaucoup d'autre.

Après la publication du rapport James et la publication du document WHITE BOOK (livre blanc) sur l'éducation, le gouvernement anglais a entrepris de restructurer les établissements d'enseignement. Cela se manifeste principalement par la réorganisation de l'institut pédagogique et la formation des enseignants sur le lieu de travail. Après la publication du document sur l'éducation, les programmes de premier cycle en éducation sont devenus la forme principale des programmes d'enseignement pour les enseignants en Angleterre. Le programme d'études de premier cycle est devenu un programme de trois et quatre ans comprenant une formation académique, une théorie de l'éducation et un stage. Le programme de trois ans est structuré en mettant l'accent sur l'utilisation adéquate des connaissances scientifiques dans l'enseignement plutôt que la recherche scientifique. À la fin des années 1970s, la magistrature a commencé à ouvrir des directions de formation des enseignants. Le programme PGCE d'un an était principalement destiné à la formation des enseignants du secondaire. En outre, pour les étudiants qui ne prévoient

pas nécessairement devenir enseignants, un programme de certification de l'enseignement supérieur, conçu pour 2 ans, a été créé.

Dès les années 1930s, la conception d'apprentissage orientée aux enfants a eu une grande influence sur le programme de formation pédagogique. Avant les années 80s, l'Angleterre n'avait pas une norme unique pour le contenu des programmes d'études pour les étudiants, y compris l'écoles secondaire primaire. À l'époque, les enseignants du primaire et du secondaire avaient une autonomie et pouvaient déterminer indépendamment le contenu et les formes de leur enseignement. Les enseignants ont également été encouragés pour leur volonté de développer les innovations pédagogiques. Par conséquent, les institutions de formation pour les enseignants étaient également auto-ajustées pour une élaboration des plans de formation et des enseignants pouvaient choisir eux-memes des écoles pour le passage des stages de pratique pédagogique.

Cependant, en 1976, le premier ministre travailliste de l'époque, James Callahan, a fort critiqué cette formation. Depuis lors, le Gouvernement anglais a pris conscience de l'importance du contenu unique de l'enseignement et, depuis lors, a commencé à gérer l'éducation et à intervenir dans le contenu de ses programmes. Ainsi, la formation pédagogique est progressivement passée à la composante pratique de toutes les disciplines.

Gestion du contenu de l'état et orientation pratique (après les années 80s)

Après les années 80s, le gouvernement a commencé à se concentrer à l'éducation et des nombreuses personnes ont commencé à penser que les cours ITE dans les années 70s accordaient trop peu d'attention à l'apprentissage des matières, aux compétences d'apprentissage en classe et à l'accent excessif sur la théorie de l'éducation. En 1984, la Commission d'attestation pour la formation pédagogique (CATE) a été créée, qui a proposé que le contenu de la formation pédagogique comprende: 50% des cours professionnels, 50% restants des cours – devaient avoir 100 heures de mathématiques, 100 heures d'apprentissage de l'anglais et 100 jours de pratique à l'école. Cela signifie la disparition progressive de la partie théorique de l'éducation (philosophie, psychologie, histoire, sociologie) dans la formation du personnel enseignant, et pour les enseignants des écoles secondaires, la grammaire et l'arithmétique deviennent des disciplines d'apprentissage obligatoires [7]. À partir de cette période, la tendance générale de la formation pédagogique se concentre de plus en plus sur la pratique et le contenu du programme ne

correspond presque pas à la pédagogie théorique.

Dans les années 90s, le gouvernement a commencé à contrôler vigoureusement la formation pédagogique et a élargi le champ des établissements d'enseignement supérieur. Il a défini le contenu de l'enseignement (DFE,1992,1993), puis établi des normes pour les étudiants, qui se reflètent principalement dans la pratique pédagogique [3]. Un élève étudiant en master pendant un an doit effectuer un stage à l'école. Ses cours pratiques scolaire devraient représenter plus de 66% de la durée totale des études. En outre, les étudiants doivent passer des examens de grammaire et d'arithmétique [2].

En 1997, la realisation d'un nouveau programme national de formation pédagogique a été lancée, qui prescrit en détail le contenu de l'enseignement de l'anglais et des mathématiques à l'école primaire (DfEE, 1997a). Les exigences nationales en matière de formation pédagogique et de contenu des programmes sont de plus en plus orientées à la pratique, et cette idée a lieu jusqu'à présent en Angleterre.

Formation des enseignants en plusieurs étapes

Après l'apparence du gouvernement de coalition, il a déclaré qu'il utiliserait le modèle d'apprentissage dirigé par l'école (school-led) pour réformer la formation des enseignants, en particulier sur la base de la route de l'emploi (employment-based route), où les écoles embauchent directement des enseignants et organisent leurs cours. Les réformes de la formation et de l'amélioration des enseignants sont mentionnées dans le document THE IMPORTANCE OF TEACH (importance d'enseignement) publié en 2010 par le gouvernement de coalition. Il parle de l'expansion du programme TEACH FIRST (enseigner premier) et de l'ouverture de plusieurs établissements d'enseignement dans lesquels l'éducation des enfants, la formation des enseignants et les recherches sont des compétences essentielles [6]. Et aussi que, depuis 2012, les examens de grammaire et d'arithmétique sont une condition pour la participation à la formation des professeurs et des enseignants, qui sera mise en œuvre en Angleterre.

Dans les cours PGCE d'aujourd'hui, les deux tiers du temps d'étude sont consacrés au stage de la pratique dans les écoles primaires et secondaires. Bien qu'il s'agisse d'un programme de maîtrise, il n'y a pas d'idée claire dans le programme que la forme de recherche scientifique de l'enseignement devrait être incluse dans le programme.

Conclusions

Après 70 ans des réformes et des innovations, la formation pédagogique en Angleterre a finalement formé un modèle de formation des enseignants

en plusieurs étapes orienté à la composante pratique de l'apprentissage. L'accent mis aux étudiants, la diversité de la formation des enseignants et des étudiants, la contribution à leur croissance personnelle ont fait l'objet d'un apprentissage à toutes les étapes jusqu'aux années 80s en Angleterre. Par conséquent, l'éducation anglaise également tendait à stimuler l'emploi des enseignants sur le marché du travail. Tous ces changements sont visibles selon le changement de nom du département national de l'éducation. En 1992 DES (Ministère de l'éducation et des sciences) est devenu DFE (Ministère de l'éducation) et en 1995, il a été rebaptisé DfEE (Ministère de l'éducation et de l'emploi), qui a récemment changé de nom pour DfES (Ministère de l'éducation et des compétences). Grâce à ce changement, nous pouvons observer des changements dans l'idéologie de l'éducation, transformant l'éducation en un rôle externe et instrumental [5]. La promulgation du nouveau programme national d'enseignement a résulté à ce que l'éducation des enseignants un sujet de contrôle de l'état. Et à partir de l'ITE initiale jusqu'à l'ITT actuelle, la formation pédagogique en Angleterre se concentre de plus en plus à la pratique pédagogique. «Il est évident que les changements ultérieurs dans les idées fondamentales de la construction de l'enseignement supérieur entraîneront des changements substantiels dans la formation du personnel enseignant, visant à modifier les rôles du futur enseignant de l'enseignement supérieur» [1, p. 44]. Quoi qu'il soit, les nombreuses années des réformes et des innovations du système éducatif anglais représentent le modèle global de l'enseignement supérieur et répondent aux normes de haute qualité.

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PROBLÈMES ACTUELS DANS LA PRATIQUE DE L'ÉDUCATION INCLUSIVE EN CHINE

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L'article est consacré aux problèmes qui existent dans la pratique de l'éducation inclusive en Chine. Bien que l'environnement socioculturel et, le système éducatif mondial en général changent vite, les problèmes de l'inclusion (éducation inclusive) restent indécis pour le moment en Chine. Tels problèmes que: le contexte juridique de la protection des personnes handicapées; la qualification insuffisante des spécialistes en application de l'éducation inclusive dans l'environnement communicatif, la culture informatique et digitale, aux niveaux théorique et méthodique, organisationnel, éducatif, socio-économique, psychologique et personel et professionel et idéologique; absence de l'expérience suffisant de l'enseignement et de la gestion dans une classe inclusive; absence des programmes et de la synchronisation des disciplines visantes à faciliter l'adaptation des personnes avec des BEP; le système de patronage psycho-pédagogique très faible; même l'absence de l'information sur l'éducation inclusive (universitaire), etc. La solution de tous ces problèmes permettra de réaliser l'objectif de l'éducation inclusive, basé sur l'humanité.

Mots-clés et expressions: adaptation, inclusion, éducation inclusive, apprentissage inclusif, école inclusive, pratique inclusive, intégration, éducation intégrée, système éducatif mondial, université, enseigné, particularités du développement.

Le développement de l'éducation inclusive est devenu une demande de temps et une nécessité vitale. La compréhension sémantique de l'inclu-

sion est imprégnée du contenu spirituel et psychologique de l'éducation et est liée aux aspects axiologiques et psychologiques [3, 4]. L'éducation inclusive (intégrée) consiste à assurer l'égalité d'accès à l'éducation pour tous les enseignants, en tenant compte de la diversité des besoins éducatifs et des capacités individuelles. C'est un concept largement utilisé pour décrire les processus et les résultats de l'éducation et de l'éducation des personnes aux besoins particuliers (personnes handicapées) dans les établissements d'enseignement de masse. Cette éducation est ciblée à trouver des solutions des problèmes et à éviter les obstacles à l'accès à l'éducation abordable, confortable et de qualité pour tous les enseignants au développement spécifique, qui se trouvent dans le domaine des dilemmes spirituels et moraux de toutes les civilisations et, surtout, dans la pratique spirituelle et morale de plusieurs milliers d'années du peuple chinois.

En Chine, le système d'éducation inclusive, qui est un élément important de toute la stratégie de l'éducation, se développe et devient de plus en plus pertinent. En examinant les progrès réalisés dans le développement de l'inclusion dans les pays voisins et en reprenant l'expérience mondiale de l'éducation, le gouvernement chinois apporte une contribution considérable dans sa direction.

Par exemple, en Russie, l'éducation inclusive a commencé à se développer rapidement grâce à la mise en œuvre de la loi fédérale n ° 273-FZ du 29 décembre 2012 “Sur l'éducation dans la Fédération de Russie”, à la création de centres de ressources pédagogiques et méthodologiques, des organisations professionnelles de base financées par concours et des institutions diverses à but non lucratif. Se référant à l'analyse scientifique de D.Z. Akhmetova, l'efficacité de l'éducation inclusive dépend de cinq conditions organisationnelles et pédagogiques essentielles:

1. La disponibilité d'un environnement accessible, <…>, mais aussi les relations humaines des enseignants avec les enfants, les parents et les uns avec les autres.

2. Un système d'intégration scientifique des enseignés dans des groupes mixtes (inclusifs) <...>.

3. Le professionnalisme élévé des enseignants et des chefs <...>.

4. Culture organisationnelle et esprit de compréhension et d'acceptation de chacun <…>; engagement.

5. Intégration d'une organisation éducative inclusive avec les institutions sociales <...>. [1, P. 24-25].

En ce qui concerne l'intégration des enfants, le scientifique soviétique L. S. Vygotsky (1896-1934) a écrit, justifiant, comme il l'avait imaginé une

grande importance de l'apprentissage intégré il y a un siècle. Il a évoqué la nécessité de créer un système d'inclusion de l'enfant handicapé dans la société des enfants au développement normal. Toute école correctionnelle "ferme son élève dans le cercle étroit d'une équipe scolaire spécifique, crée un monde fermé dans lequel tout est adapté au défaut de l'enfant, tout fixe son attention sur son défaut et ne l'introduit pas dans la vie réelle» [2]. Là, on peut mentionner le psychiatre autrichien K. König (1902-1966), qui en 1940 près de la ville d'Aberdeen (Écosse) a créé la première communauté de camphill. Fondée sur les principes de l'anthroposophie de R. Steiner, la pédagogie de camphill, qui utilise l'expertise de l'école Waldorf, a pour but d'éduquer les enfants suite à leurs capacités potentielles, ce qui constitue une étape importante de l'éducation inclusive. K. König écrivait que la vie avec des personnes "handicapées" est utile pour les personnes "normales", car elle les aide développer des compétences communicatives et à surmonter l'égoïsme. Il considérait "trois grandes erreurs" de la modernité: l'agnosticisme, la notion darwinienne de "sélection naturelle" et la théorie psychologique de "l'intelligence mesurable".

En France, l'éducation inclusive s'est développée avec l'adoption de la Loi sur l'orientation éducative, qui établit le principe de l'intégration scolaire des élèves handicapés en 1989, et l'adoption en 2005 de la Loi sur l'égalité des droits et des chances, la participation et la nationalité des personnes handicapées. Depuis cette époque, il existe plusieurs formes d'organisation de l'éducation:

1. Formation dans une classe d'enseignement général (inclusive), si nécessaire avec accompagnement individuel ou en groupe.

2. Formation dans la classe de correction de l'école d'enseignement général sous la direction d'un enseignant spécial, avec la participation aux activités communes de l'école.

3. Enseignement à distance < ... > pour les enseignés qui ne peuvent pas physiquement fréquenter les établissements d'enseignement.

4. Formation dans un établissement médico-social, y compris avec une inclusion partielle dans l'école d'enseignement général [7, pp. 56-57].

Nous observons maintenant les mesures constructives prises par les gouvernements de nombreux pays, appliquées dans l'éducation nationale et étrangère pour réalisation des principes de l'inclusion. Ces actions forment les compétences les plus importantes du XXIe siècle. – les relations académiques et sociales, les relations communicatives, la capacité de coopérer en équipe, ce qui développe finallement une société inclusive.

Le principe général des activités éducatives inclusives est la volonté de s'adapter aux besoins des catégories des enseignés différentes grâce à

la modernisation du système éducatif, c'est-à-dire sa structure, le contenu riche, de la technologie des liens. La réalisation pratique et la base scientifique théorique de l'éducation inclusive sont constamment mises à jour avec de renseignements nouvaux, se développent intensément dans toutes les directions, étant l'une des innovations dans les processus et les résultats du développement de la société.

Mais, malgré l'évolution rapide de l'environnement socioculturel et, en général, du système éducatif mondial, les problèmes d'inclusion (éducation inclusive) en Chine restent non résolus pour le moment:

- la déclaration de l'égalité des gens, de leurs droits et de leurs devoirs est souvent contraire à la mise en œuvre dans la vie; il n'existe pas encore de base juridique national pour les personnes handicapées, les personnes aux besoins éducatifs particuliers en tant que citoyens libres à part entière;
- le manque de préparation des spécialistes: psychologues, éducateurs et gestionnaires à la mise en œuvre de l'éducation inclusive; des difficultés apparraissent dans la communication, la culture de l'information et du numérique, aux niveaux théorique et méthodologique, organisationnel et éducatif, socio-économique, psychologique personnel et professionnel et idéologique;
- l'expérience de l'enseignement et de la gestion de l'éducation inclusive est au début de la recherche et de la pratique;
- l'absence des programmes visant à faciliter l'adaptation des personnes aux besoins éducatifs particuliers, ce qui augmentera les possibilités de cohésion et la stabilité sociale dans la société;
- le système faible de soutien psychologique et pédagogique, accompagnement pédagogique; manque de technologie pour l'implication organisationnelle des parents dans le processus socio-éducatif, etc.;
- l'absence de pratiques systématique de tolérance dans la société qui aident à résoudre les problèmes d'activité sociale, à éliminer les attitudes négatives et à surmonter l'isolement des personnes aux besoins particuliers;
- les infrastructures éducatives et de réadaptation ne sont pas suffisamment développées pour intégrer l'apprentissage; les formes d'apprentissage individuelles et internées sont toujours utilisées;
- la société n'est pas pleinement consciente des racines morales et psychologiques du handicap en tant qu'actions improductives de la famille elle-même et du choix personnel de la personne elle-même en ce qui concerne le traitement, l'éducation et le dévelop-

pement dans une société de stress social intense;

- jusqu'à présent, par exemple, tous les jeunes malvoyants (aveugles) ne sont pas au courant de l'éducation inclusive (universitaire) et, par conséquent, ils ne peuvent pas réagir positivement et accepter l'éducation intégrée, parfois même en raison de la contrainte banale de leurs handicaps physiques;
- les leçons tirées de l'expérience mondiale sont trop faibles, les personnes aux besoins éducatifs particuliers (personnes handicapées) limitent elles-mêmes leur capacité à communiquer, à comprendre et à connaître le monde qui les entoure;
- un grand écart dans les méthodes d'enseignement et d'enseignement des disciplines; les cours ne sont pas synchronisés pour répondre aux nécessités des personnes aux besoins éducatifs particuliers, ce qui entraîne une mauvaise perception des connaissances;
- dans les établissements d'enseignement à tous les niveaux, l'équipement de ressources est insuffisant, et dans une société technologique et informatique (digitale), la maîtrise et le développement de la culture numérique deviennent un objectif extrêmement important et prometteux pour les personnes aux besoins éducatifs particuliers.

La solution de ces problèmes permettra de réaliser l'objectif de l'éducation inclusive, mis dans l'humanité des gens [5, 6]. Les personnes aux besoins éducatifs particuliers auront plus de chances de reconnaître leur existence, de confirmer l'importance des aspects différents de leur existence, c'est-à-dire d'être entendues et de devenir des membres à part entière de la société. L'inclusion n'est pas une forme, mais une nouvelle éducation avec sa philosophie des possibilités et du choix libre, c'est une préparation à la vie et à l'intégration complète de chacun dans la société..

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NOOHUMANISTIC PHILOSOPHY

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Article recites the author's statements that the Noohumanistic Philosophy has naturally emerged as the social response on current vital problems, such as systemic, global, environmental, economic and mental crises; religious and inter-ethnical clashes, aggression as well as terrorism. Incorporating findings of the cosmism, antique cosmocentrism and modern academic researches, the Noohumanistic Philosophy outputs an educational end-product aimed at forming the Future Humanity – people with planetary and cosmic-scaled mentality, i.e., distinguished with the planet-wise intelligence and liabilities against any environmental impacts, being clearly aware of their anthropogenic strategies, which may not pose any hazards, but to be in harmony with bio-, techno- and social processes.

Studying the issue, we have discovered that the Noohumanistic Philosophy, being integrative of the social-economic, environmental, spiritual and ethical aspects, focuses on conscious harmonization of socio-natural systems as well as structuring the planetary worldview, evoking one's life philosophy in that direction, nourishing liabilities, tolerance, moral and ethical principles, and transcending worldview horizons.

The analysis revealed that the Noohumanistic Philosophy is a new paradigmatic trend aimed at forming the Noohumanistic Philosophy and Noohumanistic Worldview. It is brand new, developing, productive, high-potential and meets today's global challenges.

Keywords: philosophy, Noohumanism, Noospheric Education, Planetary-Cosmic Personality, Paradigm

The Noohumanistic Philosophy (hereinafter referred to as "the NP") has naturally emerged as the social response on current vital problems, such as systemic, global, environmental, economic and mental crises; religious and inter-ethnical clashes, aggression as well as terrorism. The NP, being integrative of the social-economic, environmental, spiritual and ethical

aspects, focuses on conscious harmonization of socio-natural systems as well as structuring the planetary worldview, evoking one's life philosophy in that direction, nourishing liabilities, tolerance, moral and ethical principles, and transcending worldview horizons.

In the context of modern philosophic discourse, the NP represents one of the branches of the noospheric philosophic paradigm. For example, O. A. Bazaluk has developed the noohumanistic model of the "Evolving Matter", proving legitimacy and naturality of the mankind's evolution at the Earth-Space scale [1; 2]. Besides, he derived the "Planetary-Cosmic" concept out of the said model [11]. G. P. Sikorskaya has elaborated the NP model of the environmental-pedagogical education and its practical implementation [9]. O. A. Bazaluk applies research data in cosmology, biology and neurosciences to prove his model, while G. P. Sikorskaya constructs her noohumanistic model on absolutely different grounds. She addresses the noohumanism as the worldview basis of the environmental-pedagogical education.

The NP incorporates the wide range of paradigms: noospheric, person-oriented, evolutionary-synergetic as well as quantum approach, which all conjugate in their focal points with philosophic projection of the noohumanism, and, thus, enable to account the NP as the paradigmatic trend.

Heavily prioritizing the socio-natural harmony, the NP acts as a part of the noospheric education. Paradigm of the noospheric education ("the Noospheric Paradigm") itself "being the concept of harmonized evolution of the nature and human civilization embodies such phenomena as 'the Cosmic Pedagogy (CP)', 'Cosmic Upbringing, 'Cosmic Education'" (e.g. studies by O. A. Bazaluk, A. I. Krimensky, M. Montessori and others). They are peculiar of wholism (wholeness of the existence); the cosmic consciousness, moral flawlessness.

Montessori Education represents another approach to handle the NP issues and is notable by its focus on a person's self-construction within learning environment based on the natural conformity principle, under which the education shall be based on the scientific understanding of natural and social processes, be concordant with general laws of human and nature development, and form responsibilities for one's self or the noosphere evolution [10; 11, 12].

The term "Noohumanism" was recently introduced to the science of philosophy [9], and originally was associated with environmental aspect (studies by G. P. Sikorskaya). The NP and its driver core – the Noohumanism may be interpreted multipolarly: not only from the standpoint of either noospheric school by V. I. Vernadsky, who emphasized the geotransform-

ing role of human intelligence; or environmentally (sustainable development concept, etc.), but also under quantum approach, highlighting one of its essential lines – worldforming value of the consciousness. However, the NP's physical component, if seen in terms of its paradigmatic essence, contains the evolutionary-synergetic paradigm, since the modern physical world-image involves the synergetic approach, which explains self-organization of systems based on their accessibility, non-equilibrium and fluctuations.

Contents of the "Noospheric Paradigm" have been enlarged with the studies of presently well-known scientists, such as N. N. Moiseev, A. D. Ursul, A. I. Subbeto, N. V. Maslov, G. P. Sikorskaya, F. V. Lazarev, A. S. Zapesotsky, O. A. Bazaluk and others.

The noospheric paradigm represents "the consciously managed value-oriented co-development of human, society and nature, whereby the community vital needs are supplied without any damage to the interests of future generations and Universe" [8, p. 24], and organically involves the sustainable development concepts, i.e. the environmental component. The noospheric paradigm has been developing to acquire expansive meaning. For instance, A. I. Kreminsky, studying an anthropological aspect of the noospheric paradigm, highlights that one of the reasons behind the crisis is the mankind's overconsumption. He believes that it is possible to create some mechanism, which will restrict excessive consumption of natural resources via self-limitation of needs. "It is not about 'asceticism' or 'abnegation' of civilization benefits, but only about excluding 'excesses' from the 'consumption list'" [7, p. 17]. According to Kreminsky, the noospheric-anthropological paradigm may initially create axiological, then ideological, and ultimately legal conditions for each human being to regulate what he or she needs and suffices, as well as what may be "painlessly" rejected". Incorporating ideas of the cosmism, antique cosmocentrism and modern academic researches, the noospheric philosophy outputs an educational end-product aimed at forming the Future Humanity – people with **planetary and cosmic-scaled mentality**, i.e., distinguished with the planet-wise intelligence and liabilities against any environmental impacts, being clearly aware of their anthropogenic strategies, which may not pose any hazards, but to be in harmony with bio-, techno- and social processes (studies by O. A. Bazaluk, A. I. Kreminsky, N. V. Maslova, D. B. Sviridenko, etc.). The Noohumanistic Philosophy, embodying didactic systems of the cosmic pedagogy and upbringing (the Montessory method), noospheric-anthropological concepts (A. I. Kreminsky, F. V. Lazarev, N. V. Maslow and others), has developed the problem statement-and-solution model, thus, demonstrating paradigmatic features.

The NP, which is based on the noohumanism, along with its noospheric foundation, equally uses the other – the humanistic component that has also acquired paradigmatic features within conceptual field of philosophy. Paradigm of the humane philosophy, as based on the humanistic psychology concepts (A. Maslow, C. Rogers, R. Burns), guides the philosophic ideas in such order that any person (acting as an opponent of communication) could be transformed into a like-minded person, an equal participant and co-author of its own reflections. Interactions between the participants in communication shall be based on mutual respect and trust, i.e. shall have pronounced humane character.

One of the manifestations the humanistic paradigm translates is the personal approach associated with person-oriented (person-targeted) learning, which itself owned paradigmatic value in philosophy. The person-oriented paradigm (I. S. Yakimanskaya, K. A. Abulkhanova-Slavskaya, N. A. Alexeev and others) ensures self-development, growth of noohumanistic conceptions based on humanistic pedagogy principles: personalization of pedagogical interaction and dialogical teaching principle, which predetermine equitable collaboration of its actors and potential harmonious development of a person with noohumanistic worldview.

According to A. G. Kovalev, the person-oriented paradigm of philosophizing transforms the knowledge into “intimate spiritual wealth of a human that ensures the main – the personal fulfillment” [10, p. 249]. The person-oriented pedagogy treats any learner as the actor (the subject), who, with the teacher’s assistance, can and must choose the vector of his or her education to achieve the best results in self-fulfillment. The person-oriented philosophizing is understood as a conceptualization that exposes peculiarities of a learner – an actor, acknowledges authenticity and inherent value of subjective experience of a child, and structures pedagogical action based on the subjective experience of a learner. The person-oriented philosophizing acknowledges and respects the uniqueness of each and every human being, and actualizes through humane relationships, that means that the principal quality of any communication between the learners shall be the tolerance. The Learner shall be eager to comprehend and, potentially, accept an opinion expressed by the Other, the motives behind his or her activities. This implicates one of the socialization leverages, whereby an individual acquires skills to communicate and work in team, or, in broader sense, to form its planetary mentality, think him- or herself as the Earth citizen responsible for the world fate. Unindifference and responsibility, both as an individual's civic position, with respect to biosphere safety, team and family atmosphere, own men-

tal health all these personal qualities play the pivotal role, are in demand and must be implemented by a modern education system. Tolerance at any level – the personal, international, intergovernmental or otherwise – is as much urgent as ever. Persistent conflicts and terrorism call for adequate reformation of present social institutions, including the education. It is not by coincidence that, following the strategic goals formulated in the "Concept of Education of the Republic of Kazakhstan until 2015", the modernization of education is associated with the changes in its contents "from the knowledge-centric to competence-based education, i.e. an education oriented toward results, integrative world perception; and to systematic imagery of world, society and humanity with the ability to intensify and extensify it", etc. [5]. We should note that identical trend takes place in Ukraine as well. Concept for modernization of Ukrainian education until 2017 is purported to create conditions that will form global, multifunctional and tolerant mentality in learners and teachers, communicability and readiness for personal and professional self-identification within all-changing multicultural environment. This requires transition from "knowledge-based" and adaptive-disciplinary paradigm of teaching and upbringing to the competence-based and person-oriented paradigms to ensure evolutive and advanced learning, development and socialization of learners. In other words, the synergy of cosmism ideas (in terms of epistemic and psycho-pedagogical knowledge) and of certain skills, along with creative work experience will contribute for the teacher's self-realization as being potent to efficiently interact with the learners within educational process, feel satisfaction from self-success in educating the youngsters, develop reflexive culture and psycho-social understanding of self-usefulness, and will confer power and confidence in communication and activities [6]. "An individual's value, its human qualities do improve, an attitude towards education also changes. The education humanizes, its contents is enriched with cultural values and meanings. Accordingly, theoretical propositions of humane pedagogy become relevant in science and pedagogy, the ideals of which are accepted by the scientific community as unconditional and universal. That translates to development of humanitarian methodology as the main basis for changing the paradigm of pedagogical science" [3, p. 4]. Therefore, development of the said aspect of the noohumanistic philosophy is extremely promising.

Environmental vector of noohumanistic philosophy is represented by the environmentally-oriented worldview, the backbone of which is the environmental consciousness. The latter is spotlighted in the ontological paradigm (e.g. studies by S. V. Krichevsky, V. I. Panov and others),

psycho-didactical works (e.g. A. V. Ivashchenko, A. V. Gagarin and others). Under the ontological paradigm "the environmental consciousness is originally observed as a special form of existence, which is the highest form of development of the psyche, and which objectifies into reality by virtue of human-environment interaction. This means that the "human-nature (environment)" system acts as a holistic, joint actor, accomplishing both natural principles of development, and the nature of the human existence, and thus capable to self-develop as a joint actor of the psychic reality" [4, p. 61-62]. Environmentally-oriented aspect of the noohumanistic philosophy, along with its other components, proves its paradigmatic value. Perception of the noohumanism as the paradigmatic trend in philosophy is consummated by the physical aspect of the NP represented via evolutionary-synergetic paradigm, which interprets the NP's self-organization processes based on the system accessibility, non-equilibrium, fluctuations and finalizes in generation of the said worldview structures. Modern natural sciences can not be rationalized without synergetic approach; they describe the system-wide self-organization based on neutralization of entropy in the bifurcation point, and origination of a new order on a different qualitative level (H. Haken, I. Prigogine, I. Stengers and others). With the paradigm-synergetic approach Ye. B. Yakimova provides grounds for the formation of environmentally-oriented worldview by adding basic principles of synergetics and evolution concepts into the physical science. Therefore, paradigmatic value of the NP components provides solid foundation to account the noohumanism as the paradigmatic trend in the science of philosophy [10].

Summarizing, one may say that contemporary higher shall be focused on building the planetary worldview in future specialists and provide conditions for mastering technologies of optimum solutions, as well as develop tolerance in judgments and activities.

With all that said, the conducted analysis proved to consider the Noohumanism as a new paradigmatic trend that forms noohumanistic worldview, which is brand new, developing, productive, high-potential and meets today's global challenges.

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L'article examine les mots dialectaux dans le travail des écrivains de Koursk K.D. Vorobyev et M.N. Eskov, dont le prose artistique présente l'unité du discours dialectal et de la maîtrise d'auteur de son utilisation. Il faut mettre en valeur les particularités de l'utilisation des mots et des expressions particuliers. L'analyse des groupes du vocabulaire dialectal particulier permet d'identifier les caractéristiques de l'idiolecte des deux artistes de mot de Koursk.

Mots - clés: idiolecte, science régionalistique, dialectisme, vocabulaire dialectal, K.D. Vorobiev, M. N. Eskov.

Lors de l'étude du texte artistique, il est particulièrement important d'identifier le lien entre la langue, l'histoire et la culture de l'endroit où l'auteur est né et a vécu, car les unités linguistiques marquées au niveau régional gardent un système des connaissances des événements historiques, les coutumes et les traditions d'un territoire particulier. Le texte artistique fixe les particularités linguistiques caractérissantes une certaine région, ainsi reflétantes les individualités dialectales de la langue russe, et reflète également la spécificité de l'utilisation du vocabulaire régional dans les discours d'auteur, ce qui rend l'image linguistique du monde de l'écrivain plus visible. L'examination du vocabulaire dialectal dans le texte artistique contribue à une étude plus complète de l'idiolecte de l'écrivain, témoigne sa valeur culturelle et linguistique pour la compréhension de la vision du monde de l'auteur et de la culture russe en général.

Sans doute le lexique dialectal est une des sources d'enrichissement du vocabulaire de la langue littéraire russe contemporaine (par exemple, le dialectisme peut passer d'une œuvre d'art à la langue littéraire). Il est important pour la compréhension de la vie d'une personne russe, son idéologie et sa vision du monde, c'est-à-dire pour le reflète des points de vue sur la vie quotidienne, du monde qui l'entoure, des relations entre les gens, des valeurs culturelles. Cette partie du vocabulaire russe n'a pas d'analogues dans d'autres langues, mais elle est significative pour une personne russe et l'espace culturel russe.

La langue, en tant que phénomène multiforme, est à la fois un produit de la culture et une condition de son existence, pour cette raison la langue est capable de traduire une mentalité culturelle et nationale. "Les dialectismes représente un trait frappant qui caractérise très favorablement une œuvre d'art. La tâche principale est bien utiliser le matériel fertile, dosé, en faisant preuve du sens linguistique et de tact inné, implantant le mot dialectal dans le tissu de la nouvelle et du récit qui est le lien entre le jour d'aujourd'hui et notre passé» [Pravedniknov, Ryumchina, Tcheremissina 2019: 37]. Une des raisons de l'utilisation des mots et des expressions dialectaux dans le texte artistique est «l'aspiration de concrétiser un phénomène, une action ou un signe» [Khrolenko 2015: 73].

Considérons l'ouvrage des écrivains dont la vie et l'activité littéraire sont indivisément liées à la région de Koursk – K.D. Vorobyev et M.N. Eskov, dont le prose artistique présente l'unité du discours dialectal et de la maîtrise d'auteur de son utilisation.

Des œuvres nombreuses de K.D. Vorobyev montrent au lecteur la vie paysanne, y compris à travers le prisme du vocabulaire dialectal. Ainsi, par exemple, le récit «Mon ami Momitch» est un des œuvres, qui contiennent des mots dialectaux même sur les premières pages: *tyukat* – 'battre; pousser, frapper quelqu'un' [SRNG: 46: 17], *doudka-poujatka* - un instrument musical en bois traditionnel pour l'oblast de Koursk et l'oblast de Belgorod (forme dialectale de prononciation [pOUjatka], bien que le nom provient d'un mot пЫж[1] [pYj]):

«Il faut légèrement frapper **potyukat** la bouture avec la manche du couteau. Ainsi l'écorce sera enlevée entièrement et vous obtiendrez une flûte **doudka-poujatka**» (Mon ami Momitch).

Dans l'ouvrage de K. D. Vorobiev dans la liste des dialéctismes à haute fréquence des chercheurs indiquent des lexèmes *clounya* 'la construction de ménage pour le battage manuel de pain et de stockage des gerbes', *rouchnik* 'serviette', *povet* 'lieu sous couvert dans la cour paysane; le toit

[1]bourre

de chaume de la grange', *kouren* 'la hutte, les abrivents; dans certains endroits – une maison d'habitation'. Certains mots peuvent être inconnus pour un locuteur natif, y compris pour la raison qu'ils ont un marquage régional, c'est-à-dire ils sont liés à une certain région. Ainsi, par exemple, le lexème *zamachnyi* dépendant d'un lieu d'utilisation à l'autre sera interprété différemment: 'filé, fait de zamachkis[2]': poskonnyi: *toile zamachnyi*[3]*, la chemise zamachnyi, tissu zamachnyi* – district Rylskiy de la province de Koursk, district Soudjanskiy de la province de Koursk, 'de chamois' – Donskoy [SRNG: 10: 237, 238]. Chez K. D. Vorobyev dans l'histoire «Mon ami Momitch» nous trouvons:

«Tard, j'ai remarqué comment le gros bout du chêne s'est levé au – dessus du sol, parce que je regardais le dos et les épaules de Momitch - là, sous sa **chemise de chicot zamachnyi** blanche, des pelotes rondes ont lentement commencé à grandir et à bouger» (Mon ami Momitch).

Dans certains cas, le mot dialectal ne reçoit pas une description complète dans les dictionnaires, ainsi, par exemple, le lexème *potchetchui* dans les écrits lexicographiques a des définitions de 'hémorroïdes' [Dal] ou 'signification? péjoratif' [SRNG: 31: 11]. Dans telles situations, le contexte de l'auteur devient une aide importante pour le chercheur:

"*Sankya-a! Sankya-a, que tu attrapes* ***potchetchui!***" (Mon ami Momitch).

Considérons un autre fragment de l'histoire de K.D. Vorobyev:

«*Encore de* ***varok***[4]*, où le cien se battait et* ***yarilsya***[5] *à la* ***moutovyaz***[6]*, j'ai vu Zuzya sur le seuil de la cabane de Momitch, et Mityara Pevnev et l'institutrice près de* ***podvod***[7]*. En se penchant et en s'accroupissant, Zuzya tirait une plume gonflée* ***de koumatch***[8] *de la canopée, et à son deuxième bout, Nastya se couchait entre les* ***pritolokis***[9] *des portes. Elle nous remarqua avec Momitch et, serrant la plume avec ses mains nues, la tira vers elle. Zuzya a poussé en avant et est tombé, glissant – n'est pas* ***obvyksya***[10]*, il est évident, dans des bottes chromées*" (Mon ami Momitch).

Seulement dans quelques phrases le lecteur voit un ensemble des mots peu connus (la liste peut varier selon le vocabulaire d'un certain locuteur): *varok, moutovyaz, yaritsya, podvod, koumatch, pritoloka, obvyknoutsya*.

[2]chicot
[3]de chicot
[4]l'*étable*
[5]*s'enrageait*
[6]*à la corde*
[7]chariot
[8]andrinople
[9]chambranle
[10]habitué

Pour déterminer la signification de ces mots, le lecteur devrait s'adresser aux dictionnaires. Ainsi, par exemple, le lexème *moutovyaz* dans le «Dictionnaire des dictons russes populaires» a cette définition: 'un fil épais pour une liasse des pelotes de fils'; 'une ficelle, un ruban, avec lesquel une filasse est attaché au rouet' [SRNG: 19: 31, 30]. Dans le dictionnaire de V. I. Dal ce mot est défini comme ' corde, dentelle, bride, fil épais' [Dal]. Ainsi, dans le contexte de l'œuvre, ce lexème doit être perçu par le lecteur comme une corde à laquelle le chien est attaché. Le verbe dans la phrase *le chien yarilsya* a le sens d' 'être dans un état de rage, de colère intense' (dans certains dictionnaires, il est accompagné de notes *vielli, simple* (+traduction à ajouter)). Ainsi, ce n'est qu'en percevant correctement le sens des mots inconnus que nous pourrons comprendre le sens de ce que nous avons lu.

Les mots dialectaux sont présents même dans une histoire courte de K.D. Vorobyev sur la vie en captivité – «L'allemand en bottes de feutre», à leur aide, les images des personnages sont révélées plus profondément, la couleur de l'époque est plus visible. Ainsi, le mot *vajkost* mérite l'attention. Il n'est pas fixé dans les dictionnaires, mais nous rencontrons l'adjectif *vajkiy* - ' lourd, pesant, lourdingue ' ou 'nécessitant d'une attention particulière, le respect' [SRNG: 4: 14]. Notons que dans la langue ukrainienne il y a des mots *vajhki* 'lourd', *vajhkost* 'lourdeur', en biélorusse – *vajhki* 'lourd, significatif', *vajhkasts* 'lourdeur'. Dans les matériaux du dictionnaire de la langue russe ancienne I. I. Sreznevskiy il y a un verbe *vajhiti* 'peser' [Sreznevskiy: 1: 224]. On peut supposer que *vajkost* est un nom abstrait qui désigne telles caractéristiques d'un objet que le poids, l'importance. Ce context peut être une confirmation: *"... j'ai pris le paquet et j'ai immédiatement senti* ***l'vajkost*** *en apesanteur du pain...»* (L'allemand en bottes de feutre).

Les adjectifs dialectaux servent souvent à créer l'image de héros. «Les caractéristiques précises et volumineuses exigent un remplissage plus émotionnel que le vocabulaire littéraire, une expression accrue caractéristique du lexique régional. Les traits extérieurs et intérieurs vifs des personnages apparaissent au premier plan grâce à la parole vernaculaire précise» [Pravedniknov 2019: 145]. Ainsi, le lexème *mogoutnyi* peut être utilisé dans les textes de M. N. Eskova est utilisé pour transmettre les paramètres impressionnants du personnage, l'image d'une personne non seulement physiquement forte, mais une personne qui est née sur le terre russe, qui reçoit sa force - physique et spirituelle - des ancêtres, et cette puissance physique existe depuis des siècles et est transmise de génération en génération:

«...Le conducteur du tracteur a chanté et, levant les mains ***mogoutnyis***[11]*, les pieds pas moins* ***mogoutnyis****, piétinants a donné du plaisir à toute sa silhouette»* (Dans les rayons du coucher du soleil).

En plus que l'adjectif *mogoutnyi* dans les œuvres des écrivains, nous fixons le nom *mogoutnost*, qui transmet à la fois un sème 'force' et un sème 'taille énorme', 'imposture':

"*Kolya était connu de sa* ***mogoutnost*** *ici, et quand même il était un peu bizarre de la voir chaque fois: inhabituel et joyeux*» (Torf).

Le lexème dialectal de *prokhonyi* a le sens 'rare, maigre' dans le contexte du travail de M.N. Eskov:

«La terre s'est transformée en une pâte ***prokhonyi***[12]*: partout où vous marchez le maelstrôm est partout» (*Ni nuages, ni nubécule*).*

Habituellement, cet adjectif caractérise la pâte, mais dans notre cas, l'auteur trouve une telle image originale pour décrire le résultat d'une pluie très forte, en organisant un lien associatif de la *terre sous la pluie – pâte prokhonyi*.

Dans les textes de K.D. Vorobyev, nous fixons le lexème *kournopyatyi*, qui est utilisé pour décrire l'apparence des enfants (dans les discours de Ryazan, on appelle comme ça une personne camuse):

«*Les filles étaient semblables, à la fois* ***kournopyatyies***[13] *et aux cheveux blancs» (Combien ça coute la joie de Rakitny*).

Le vocabulaire dialectal est utilisé par les auteurs de Koursk pour décrire les peintures de la nature russe. Ainsi, par exemple, M. N. Eskov utilise le dialectisme de *volglyi* dans ce contexte, qui est fixé dans le dictionnaire des locuteurs de Koursk:

«*...Les courtines de roseaux, de saulaie grisâtre* ***volglyi*** *et de groseilles dures s'élèvent attractivement*» (Torf).

Une des histoires de K.D. Vorobyev tire son nom du nom de la fleur des champs de bleuet – «Sinelle»:

«*Dans notre région, les bleuets étaient des fleurs et ils s'appelaient* ***sinelle***[14]» (Sinelle).

Et dans une conversation sur les champignons, le garçon appelle le champignon blanc *belyak*:

"*Il y a beaucoup de* ***belyaks***[15]*. Assez pour deux; peut-être qu'on aille chercher les* ***belyaks****? Il y a maintenant plein d'eux!..*» (Première lettre).

[11]fortes
[12]molle
[13]camuses
[14]chenille
[15]cèpes

Dans les œuvres des écrivains qu'on a nommés les particularités phonétiques de la région de Koursk sont reflétées, par exemple, dans le changement des voyelles après dépareillées consonnes fermes (*janitsya*[16]*, pachanissa*[17]*, pachanitchka*), l'apparition du son [i] au début du mot devant consonne (*isdelat*[18]); l'apparition de la combinaison [khv] au lieu du son [f] devant les voyelles (*Akhvanassyuchka, khvosit, khvount, khvinskyi*) et d'autres. Aussi, chez M N. Eskov nous trouvons:

"*Et il est tout tôt de* ***janitsya****: il faut finir l'école*» (Ni nuages, ni nubécule...).

«*Non, on ne peut pas attendre, il pourrait* ***isdelat*** *un mutilé de vous, le ciel vous en garde* » (Mon petit frère).

"- **Kchront**[19] est maintenant, bayut, loin» (Vieux pommier avec une brisure).

Dans les œuvres artistiques des auteurs de Koursk, nous trouvons des variantes très intéressantes des adjectifs à la composition morphémique avec des suffixes de langage commun, qui affectent en même temps la sémantique du mot. Ainsi, chez M. N. Eskov, nous fixons l'adjectif *rassypistyi* au sens ' friable facilement'; le suffixe soutient ici cette 'inhomogénéité', 'déconnexion', bien qu'une telle caractéristique de la corde semble quelque peu inappropriée:

«*J'ai bien fait une corde, mais elle était tout en nœuds, parfois mince, puis épais, voire tordu ou* ***rassypistyi****, comme une queue*» (Torf).

Chez K. D. Vorobyev, vous pouvez rencontrer le lexème *bleskoutchyi* dans le sens 'brillant':

«*Je ne pouvais pas contourner l'ancien* abrivent*, et sur son seuil, j'ai vu un grand tas de quelque chose* ***bleskoutchyi*** *comme un feu*» (Mon ami Momitch).

Ainsi, nous voyons que la présence des dialectismes dans les textes artistiques des auteurs de Koursk capture et garde un discours populaire vivant pour les générations futures (y compris le discours des habitants d'une région particulière). L'inclusion des éléments linguistiques non littéraux assiste au réalisme des peintures artistiques créées. C'est à l'aide de telles dérogations des normes de la langue littéraire que l'identité nationale des personnages des œuvres est dessinée et que la langue d'auteur individuelle est créée. Par conséquent, ce matériel lexical est une source riche pour l'étude des particularités de l'idiolecte de l'écrivain et de son patrimoine artistique en tant que partie de la culture russe toute entière.

[16]se marier
[17]blé
[18]réaliser
[19]ligne de combat

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THE SYMBOL OF HEN IN RUSSIAN FOLKLORE (FROM THE "HISTORY OF THE SYMBOLS OF SLAVIC MYTHOLOGY")

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This work is part of a study in the field of symbols of Slavic mythology. In this report we will touch upon the topic "The symbol of hen in Russian folklore". Let's show the roots of its origin and some transformations of the image. The research is based on the versions of the fairy tales "Ryabushka Hen" [Pockmarked Hen – auth.] (here we will consider one, the most common version) and some beliefs, rituals, magical actions associated with the image of a Hen.

Keywords: mythology, golden egg, symbol of hen.

In previous reports, we have already considered some of the symbolic images that have come down to our time in a wide variety of forms and versions. They exist in numerous genres of folklore, both independently and crossing and interacting with other symbols. One of the most interesting symbols is the image of the Chicken laying the Golden and Simple Eggs. The image of wealth and prosperity was entrenched behind this symbol. (The symbol of the Rooster and Chicken has been examined by scholars several times [MPW 1992]). What did this mean initially? Let's figure it out. Let's consider the tale in a nutshell. The plot is well known (RFT).

The Chicken laid the Golden Egg. They put it on the shelf. Grandfather and Grandmother could not break it. The mouse ran, waved its tail, the egg fell and broke. Grandfather and Grandmother began to cry, and the Hen calmed them - promised to lay a Simple Egg.

How is the image of the Chicken and the Rooster viewed by the people? Very ambiguous. On the one hand, it is always a symbol of the new time, and on the other, a bird that can carry danger. In the previous report

of the current conference on the symbolism of the Snake, we partially touched on the symbol of the Rooster: from the Egg laid by it, the "Flying Serpent" (KAV) appears. [HOGSS]. The rooster sings at Midnight, driving away unclean spirits with its cry, but, like any creature associated with the time of the Night, it is also dangerous. The sorcerer can turn into the image of the Chicken or the Rooster. Singing Rooster at the wrong time - predicts a negative situation, etc. But what can you say specifically about the Chicken? On the second day of the wedding, the mummers decorated the Chicken with red ribbons and went with songs and with this Chicken around the village. Then they gave it to the bride, and cooked noodles from it. [Zaporozhets 2011]. Also, if a guy gave a young Rooster to a girl, it meant that he would come to marry her. (UFS). (Hence the cockerel lollipops, it was also a ritual gift). When a boy (or a group of boys) on the first day of the New Year came with congratulatory songs "Sow grains in the house" for good luck, for a harvest, then the owners of the house planted him on the threshold with the words: "So that the hens lay eggs." (KNP). Indeed, in the cold season, in severe frosts, hens could stop laying eggs. And this is a loss on the farm. (Although, as we will see later, the sacred meaning of the spoken words was deeper. And it was not for nothing that the boy, as a representative of the newly born New Time and the New Sun, was put on the threshold - the same transitional place as the New Year itself. (The girls did not go to "sow", the woman - is the symbol of the Moon, and the man - is the Sun)). When a stone with a hole “hen god” was found - it was widely considered and is still considered to be a good omen. In the evening, the baby was carried in the hen coop so that he slept well. (SNS). And in lullabies, Hens and the Rooster were mentioned, thus indicating that it was time for sleep. [Zaporozhets 2012, Zaporozhets 2019]. From all of the above, it becomes clear that the Chicken and the Rooster symbolize the onset of some new time. But which one? What calendar system can be traced, for example, in a fairy tale? According to the symbolism of the Golden Egg, it is clear that this is the designation for the Daystar - the Sun. By analogy with this, the Simple Egg symbolizes the Moon. If the symbols of the daily calendar are transferred to the calendar of the year, then the Golden Egg will denote the Hot Summer Sun, and the Simple Egg is the Cold Winter Sun, which shines, but does not give heat.

The fairy tale calendar system is very simple:

1. When "Chicken lays the Golden Egg" – this is a symbolic description of the coming of the New season and the appearance, birth of the "New" Sun - the winter solstice.

2. "They put the Egg on the Shelf" is the Sun at its zenith, the Summer

Solstice.

3. "Grandfather hit it - did not break it" - the month of July, the beginning of the decrease in daylight hours.

4. "Grandmother hit it - did not break it" - August.

5. The "mouse" brushed the Egg off with its tail, and it broke. The Broken Egg - is the point of the Winter Solstice. And "Mouse" - is the time before the solstice, the month of December. (We also remember that the Koschey kingdom, that is - Winter, is sometimes called the "mouse" kingdom in fairy tales). The symbol of the "Mouse Tail" means the end of December, that is, the time immediately before the Winter Solstice (or before midnight, if, by isomorphism, the symbolically described events are considered as a time of day). It is no accident that magical power is attributed to the tail. It, like any last object or subject, is a mediator between two worlds: the world of the living and the world of the dead. (Therefore: it was impossible to leave the last piece of food unfinished ("you will leave all the strength in it"; in children's games (for example, "Magpie" (which, by the way, brings news on the tail)), it was the "little finger", the last finger - a child, was sent into the space of "un-life": “where dogs do not bark and cocks do not sing”, since only he can pass the “death zone” and return home unharmed; in fairy tales, only the youngest son succeeds in completing tasks; not to mention the fact that only the youngest, naturally, late-born child (and even if at the birth of which or during pregnancy one of the close relatives died) was supposed to become a medicine man, healer, shaman, witch ... (The listed customs exist everywhere).

6. Through the Mouse Tail, the Egg was broken - this is the moment of the Winter Solstice.

7. Then the Hen consoles Grandfather and Grandmother, promising to lay another Egg for them, "Not Golden, but Simple." Comment № 1.

The very image of the Pockmarked Hen [that is, black feathers mixed with white - auth.] Is not accidental. The variegated color of the transition period, from life to death and vice versa - from death to life, from darkness to light, suggests a dual color.

1. In lullabies, the Hen and the Rooster are called as mediators, but already "escorting" into the world of darkness, sleep ..., At this time they must protect the child from malevolent otherworldly forces. Therefore, the Pockmarked Hen is mentioned in lullabies as a midnight time character.

2. The Hen and the Rooster are present in the calendar rites (fortune-telling by the Chicken or the rooster on the betrothed).

3. At the wedding, the Chicken and the Rooster are also iconic symbols of the coming of the New Time in the life of the newlyweds and play

one of the most important roles of the ceremony.

4. With the same significance, a rooster (with a cat) is launched first when settling in a new house, etc.

The duality of the symbol will later be found in the image of Baba Yaga, who has one bone leg, since she is an intermediary between the world of the living and the world of the dead. (Unlike Baba Yaga, Koschey, as a representative of the world of the dead, is completely a skeleton - "Bones"). And it's not for nothing that we remembered Baba Yaga here. Baba Yaga, together with her Izba [House – auth.], occupies a transitional space, that is, it stands where the old time ends and the new begins - at the point of the winter solstice. Therefore, the House of Baba Yaga is symbolically designated as “standing on Hen Feet”. The time immediately after the winter solar turn falls on Hen Feet. (The symbol of the Chicken and the Rooster is located "head first", towards Summer, towards the Midday Golden Sun (therefore, the Rooster in Russian folklore is referred to as the "Golden Comb"), and with its feet - to the point of the winter solstice). From this it is clear that the symbol of the "House on Hen Legs" is not a description of the architecture of the Dwelling, but a pseudo-geography - the location of the House at the point of the winter solstice.

All of the above is understandable, except for one thing - where did the characters from the fairy tale about the Pockmarked Hen, symbolizing September, October and November, go? This tale has clearly undergone some kind of transformation, but what kind and why? A fairy tale with similar actions and characters "Turnip" will help us understand this. [RFT-2]. Here is a summary.

Grandfather planted a Turnip. It grew up big, very big. He began to tug at the Turnip. Pulls-pulls - cannot pull. He called Grandmother. Grandmother for Grandfather, Grandfather for Turnip, pull-pull - cannot pull. Then they called the Granddaughter, then the Dog and the Cat - they could not pull the Turnip. And only when the Mouse came - they pulled the Turnip!

Familiar? Very. And here all the symbols are in place.

1. "Grandfather planted a Turnip" - equals - "Hen laid an Egg" - the beginning of the New Time, and the birth of a New Star - the month of January (the Sun in the constellation Capricorn).

2. “Turnip grew big, very large” - equals - “They put the Egg on the Shelf” - Luminary at its zenith, the time of the Summer Solstice. (Sun in the constellation Gemini).

3. Grandfather “pulls-pulls Turnip - cannot pull out” - equals “They hit - did not break the Egg” - the month of July, time after the solstice,

the beginning of the decrease in daylight hours. (Sun in the constellation Cancer).

4. "Grandmother for Grandfather, Grandfather for Turnip - they did not pull the Turnip" - equal to " Grandmother hit the egg - did not break it" - August. (Sun in the constellation Leo).

5. “Granddaughter came” - September. (Sun in the constellation Virgo).

6. "They called the Dog" - October. (Sun in the constellation Libra).

7. "Cat" - November. (Sun in the constellation Scorpio).

8. "Mouse" - December. (Sun in the constellation Sagittarius).

It turns out that the previously considered fairy tale about the "Pock-marked Hen" has come down to our time in a truncated, destroyed, incomplete form. This can be clearly seen in the figure. In the figure, the signs of the zodiac are depicted in those zones of the months as they were located 2.5 thousand years ago. That is: January - the constellation of Aquarius, February - the constellation of Pisces, etc. In previous reports on symbols, we indicated this factor, so we will not dwell here in detail. One can only point out that both logically and semantic significance, months and signs of the zodiac in the old calculus, completely correspond to each other. For example:

1. Grandfather - as a male solar symbol, is under the sign of Leo;

2. Grandmother - as a symbol of a woman, is under the sign of Virgo;

3. Granddaughter - as a representative of the younger generation, is under the wedding sign of Libra;

4. The dog guarding the yard and house space is under the sign of Scorpio, therefore it is often referred to as ("Bad");

5. A cat walking by itself - under the sign of "alien space" - Sagittarius;

6. and the Mouse, as an invisible threat of hunger - under the sign of severity and restrictions - by Capricorn. Comment № 2.

In connection with all of the above, it is interesting to note that the image of the Mouse, as an unclean animal, never occurs in lullabies. Most likely, this happened not because of a simple loss of symbolism, but precisely because this image represents the time before midnight or, by analogy, the time before the winter solstice, when the luminary is in the most flawed position, that is, indicates the time of the peak of nature's death, the darkest period of the year. An interesting psychological factor. That is why some (especially women) are hysterically afraid (or at least dislike) such seemingly small animals like the Mouse. Because at the subconscious level, at the genetic level, the memory of this symbol of the end of time, that is, the death of nature, lives. Since it is the mice among the agrarians, to whom the Slavs belong, that are the main enemy of crops

and preservation of the harvest, and, as a result, the cause of possible starvation.

It is interesting to consider the quality of the characters in the fairy tales "Pockmarked Hen" and "Turnip".

First, they are arranged on a decreasing basis, which indicates a gradual decrease in the remaining season.

Secondly: on the contrary, people - animals - 3 + 3, which indicates the enumeration of:

a) three months of the "half-year Summer" (July, August, September), relating to the "world of the living" (representatives are people),

b) and three months of "semi-annual Winter" (October November, December), referring to the time of the "death" of nature (representatives - animals), if we consider the year divided into two halves at the points of the Spring and Autumn solstices.

Third: by the opposite

1. among people:

a) sexual: Grandfather - Grandmother,

b) and age Grandmother - Granddaughter;

2.and among animals:

a) by antagonism: Dog - Cat, Cat - Mouse,

b) and at the "place of residence": Dog in the yard, Cat in the house, Mouse - underground, in cellar. Moreover, animals are arranged according to the principle of gradual deepening from the outside world, into the house and into the world of the dead - the underground.

Thus, it turns out that all subsequent characters "neutralize" the previous one.

What does not fit in the tale about the Chicken is that at the time of the Winter Solstice, when the Golden Egg broke, for some reason it promises Grandfather and Grandmother to lay the Simple Egg. Everything falls into place if we consider the transformed image of the Mouse, as a symbol that has passed from December to the Month of September. Indeed, in the tale about the Chicken, there are only three symbols-characters. Let's arrange them in order: Grandfather - July, Grandmother - August and Mouse - September.

If we assume that the month of September is the time of extinction of the Summer Sun, then, therefore, the appearance of the New - Winter, it will be October. Then the time of "dying" of the Cold Winter Sun falls on the month of March, and the revival of the Golden Summer Hot Sun - the month of April! (At the end of March, the New Year was celebrated in Russia before the reform of Peter 1). It turns out:

1. in spring, in April, the Summer Golden Sun is born, then the time of heat passes - "The Golden Egg has broken" - the month of September has come;

2. in autumn, in October, "The Chicken lays a Simple Egg" - the Sun switches to "winter mode", does not give heat.

3. Then, logically, (in March) the Simple Egg should also break - the time of spring comes, the time of the birth of the hot Golden Sun! ...

And thus, the endless movement of time in a circle is traced. (By analogy with the time of year with the time of day, it turns out that in the morning the Hen lays the Golden Egg - the Sun, and in the evening - the Simple Egg - the Moon). Comment № 3.

Why did this myth undergo such a transformation? What is the reason for this? Indeed, according to a similar fairy tale "Turnip", it is clearly evident that initially the point of the winter solstice dominated in the fairy tale about the Hen! In what cases can people postpone the celebration of the New Year from the winter solstice to the spring solstice? In the event of climate change, namely, a sharp cold snap! After all, when the climate is warm, then it is important for people to mark the point of the winter solstice, as it indicates the beginning of an increase in daylight hours. And when the climate is cold, the increase in daylight hours plays little role, nature still does not wake up, because it is cold. Snow and ice are not melting yet. There is even such a proverb: "The sun [turns] to summer, and winter to frost!" Epiphany frosts are still coming, the strongest for all winter time! Even about March, it is said “Mart-Martok – you'll put on seven portki” [March - you will put on seven trousers – auth.]. It is when the temperature of the climate changes sharply towards cooling, the New Year is transferred to the point of the spring equinox, since from the spring solstice the heat begins to increase and nature awakens. Until now, this festival exists in Russia as Maslenitsa (pancake week).

April-October - division of the season into two semesters. Here it is impossible to ignore such a fact: in spring and autumn, at sunrise above the horizon of the Pleiades star cluster, many peoples orientated themselves with the beginning and end of field work, with the beginning and end of the summer warm season. "Stozhars burn in the east in the spring in May-April ..." (Vologda Oblast, Mezhdurechensky District) [Ruth 2010]. The Eastern Slavs called the Pleiades cluster "Stozhars" ("Stozhars" are large thick sticks driven into the center of a haystack to strengthen it). In the spring, the Pleiades determined the beginning of the rainy season, and in the fall, the rise of the Pleiades in our ancestors meant the beginning of the harvest season. Also, the Pleiades star cluster was called "The

hen with chickens", "Hens in the Nest", etc. [Ruth-2 2010]. The name of the Pleiades star cluster - "Stozhari" for one of the main moments of the beginning of the harvest is understandable: when the Pleiades ascended over the horizon, autumn came, and they began to harvest from the fields. And what does the hen (or hens) have to do with it? Presumably, the reason for the name of the Star Cluster "Hen" is that in the winter, as mentioned earlier, the hens could stop laying, or they did not fly as well as in the summer, and in the spring the active nesting of the Eggs again resumed, and the incubation of chicks from them! (And in the wild, eggs are laid during spring). Probably, like a rooster, whose cry meant the beginning of a new time of day, the hen also remained the main symbol of the beginning of a new time. In any case, the connection between the Hen and its name by the name of the Star Cluster can be traced clearly, although this issue requires even more in-depth study.

Thus, comparing the research of symbolism in the previously presented reports [Zaporozhets 2020, HOGSS], we see that:

1. ***landmark on the Star map of the sky*** *from the Dominant of the constellation Draco and the Pole Star Tuban, which was in the center of the sky, above the head* (report on the myth "Husband-grass Snake"),

2. *gradually moved to the constellations Ursa Major and Ursa Minor and the point of the winter solstice* (report on Carols),

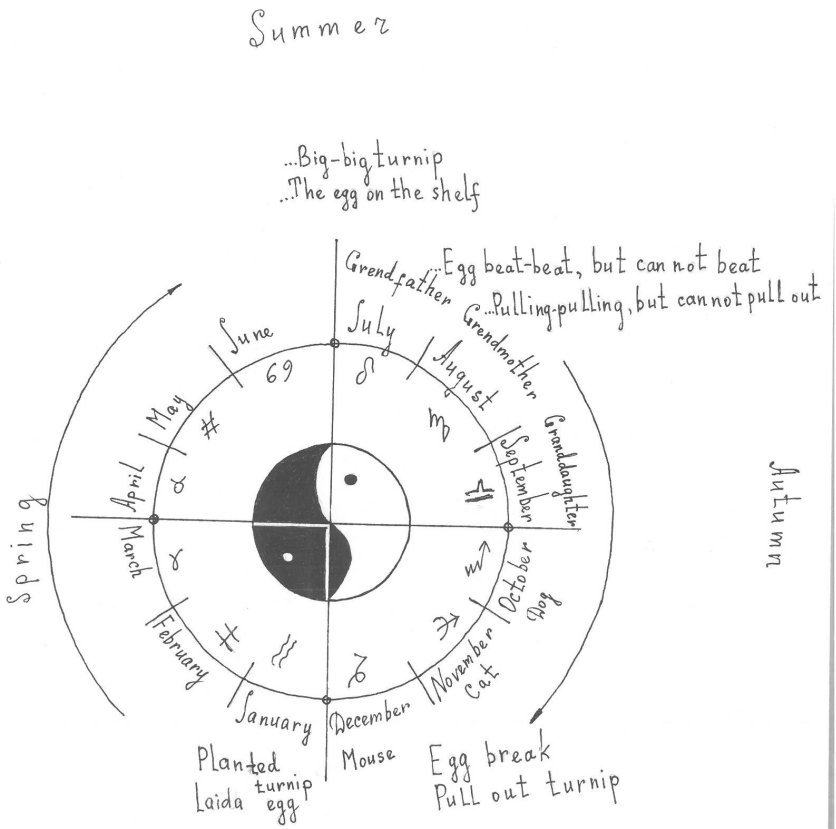
3. *and then moved to the Pleiades star cluster and the point of the spring solstice* (report on symbol of the hen).

All these facts indicate changes in the map of the starry sky overhead, in connection with the resettlement of large masses of people over great distances, due to a sharp cooling in the temperature of the climate.

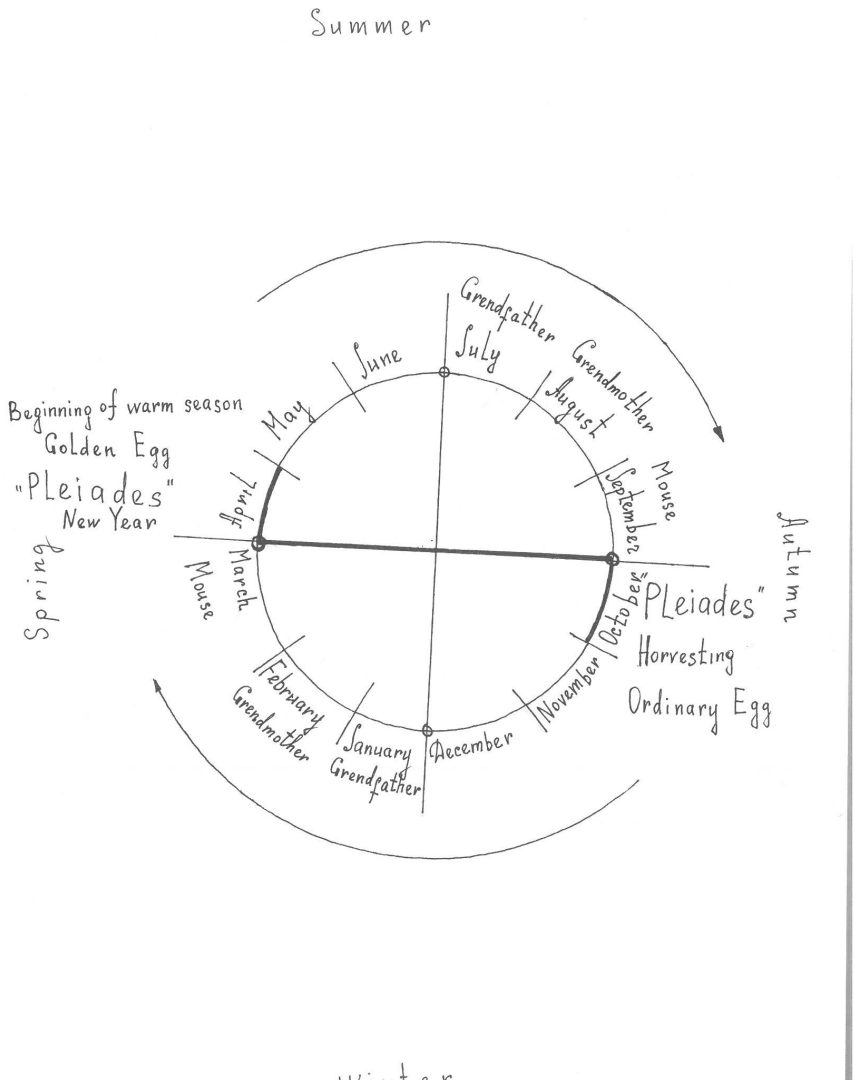
The author considers it necessary to clarify that the presented reports are a scanty part of the ethnographic research carried out, in which, through numerous evidences, the correctness of the conclusion about sharp climate changes and the resettlement of people to new territories is repeatedly confirmed.

So, we see that thanks to the conducted even a brief analysis, a very important question arises: at what time and for what reason a sharp cold snap came? Probably we are talking about - the ice age, which was repeated more than once and which caused the resettlement of a huge mass of people from one territory to another. This question remains open and awaits further research.

1.


Summer
...Big-big turnip
...The egg on the shelf
...Egg beat-beat, but can not beat
...Pulling-pulling, but can not pull out
Grendfather
Grendmother
Granddaughter
Dog
Cat
Mouse
Spring
Autumn
Winter
June
July
August
September
October
November
December
January
February
March
April
May
69
Planted turnip
Laida egg
Egg break
PULL out turnip

2.


Summer
Grendfather
Grendmother
July
June
August
May
September
Mouse
April
Beginning of warm season
Golden Egg
"Pleiades"
New Year
March
Mouse
Spring
Autumn
"Pleiades"
Horvesting
Ordinary Egg
October
November
December
January
Grendfather
February
Grendmother
Winter

Comments

1. One more interesting fact must be pointed out. Until now, everywhere (and the author has recorded this more than once) in the village environment, there is a primary version of the tale, when the Hen first laid the Simple Egg, and then, when it broke - promises Grandfather and Grandmother to lay the Golden Egg. In Soviet times, when the propensity for wealth and luxury was suppressed in every possible way, the fairy tale plot was specially changed exactly to the "opposite", in order to advertise the motto: "Why would we need such bourgeois habits - craving for gold?" ... And, if this myth is considered from the perspective of the promise of the Renaissance (after the winter dead sleep of nature) of the Golden Summer Sun, which gives Life to all nature, then the end of the tale is very joyful and optimistic! The spring sunrise of the Pleiades above the horizon says: “Do not be sad that the time of the winter sun is over, but the time for a warm Summer and a new harvest is coming! Rejoice, meeting the Golden Sun rise! " This is the true logic of the tale.

These are the layers of society that sometimes have to be cleared in order to "get to the bottom" of the true meaning of the legend.

2. A similar reckoning of time remained in the Eastern 12-year Jupiterian calendar. (The cycle of Jupiter is twelve years, that is, in each sign of the zodiac it stands - one year). It is believed that when Jupiter enters the zodiac sign of Capricorn, it is the year of the Mouse/Rat.

3. Here it is necessary to point out the following fact: in nature, domesticated hens lay once a day, but at different times of the day, namely: some in the morning, and others in the evening. And the peasant women, knowing this, do not release all the hens from the barn into the garden in the morning. They check with their finger whether the Chicken has an egg, and if it has not yet laid in the morning, then it is not allowed out of the shed, so that later they do not look for an egg laid somewhere in the garden. (Recorded everywhere).

List of informants

1. RFT – Russian folktale. The plot is widespread.

2. KAV – Kondratyeva Anastasia Vasilievna, b. 1921 Worker. Originally from the Omsk region, Kazan district, the village of Kazanka. In Moscow since 1932. Recorded by V.V. Zaporozhets in Moscow in 1998.

3. KNP – Kraynikh Nina Petrovna, b. 1935 Cossack. Local. (Paternal cousin and godmother of the author) Recorded by V. V. Zaporozhets in the Krasnodar region, in the village of Dinskaya in 2004.

4. SNS – Samoylenko Natalya Sergeevna, b. 1957 (Daughter of Kraynikh N.P.). Cossack. Local. (The author's second cousin).) Recorded by V.V. Zaporozhets in the Krasnodar region, in the village of Dinskaya in 2011.

5. RFT-2 – Russian folktale. The plot is widespread.

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4. UFS – lyrics of the Ukrainian folk song.

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THE ORIGIN HISTORY OF THE SYMBOL OF GRASS-SNAKE (SERPENT) IN THE TRADITIONAL CULTURE OF THE SLAVS (FROM THE "HISTORY OF THE SYMBOLS OF SLAVIC MYTHOLOGY")

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This work is a continuation of research in the field of symbolism of Slavic mythology. In the report, the author reveals the topic of the Grass-snake symbol: its origin and variants of transformations. Expedition materials from the author's archive are used as examples and evidence. (Records from the 1970s to 2019 in different regions of Russia).

Keywords: mythology, symbolism, serpent, dragon, husband-Grass-snake.

In previous reports related to the mythological structures of cultural heritage, the author has already dealt with the topic of decoding a particular symbol. In the presented report, we continue to develop this topic. In this study, we will consider the symbolism of Grass-snake in Slavic mythology, the transformation of its image, the development of storylines. We will reveal the basis of the origin of the symbol itself, its deep roots of origin, dating back to time immemorial.

The topic of the Serpent/Dragon has been sufficiently studied by folklorists and mythologists of the past and the century before last [Veselovsky 1880; Ivanov V.V., Toporov V.N 1974; Kirpichnikov A.I. 1879; Piotrovsky B. B. 1939; Propp V. Ya. 1946 et al. ...] It has a fairly wide area of distribution in Slavic folklore. Nevertheless, there is a large amount of material not covered in the study of the topic, which we will provide in our report.

The variability of the image of the Grass-snake/Dragon is striking in its diversity in various genres of folklore. It is:

a) Flying Serpent, hatched from an egg laid by a rooster, bringing wealth (KAV). Comment № 1. [Zaporozhets V. V. 2002, 95.];

b) Flying Serpent as a walking deceased, whose soul did not leave for the “other world”, for any reason (often because someone was longing for the deceased, hence the ban on excessive mourning for the dead); (KAV), (TZI). Comment № 1. [Zaporozhets V. V. 2002, 95.];

e) “Dragon (Greek drakon), in the mythology of many peoples, is a fantastic image of a winged (sometimes many-headed) fire-breathing serpent. The images of fabulous monsters in Russian folklore (Serpent Gorynych) have a well-known resemblance to the Dragon” [SED];

d) Various beliefs, omens, magical actions, rituals, etc., associated with the image of the Serpent. (ZAP), (AK), (S 1), (S 2). Comment № 2, 3, 4, 5.

In Slavic fairy tale folklore, there are variants of a fairy tale that goes under the name "Husband-Grass-snake". The author has repeatedly heard this fabulous story in childhood from her grandmother, who is a descendant of the resettled Cossacks from the Don to the Kuban in the 18th century by Tsarina Catherine II. The tale was previously published (in the Ukrainian dialect) [Zaporozhets 2017]. In the report, we will give its summary in the author's translation.

Husband-Grass-snake.

The girls were swimming in the river. They got out of the water, began to dress, and on the dress of the most beautiful of them there was a Grass-snake, and it did not give the dress away. "Marry me, you will live richly like a queen, or I won't give you your dress...". The girl agreed... She lived in the kingdom of Grass-snake, he was the king of all Grass-snakes. At night he was a man, and by day - Grass-snake. They had two children: a boy and a girl, but she began to yearn for home ... Then Grass-snake allowed her to visit her relatives, on condition that she and the children would not tell anyone who their father was. ...The girl's mother deceived her little granddaughter, and found out that their father was Grass-snake, and that he was waiting for them near the forest, and she went and killed him. …When the main character went to her home, then, by the bloody wave rushing to her feet, she realized that someone had betrayed her husband's secret, and he was killed. …When she began to ask the children, the girl began to cry and admitted that she had told her grandmother. Then the mother, in a fit of grief and anger, cursed her daughter so that from now on she would be an eternal Cuckoo, never have her own nest and never see her children. The son of the main character turned into Oak, and she herself became a widow - a dark Spruce. And since then, the little girl keeps flying through the woods, cuckooing, cries to this day (ZPF).

In the Lithuanian version of the fairy tale "Spruce - Queen of Grass-snakes", a girl in the kingdom of Grass-snakes (in the lake) had two sons and a daughter. When she and her children came to stay at home, her brothers tortured and intimidated the children, learned that their sister's husband is a Grass-snake and killed him. When she found out that the girl was frightened by threats and told who their father was, she said that from now on her two sons would be Oak and Ash, her daughter would be the ever-trembling Aspen, and she herself would be a gloomy Spruce, always shedding tears-tar (SN). Comment № 6.

The symbolism of Spruce is widespread in Slavic folklore. As for the designation of the feminine principle, on the one hand it is a symbol of virginity, on the other - a widow. One way or another, Spruce - is a symbol of a girl or woman who does not have a husband. For example, the wedding theme is all permeated with the symbol of a coniferous tree (sometimes it is a Spruce, sometimes a Pine).

First: the wedding cooking, which is distributed to everyone who is invited to the wedding, and to those who come and those who meet on the way of the wedding procession - bumps. Whether they are hop cones or spruce - the question remains open. But, when specially invited women, on the eve of the wedding, bake a wedding ritual cooking, everyone makes sure that if the bump turns out to be ugly, it is not altered. Remaking the pine cone (when it was not yet baked, but in the form of raw dough) was considered black magic aimed at separating the newlyweds.

Secondly: if the bride was an orphan, she did not have a father, then they sang to her:

As in a clean field, clean expanse,
A young pine tree was growing.
As many branches- sprigs on the pine,
Yet there is no top.
Natalia has a lot of relatives,
Yet no father.
There is someone to equip her, but there is no one to bless her ... (DNI).

The bride, comparing her to the Spruce, sang:

There is a Pine tree on the mountain,
There is a bright room under the mountain,
There is a red girl in the bright room ... (GMV).

“Before, a Pine decorated with all sorts of ribbons, bows, sweets and ribbons baked from dough was stuck into a wedding loaf. It stood in front of the young on the table. Then this tree was left on the tallest tree or on the roof until it fell by itself”(GAA).

But! Why do the same conifers carry the symbolism of death? Earlier, when the deceased was taken to the cemetery, branches of coniferous trees were thrown from the cart to the ground (with needles to the cemetery). The grave was also covered with branches of coniferous trees. There is a widespread ban on planting a coniferous tree (and, in general, a forest, not fruit) tree near the house. This is a sign of the future imminent death of one of the young members of the family or - to the departure of the husband from the family... etc.

The coniferous tree, in particular the Spruce, symbolized purity, virginity and sleep — equal to the death of nature, because, in contrast to deciduous trees, it remained green during the winter period. Spruce does not drop needles for the winter. When all deciduous bare trees are covered with snow, she alone turns green. That is why they did not call death into their family - they did not plant a coniferous tree next to the house.

Further, the space of Grass-snake itself, the master of the forest or underwater world, also indicates being in the world of “not life”. Having married Grass-snake, the girl is already in the magic world, in the world of spirits, not people. (In ancient times, for example, the dead were carried away to the forest. Hence the expression "to give an oak", that is, to die). The kingdom of Grass-snake is already a "landmark" place in itself. If we consider the ancient calendar, tied to the points of the solstice, by the elements, we will see that everything in the tale is not accidental. So:

1. from the winter solstice to the spring solstice, the element of Fire dominated - an increase in solar time of the day and heat. Spring;

2. from the spring solstice to the summer solstice, the elements of the Earth dominated - the time of field work. Summer;

3. from the summer solstice to the autumn solstice, the element of Air dominated - the time of dispersion of ripe seeds. Fall;

4. from the autumn solstice to the winter solstice, the element of Water dominated - the time of heavy rainfall. Winter.

Thus, the ruler of the water world - Grass-snake, is a symbol of Winter, sleep, death of nature, as well as Spruce.

It turns out that it is no coincidence, in a fairy tale, a girl gives out her father-Grass-snake. She is essentially a cuckoo, a bird of spring, warmth, the beginning of nature's life! This is not just an image of a “homeless” bird tossing its unhatched cubs to other birds. It is a border bird between winter cold and summer warmth. It is popularly believed that when the cuckoo is singing, there will be no frost - "the cuckoo sung it away!" Winter is over. This is a magical bird. It was treated with caution and respect. It was impossible to imitate the cuckoo - you would become homeless. The

cuckoo - speckled in color, symbolized the transitional time of nature, but the transition from death to life! Therefore, the cuckoo was asked: "How many years have I left to live?" It's a prophet. A predictor of a person's life span! What other bird has such a gift? No more like that. It is not for nothing that the nightingale is called the "Robber" in the epics. This is a nocturnal bird, and when the nightingale sings, frosts can still hit. And when the cuckoo sings - no. With her singing, she finally drives away the winter! This is the ancient secret meaning. In fact, the tale describes how the Earth (the Girl) plunged into the kingdom of Winter - the death of nature (the world of Grass-snake), and then the Cuckoo brought her out of there. But the later understanding of the world of people “humanized” the heroes too much, giving the myth a moral and ethical coloring. This is a common occurrence. The myth is too ancient.

Another interesting nuance. In early 2020, from a young woman scientist who is a puppet enthusiast, I wrote down this fact. “My grandmother told me that on the New Year's Fir, instead of a star, they hung “Grass-snake”. They made it from a single piece of white fabric (they could have taken a sheet for this), about 0.5 meters, twisted it with threads, painted a face. Grass-snake was made in the village of Mostovka (Irkutsk Oblast). This is my mother's story. This Grass-snake hung on the Fir like a hose. And that's all. Unfortunately, I don't know anything else...” (BKV). Awesome! There are also people in whose memory it is preserved that for the New Year they hung on the Fir, made of material, Grass-snake! I did not expect that there is more information of this content.

Let's dive deeper into the myth that has come down to our time. If we are talking about the calendar cycle, about how Winter first came on earth, and then Summer returned, then we come to the point of the winter solstice, which is confirmed by information about the New Year's veneration of the Spruce and Grass-snake (it is no coincidence that it was preserved in the northern regions, where the lack of sunlight in winter is especially felt). The winter solstice is one of the dominant points of the entire annual circle, since before it the Sun gradually “fades away”, and after it, it revives again. Psychiatrists know that at this time the danger of suicidal phenomena is increased. Not all people can easily tolerate solar deficiency. Therefore, in ancient times, at this moment, various holidays were established in order to give people more spiritual strength and optimism.

The Grass-snake symbol - is one facet of the trinity that has grown over time: the Serpent (Snake)/Dragon (Gorynych the Serpent) and Grass-snake. The characteristics of spiritual, unearthly space and time unite them all:

1.the ability to eternal rebirth;

2. possession of untold wealth;

3. increased eroticism (according to the dominant nighttime activity).

Why did the deification of the Grass-snake happen?

First: it is not poisonous. It is not a symbol of "invisible" death, which can be a common poisonous snake.

Secondly: it, like all snakes, changes his skin, but does not die at the same time. Which living creature has the same ability? Practically - nobody. Yes, animals shed, change their coat color, but do not shed all their skin. (No wonder the snake has become a symbol of medicine). In previous reports on carols (congratulatory ancient pagan songs performed before Christmas) [Zaporozhets 2020], we talked about the fact that the Bear acquired the status of a totem animal due to the fact that the bear, waking up from winter sleep, comes out of the burial den with its offspring - cubs that appear in the bear at the winter solstice. Therefore, one of the main constellations that never go beyond the horizon (by which they were guided in space and time) was called the "Big Dipper". And Ursa Minor also dominated the sky, thanks to the Polar Star, which never leaves its place, by which it was also oriented in space. The entire sky revolves around the North Star. But what unites these three constellations: Ursa Major, Ursa Minor and Dragon? Why are the totem animals Bear and Grass-snake so intertwined? And all three constellations are located - nearby! And the fact is that in the constellation of the Dragon there is the North Pole of the Ecliptic, around which the North Pole of the World moves for 26 thousand years. This is due to precession.* Comment № 7. In the dictionary of Astronyms by M. E. Ruth we read: “Dragon. The constellation of the Northern Hemisphere, standing close to the zenith, and therefore visible all year round. The ancient Greeks and Romans called this constellation the *Serpent*, but there were quite a few constellations with this name [in ancient languages the words “serpent” and “dragon” were synonymous – auth.], and when ordering the star map, the image of a fabulous monster was fixed to this object. Astronomers highlight the group of stars that form the head of the Dragon - the *Head*." [Ruth 2010]. * Comment № 8.

Thuban is the Alpha Dragon. It was the North Pole Star from 3942 to 1793 BC when some of the largest pyramids of Ancient Egypt were built. It was closest to the North Pole in 2830 BC. As the North Star, Thuban was preceded by Edasih (Lot of the Dragon). Edasih was the Pole Star from about 5500 to 3500 BC ... Thuban has drifted slowly from True North over the past 4800 years, but will again become Pole Star in 20346. [I].

"Thuban is the Alpha Dragon. The star is named after the constellation: *Tuban* - is Arabic for "Dragon". [Ruth-2, 2010].

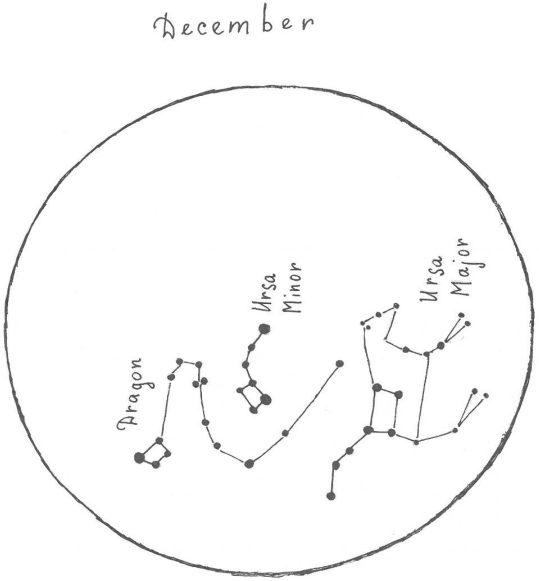
Pole Star is notable for the fact that the axis of the Earth is directed strictly at it. Therefore, Polaris is practically motionless, and the rest of the stars describe circles around it. In the northern hemisphere, Polaris is always directly overhead.

By the way, in the Egyptian pyramid in Giza, just two (according to scientists) "air ducts" were constructed (although it is doubtful that these are precisely "air ducts", and not tunnels intended for some other application). The tunnels are projected onto 2 centers of the sky or onto two Pole Stars: one "duct" is projected onto the place of the Pole Star, where it was two and a half thousand years BC (the star Tuban from the constellation Draco) and the second "duct" is projected onto the modern Pole Star from the constellation Ursa Minor. I wonder why? The question remains open.

So, the Grass-snake/Serpent/Dragon is an older totem symbol than the Bear. After all, it turns out that the constellation Ursa Major was used to determine the time (year, month, day), and the constellation Ursa Minor was determined - space, place (especially in navigation, this was relevant when sailing in the northern seas). And even in more ancient times - more than two thousand years BC, according to the constellation of the Dragon, both space and time were determined. By the way the Dragon's Head is located (where it points), they determined the time, and by the Polar Star Tuban (Alpha Dragon), they determined the space, the place of their location at a given moment. I must say that the Head of the Dragon, like an arrow, is directed at 6 o'clock (if the celestial sphere is considered as a clock face) as well as the Tail of the Big Dipper! And thus, we see that the primary is - orientation by the location of the constellation of the Dragon! And then it becomes clear why the shape of the constellation Ursa Major (and Minor) received such a "long tail". This is not just a "wild fantasy" of the people (as some scientists, the same respected M. E. Ruth for instance, say), but this, unusual at first unenlightened glance, "construction" of the constellation is the most convenient for a more accurate and easy time determination.

Thus, the constellation of the Dragon, carrying such important information for survival as: space and time (especially if a person was on the way) was the basis of the foundations of human life. This "lifeline" of the ancient map of the starry sky keeps the genetic memory of mankind, in spite of the distance of time and space, the prohibitions of society, distortion of beliefs, etc., etc.

Drawing.



Comments

1. My grandmother told me... after three years, the rooster lays an egg. Well, I saw this egg, I took it myself. ...Such a bubble lies like from a large fish: one head is small, round, the other is long. And it is soft. Well, I didn't recognize it, I brought it in, my mother says: "Yes, it's roosters'!" They tore it apart, but in this egg it was like a worm. So this snake is growing. Mom told how her acquaintances (their grandmother) soared, raised this snake. The grandmother has been sitting on the stove for three years and holding it in her bosom under her armpit, steaming it. And here comes this snake. They make a wish for it and make a nest,

where it should be. There it flies, steals money somewhere, and then flies to his place and brings gold or silver there and puts it in a nest. And I saw this nest at my mother's acquaintances: twisted, like for a goose. it was in the upper room under the chest of drawers. And I thought: "Here in this nest of snakes they carry money" (KAV). [Zaporozhets V. V. 2002, 95.].

Nastasya used to say that a snake was made from an egg, otherwise they said that it was like a dead man who was flying, and, as they used to say, some snakes were flying. Let's say, the husband dies there or whoever he is, and she misses him very much, and so he came. And she also opened the door for him, as he came alive, went to bed with him, and brought gifts - some sweets, and in the morning she looks - there are some katyashki. It used to be such a gossip. So they went to church then, prayed, then somehow they walked a strip so that he would not fit. Killed it in some cases. Yes. Well, it's not him who walks, it's the wicked one.... (TZI). [Zaporozhets V. V. 2002, 95.].

And I also saw this snake twice. this is such a flying smut, as there is a smut. So black is flying, about a meter long and as thick as an arm. I would not have seen it, but sparks fly from it like an ordinary fire, it becomes like all fiery, because sparks from her. What a creature.

Once my brother and I were walking from the field, it was already dark, and now it was flying (maybe higher than a tree) over us. We saw, were scared and ran home! We think: "Now it will fall on us, burn us!" Well, we ran home and hid as soon as possible. And the mother asks: "Who was chasing you?" We said: so, they say, and so. She says: "Someone is involved in this business." That's all. And where it flew - no one knows. That's what it's like, this snake.

And then these neighbors were kicked out and everything disappeared and they did not appear anymore, that's all. (KAV). [Zaporozhets V. V. 2002, 95.].

2. There is such a belief: When snakes are celebrating a wedding, and you accidentally see it, you need to throw something into their ball: belt, jacket, shirt ... and run away. Then come and take it. This will be the best amulet from everything. Well, this was usually done when - if there was a war, then no bullet, nothing could hurt a person in these clothes. This is against death. (AK).

3. There are such dreams - each has its own meaning. For example, if grandmother Olya dreams of a snake, then this is something good, just great joy! And God forbid me to dream – might as well just die ...

4. And it happens that a snake falls in love with a person ... A snake

began to crawl up to one guy and dance on its tail in front of him. He was scared of course! He began to hide, told everyone that a snake was crawling towards him…. No one believed him, because she crawled when no one was looking. In the end he was admitted to a mental hospital. (He was already glad to hide himself). And she found him anyway. And when he wanted to look at least through the window, so that he could not sit within the four walls, he again saw her dancing in front of him and his heart could not stand it and he died. And how did we figure out that he really wasn't lying? When he was buried, we came to the cemetery for a day, to commemorate, and saw that a huge dead snake lay twisted on his grave. That's how it was. It was she who died of longing for him. And she was the queen of snakes. Her head was with a small yellow crown of skin folds or something (S 1).

5. Everywhere: if you find a "snake crawl", that is, the skin of a snake after molting, then it will be an absolute protection against all misfortunes (S 2).

6. SN – Salome Neris. Poetess. The fairy-tale poem “Egle - Queen of Grass-snakes” was written in 1940 based on the plot of a Lithuanian folk tale. It is believed to be one of the oldest stories in Baltic folklore, with over a hundred different variations. The name Egle is very popular in Lithuania and means “Spruce” in translation. The name "Zhilvinas" means "Grass-snake".

7. Precession - (from Late Latin praecessio - forward movement), movement of the axis of rotation of a rigid body ... in which it describes a circular surface (SED).

8. The opinion of scientists is divided on the question of which country gave the name to the constellation: Greece or China. There is also a point of view that the worship of the Serpent took place in several countries at the same time, independently of each other. It is also known that more than 4000 years ago in China, the Kite was already made from bamboo and silk (and before that time it was made from wood). The Dragon was the most popular. It is a symbol of wisdom and strength. It was believed that the thread connecting the flying Dragon and man is a symbol of man's connection with the gods and souls of ancestors. The higher the Dragon-Serpent flies, the further it will carry away all troubles. Kites came to Europe in the XV century. Now the Kite festivals are becoming more and more popular, they are usually celebrated in spring and autumn.

List of informants

1. KAV – Kondratyeva Anastasia Vasilievna, b. 1921 Worker. Originally from the Omsk region, Kazan district, the village of Kazanka. In Moscow since 1932. Recorded by V.V. Zaporozhets in Moscow in 1998.

2. TZI – Tarubarova Zinaida Ivanovna, b. 1936 Worker. Originally from the Voronezh region, Nizhnedevichesky district, the village of Gusevka. In Moscow since 1953. Recorded by V.V. Zaporozhets in Moscow in 1998.

3. ZAP – Zaporozhets Anna Petrovna, 1925 - 2007 Originally from the Orenburg region, Buzuluk district, the village of Yegoryevka. From the 1950s she lived in the village of Dinskaya, Krasnodar region, from 2000 to 2007 - in Moscow. (Author's mom). Recorded by V.V. Zaporozhets in the Krasnodar region, the village of Dinskaya in the late 1990s.

4. AK – Almaz Kasimov, b. 1990 Student. Originally from Central Asia. In Moscow studying. Recorded by V.V. Zaporozhets in Moscow in 2010.

5. S – Bylichka. Heard in the Stanitsa Dinskaya of Krasnodar region in the 1970s. Recorded by V.V. Zaporozhets, in the 2000s. by memory.

6. ZPF – Zaporozhets Praskovya Fyodorovna, 1900 - 1984 Hereditary Kuban Cossack. Local. She lived in the Krasnodar region, the village of Dinskaya. (The author's paternal grandmother). The tale was heard in the 1960s. Recorded by V.V. Zaporozhets at the end of the 1990s. by memory.

7. DNI – Davydova Nadezhda Ivanovna, b. 1922 Working in a textile factory. Originally from the village of Voinova Gora (4 kilometers from the town of Orekhovo-Zuevo). Recorded by V.V. Zaporozhets in Moscow region, Orekhovo-Zuevo in 2002.

8. GMV – Gradova Marfa Vladimirovna, b. 1903 Peasant. Originally from Novgorod region. In Moscow passing through. Recorded by V.V. Zaporozhets in Moscow in 1985.

9. GAA – Grigoriev Alexey Andreevich, b. 1912 Cossack. Local. Recorded by V.V. Zaporozhets in the Krasnodar region, in the village of Dinskaya in 2004.

10. BKV – Babkovskaya Ksenia Viktorovna, born in 1980 Specialist in folk dolls, collector, head of the "Russian antiquity" studio at the Zatveretsky House of Culture. Born in Novokuznetsk, Kemerovo region, now lives in Tver. In Moscow at a conference. (Knows from her grandmother Kuzmina Aksinya Kharitonovna, born in 1923 in the village of Mostovka, Zalarinsky district, Irkutsk region). Recorded by V. V. Zaporozhets in Moscow in 2020.

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CIRCADIAN RHYTHM OF SYSTOLIC BLOOD PRESSURE DURING TOXEMIA IN TODDLERS

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The indicator of the mesor of the systolic blood pressure (SBP) on the first day was 8-13 mm Hg higher than the age norm in all groups. In the presence of deviations in other structural characteristics of the SBP circadian rhythm, 3 degrees of severity of pathological abnormalities of the projection of acrophase and bathyphase were found: 1-projection of acrophase and bathyphase of the circadian rhythm SBP in the normal position (acrophase - 9-11 hours, bathyphase - 23-3 hours); 2 - displacement of acrophase within daytime hours (clockwise), bathyphase within dark time of day; Grade 3 - the shift of the acrophase peak to night hours (23-7 hours), and the bathyphase to daylight hours (8-22 hours), that is, inversion of the SBP circadian rhythm. The degree of deviation corresponded to the severity of the period of toxemia.

Keywords: circadian rhythm, systolic blood pressure, toxemia period, toddlers.

Relevance. Children account for 20-30% of the total number of persons with burn injuries. The mortality rate due to burns among children reaches 2-4%, in addition, about 35% of children are disabled annually. The high prevalence of burns in the child population, the tendency to develop burn disease and severe post-burn disorders make the prevention and treatment of burn injury in children a priority.

The cardiovascular system in children has great compensatory capabilities, which leads to persistent circulatory disorders, a state of decompensation of the contractile function of the heart develops due to its increased contractility, secondary carditis. Due to the high risk of complications and mortality, the problem of developing early preclinical signs by functional research methods in order to increase the effectiveness of timely corrective measures during the period of toxemia of burn disease remains relevant.

Purpose of work. Study and assess changes in the circadian rhythm of systolic blood pressure during toxemia in toddlers.

Clinical material and research methods. Data of studies of 24 children aged from 3.1 to 7 years was examined. Patients were considered depending on the severity and area of damage, age, duration of treatment in the ICU. Thus, the number of children in the ICU for up to 10 days was 10 (1 subgroup), 11-20 days - 8 children (2 subgroup), more than 21 days (21-54 days –6 children). The severity of the burn was assessed by calculating the surface area of the damaged skin and using the Frank index. A detailed analysis of reliably significant deviations, intergroup differences of the studied indicators was carried out. The results were obtained by monitoring with hourly registration of hemodynamic parameters. The research data were processed by the method of variation statistics using the Excel program by calculating the arithmetic mean values (M) and mean errors (m). To assess the significance of the differences between the two values, the parametric Student's test (t) was used. The interrelation of the dynamics of the studied indicators was determined by the method of paired correlations. The critical level of significance was assumed to be 0.05. Intensive therapy from the moment of admission was aimed at removing burn shock by adequate anesthesia and intravenous administration of crystalloids, volemic solutions under the control of hemodynamics, and the volume of urine output. Intensive therapy also consisted of regular, every 8-12 hours, introduction of cardiotonic, desensitizing, stress-limiting, vasodilator drugs. Hormones and blood substitutes were used according to indications. Inhalation of humidified oxygen and physical heating methods were carried out. In all children, vitamins C and group B, antipyretic and hyposensitizing agents, as well as drugs against stress damage to the gastrointestinal tract, septicotoxemia and toxemia were used. According to indications, early, delayed surgical necrectomy, prevention of coagulopathy, energy deficiency, volemic disorders, and correction of "tachycardial syndrome" were successfully carried out.

Table 1

Characteristics of patients aged 3.1-7 years

Groups	Body weight, kg	Age in years	Height in cm	Burn area of 2-3A degree in%	Burn area of 3B degree in%	IF in units	Duration of inpatient treatment	Number of days in the ICU
1	15,8±1,8	4,7±0,8	99,7±5,9	37,3±14,7	3,1±4,4	42,5±15,7	25,5±10,3	8,1±1,3
2	16,6±2,4	4,0±0,1	103,5±8,3	47,9±17,1	18,1±12,2	85,1±28,7	49,9±16,9	13,1±1,9*
3	16,4±2,4	4,4±0,6	107,3±9,8	59,2±12,2	36,7±13,3*	127,5±33,3*	61,8±13,5*	27,3±3,2*

The average age of children with severe burns in the age group from 3.1 to 7 years ranged from 4 to 4.7 years, height from 99.7 to 107.3 cm, body weight 15.8 - 16.4 kg (Table 1). There were no significant differences between the groups and in the index of the area of the 2-3A burn, which was 37.3±14.7% in group 1, 47.9±17.1% in group 2, and 59.2±12.2% in group 3. However, a statistically significant difference was found in the area of grade 3B burns in groups 1 and 3, which in the most severe group of children exceeded the grade 3B burn in group 1 by 11 times ($p<0.05$) and was 6 times greater than in group 2. At the same time, the Frank index in group 2 turned out to be twice as large as in the first (unreliable due to the large spread of the indicator in the group), and in group 3 it was significantly more than in the first more than three times ($p<0.05$). In accordance with the severity of the condition, the duration of intensive therapy in ICU conditions in group 2 was more than in the first by 62% ($p<0.05$), in group 3 more than three times longer ($p<0.05$) than in the first. According to the severity of the condition, the duration of inpatient therapy in group 1 was 25.5±10.3 days, in group 2 - 49.9±16.9, in group 3 - 61.8±13.5 days. Thus, the decisive factors in the need for inpatient treatment were such indicators as the size of the burn area of grade 3B, the Frank index, and the duration of intensive care in the ICU.

In group 1, there were - 6 girls, 4 boys, in group 2 - 4 girls, 4 boys, in group 3 - 1 girl, 5 boys. A distinctive feature of groups 2 and 3 of patients was that in group 1, a grade 3B burn was detected in 2 patients (20% of patients), in group 2 - in 5 patients (62% of patients), in group 3 in all children (100 %), and the area of the 3B degree burn was more than 15% to 70% of the body surface.

The duration of intensive care in the ICU and treatment in the hospital corresponded to the severity and depth of damage to the skin surface and IF (Table 1).

Results and discussion.

As can be seen from the results of hemodynamic monitoring presented in Table 2, the systolic blood pressure (SBP) index of children in group 1 was higher than the age norm by 8 mm Hg (norm 92±12 mm Hg), in group 2 - by 13 mm Hg, 3 - by 10 mm Hg.

Table 2

Dynamics of indicators of mesor, acrophase, batiphase of the circadian rhythm of systolic blood pressure during toxemia in children aged 3.1-7 years

Days	Mesor, mm Hg			Acrophase, mm Hg			Batiphase, mm Hg		
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
1	100±6,9	105±6,9	102±6,4	106±10,6	110±5	115±5	85±3,0*‴	93±18	96±5‴
2	104±7,8	105±6,1	106±6,2	107±7,6	109±6	111±8	100±6,3	101±4	90±27
3	103±5,9	111±6,5	112±8,0	105±7,2	114±6	120±5	101±3,1	108±6	108±6
4	103±5,8	106±7,1	109±5,9	105±6,3	110±6	113±3	101±7,4	103±4	106±4
5	105±5,9	107±5,9	113±6,1	109±6,0	110±4	116±7	102±5,9	104±7	107±6
6	106±8,3	107±7,1	110±5,6	110±6,8	112±8	114±5	103±10,9	104±6	106±5
7	107±6,0	111±6,0	107±6,3	110±7,5	112±7	109±7	104±5,9	107±7	102±8
8	107±7,0	107±4,6	107±5,3	111±4,9	110±3	112±4	102±8,2	105±6	104±7
9	106±7,2	107±6,7	114±5,7	110±7,3	111±8	117±6	103±9,3	104±5	111±6
10	106±4,6	105±6,7	114±8,4	122±3,0*	108±7	117±8	92±6,0‴	103±8	112±9
11		108±4,5	112±6,4		112±5	117±5		105±4	108±3
12		106±8,9	111±7,0		118±21	115±5		94±6	107±9
13		109±5,1	113±5,4		121±6	116±8		101±2‴	109±5
14		110±5,4	111±5,5		119±6	116±5		97±19	109±7
15		118±5,0	110±5,6		123±8	117±9		113±3	106±5
16		110±5,3	109±6,3		120±11	114±8		100±3	104±7
17			111±5,0			115±7			106±4
18			111±8,8			118±10			107±9
19			108±5,9			116±8			102±6
20			118±6,0			127±10			112±7
21			119±5,7			123±7			113±8
22			114±6,3			119±7			111±6
23			112±5,7			121±7			108±7
24			111±4,8			116±2			105±5
25			107±5,3			111±5			103±5
26			107±5,6			113±4			102±2
27			115±4,0			119±5			113±2
28			116±3,4			120±3			113±3
29			109±6,5			115±7			105±3
30			111±4,8			118±5			108±2

*- significant relative to mesor group of the same name

‴- deviation is significant relative to the value in the acrophase of the group of the same name

There was a significant difference between SBP in acrophase from mesor on day 10 in the 1st group of children by 16% ($p<0.05$), from

bathyphase by 22% ($p<0.05$), bathyphase from mesor by 15% on day 1 ($p<0.05$), bathyphase from acrophase on day 13 in group 2 by 16% ($p<0.05$). The lack of significant significance with fluctuations in SBP is associated with a large scatter of indicators in this age group.

However, fluctuations of mesor of the circadian rhythm SBP reached on days 2-3, 13, 19-20 days - 10 mm Hg with a period of fluctuations of 7.8 days (Fig. 1).

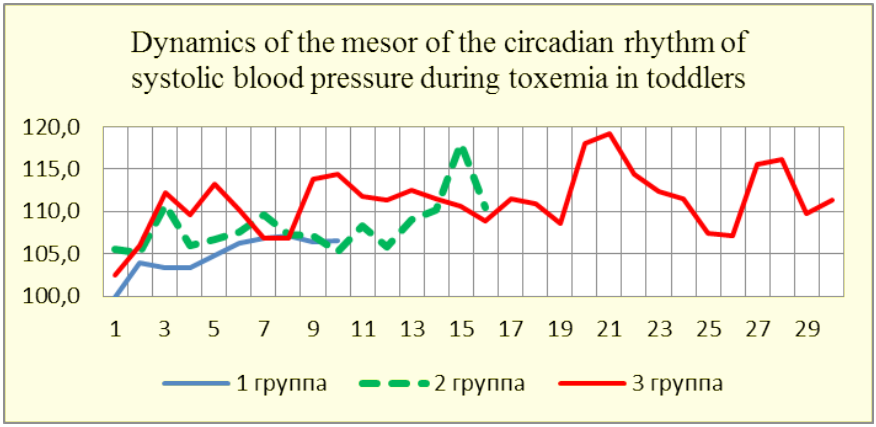

Fig. 1

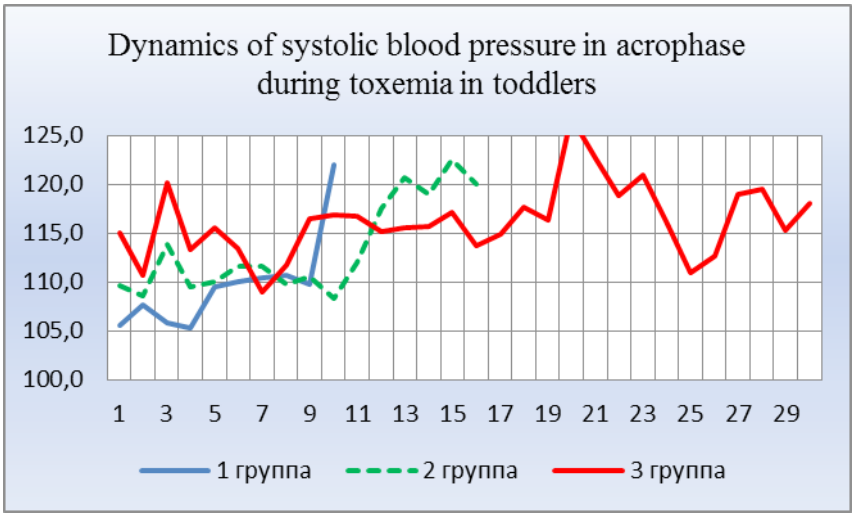

Fig. 2

A wavelike change in the SBP index was revealed in the acrophase (Fig. 2) and bathyphase (Fig. 3) of the SBP circadian rhythm. The maximum increase in SBP in acrophase was detected on day 3 (120 mm Hg), and on day 20 (126 mm Hg), the minimum parameters of the bathyphase of the circadian rhythm SBP were found on day 1 in all patients, on day 10 in group 1, on the 12th day in group 2 and in group 3, the SBP value in bathyphase throughout the observation period (from 3 to 30 days) remained above 100 mm Hg, exceeding the average daily norm by 10 mm Hg. Thus, the most pronounced hypersympathotonic effect on hemodynamics was revealed in the most severe group 3 of children.

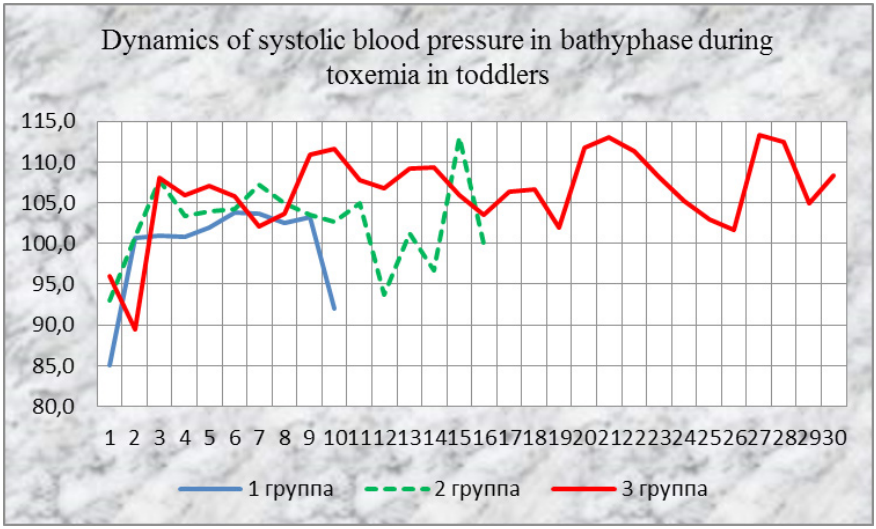

Fig. 3

As shown in fig. 4, a strong direct correlation was revealed in group 1 mesor SBP from acrophase and the bathyphase level of the circadian rhythm of body temperature. That is, the higher the maximum increase in body temperature was, the higher the SBP was. In groups 2 and 3, mesor SBP was found to be directly dependent on an increase in temperature in the bathyphase of the circadian rhythm T. That is, nocturnal hyperthermic reactions cause an increase in the average daily SBP level, which is clinically manifested by an increase in SBP, anxiety and other clinical signs of arterial hypertensive reaction.

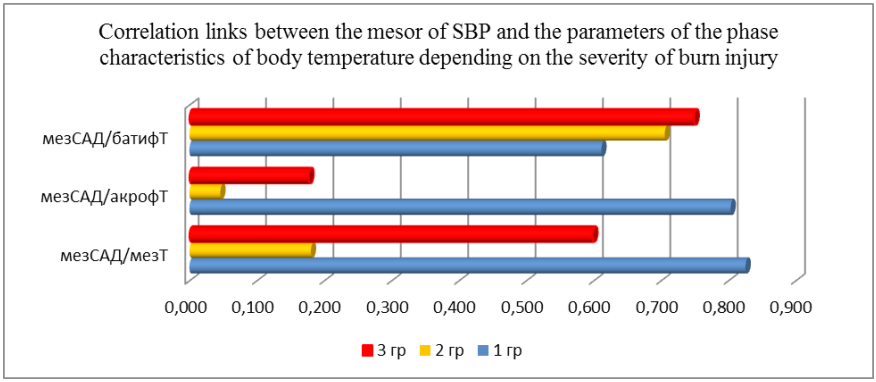

Fig. 4

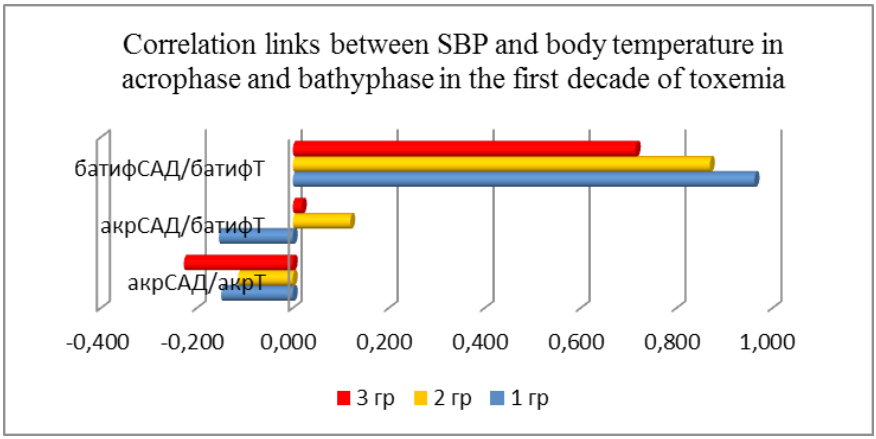

Fig. 5

In groups 2 and 3 of children, a direct strong correlation was found between body temperature indicators in bathyphase and SBP in bathyphase (Fig. 5), which confirms a direct relationship between the general deterioration of the state with an increase in SBP at night during a hyperthermic reaction in the dark period of the day.

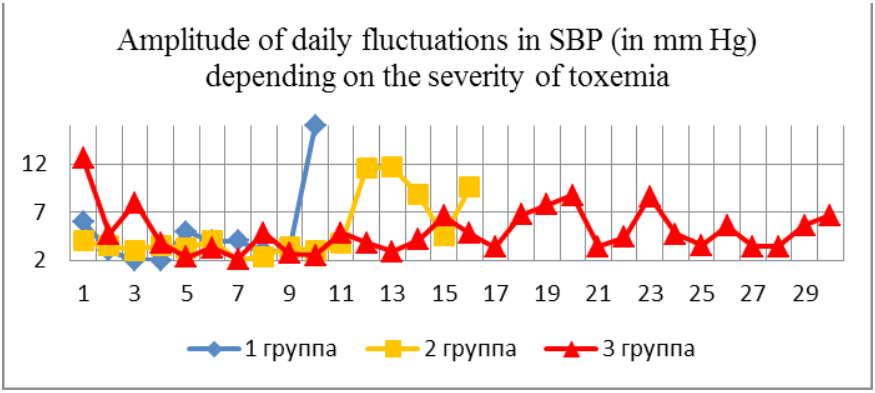

Fig. 6

The greatest increase in the amplitude of oscillations in group 1 was found on days 6 and 9 (16 mm Hg). In group 2, 12,13,16 days (12-10 mm Hg). In group 3, the highest value of the amplitude of the daily fluctuation of SBP was detected on day 1 (12 mm Hg). Changes in the amplitude of daily SBP fluctuations in group 1 were represented by two waves with an oscillation period of 5 days. Group 2 also revealed two waves with a period of 6 and 5 days of low amplitude (2 mm Hg), as well as a 3 wave with a period of 4 days, an amplitude of 8 mm Hg. In group 3, there are 8 periods of oscillations with maximum amplitudes on day 1 (12.7 mm Hg), on days 20 and 23 (with an amplitude of 6 mm Hg). Thus, during the period of toxemia in severe burns, SBP changes occurred in a circadian rhythm with the dependence of the level of mesor, acrophase, bathyphase on the circadian rhythm of body temperature, and the severity of burn injury.

In group 1, the normal projection of SBP acrophase was observed during 40% (4 out of 10) of the period of toxemia, 30% bathyphase (3 out of 10 days). In group 2, the normal position of the acrophase was detected during 12% (2 out of 16), bathyphase - 12% (2 out of 16 days). In group 3, the normal projection of acrophase was observed for 26% (8 out of 30 days), bathyph - 3% (1 out of 30). Thus, the longest time normal projection of acrophase and bathyphase was found in group 1. The longest time pathological shift of the bathyphase was revealed in the 3rd group of children. Thus, the number of days with a normal projection of acrophase and bathyphase corresponds to the severity of toxemia, that is, the more severe the burn injury and the longer the period of toxemia, the longer

the abnormalities of the projection of acrophase and bathyphase are observed. At the same time, in group 1 relative to other groups, displacements of acrophase within daylight hours (90%), bathyphase during night hours (40%) prevailed.

In group 2, SBP acrophase displacements within daytime (moderate) were observed for 50%, bathyphases - 18% of the toxemia period. In group 3, migration of acrophase during light hours was 76%, bathyphase 26% during toxemia. The most significant shifts (inversion of the circadian rhythm) - the shift of the acrophase peak to night hours in group 1 was not detected, bathyphase was observed during the daytime for 60% (6 out of 10 days).

In group 2, inversion for acrophase lasted for 50% (8 out of 16), for bathyphase 75% (12 out of 16) of the period of toxemia. In group 3, the displacement of the acrophase at night hours persisted for 20% (6 out of 30), for the bathyphase for the daytime - 76% (23 out of 30 days).

Thus, the assessment of acrophase and bathyphase shifts includes the identification of normal projections, moderate displacements (acrophase in the daytime), bathyphase in the dark, and the duration of the most pronounced shift - inversion of acrophase and bathyphase of the circadian rhythm SBP. 3 degrees of severity of pathological deviations of the projection of acrophase and bathyphase were found. This is in the presence of deviations in other structural characteristics of the SBP circadian rhythm: 1 - projection of the acrophase and bathyphase of the SBP circadian rhythm in the normal position (acrophase - 9-11 hours, bathyphase - 23-3 hours); 2 - displacement of acrophase within daytime hours (clockwise), nighttime bathyphase; grade 3 - the shift of the acrophase peak to night hours (23-7 hours), and the bathyphase to daylight hours (8-22 hours), that is, inversion of the SBP circadian rhythm.

Conclusions. The mesor index of systolic blood pressure (SBP) in children was 8-13 mm Hg higher than the age norm in all groups. In the presence of deviations in other structural characteristics of the SBP circadian rhythm, 3 degrees of severity of pathological abnormalities of the projection of acrophase and bathyphase were found: 1-projection of acrophase and bathyphase of the circadian rhythm SBP in the normal position (acrophase - 9-11 hours, bathyphase - 23-3 hours); 2 - displacement of acrophase within daytime hours (clockwise), bathyphase within dark time of day; grade 3 - the shift of the acrophase peak to night hours (23-7 hours), and the bathyphase to daylight hours (8-22 hours), that is, inversion of the SBP circadian rhythm. The degree of deviation corresponded to the severity of the period of toxemia.

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IMPACT OF PERIODONTITIS ON PREGNANCY OUTCOME [1]

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One of the key issues of modern medical science is the study of cause-and-effect relationships in concomitant diseases. From this point of view, it is of great interest to study the influence of inflammatory periodontal diseases on the course and outcome of pregnancy, especially on preterm birth with prematurity of newborns. In 5421 pregnant women, we carried out studies, the purpose of which was to clarify the relationship between periodontal diseases (as well as their various clinical indicators) and preterm birth. Preterm labor was noted in 72 cases (13.82%). In the group of pregnant women with preterm labor, the prevalence of periodontal disease was 97.22%, while in women in labor with normal terms of labor, this figure was only 71.49%. At the same time, the analysis of possibility (odds/ratio = 13.95) and analysis of variance (ANOVA) showed that the presence of inflammatory periodontal pathology is a risk factor for Preterm labor. Moreover, in this respect, lesions accompanied by destructive changes in the periodontal tissues (periodontitis) pose a special "threat".

Keywords: inflammatory periodontal disease, preterm labor, prematurity, relationship

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Introduction

One of the key approaches of modern medical science is the study of cause-and-effect relationships between combined pathological processes. From this point of view, special attention should be paid to the influence of inflammatory periodontal diseases on the course and outcome of pregnancy, in particular, on preterm labor with prematurity (Ebersole J., et. Al. 2014; Ren H., Du M. 2017; Nazir M. 2017). However, the results of various scientific and clinical studies have not yet made it possible to draw unambiguous conclusions about the existence of a causal relationship between inflammatory periodontal pathology and preterm labor. In scientific publications of recent years, there are many reports in which, on the basis of a comparative analysis of scientific data, an attempt is made to substantiate the presence or absence of clear connections between the phenomena under consideration. In particular A. Kim et. al. (2012), T. Konopka and A. Paradowska-Stolarz (2012), as well as A. Teshome and A. Yitayeh (2016) found that, although most studies indicate that periodontal disease is a risk factor for Preterm labor, nevertheless, additional randomized clinical trials with long-term follow-up are needed to definitively establish the relationship between these phenomena.

Material and research methods

Considering the above, we conducted clinical studies to identify the connection between inflammatory periodontal diseases and their individual pathological indicators with preterm labor. As Preterm labor and prematurity, the following are accepted: the duration of the gestational period is up to 37 weeks and the weight of the newborn is up to 2.5 kg.

521 pregnant women aged 18-41 years with a gestational period from 4 to 40 weeks were under dynamic observation. The gestational age was determined based on the last menstrual period and ultrasound examination. To exclude the possible influence of additional factors on the studied parameters, the study did not include pregnant women with diabetes, hypertension, various complications of pregnancy, infectious diseases, as well as those with bad habits (smoking, drinking alcohol).

The study was approved by the Ethics Committee of Yerevan State Medical University and conducted at the Research Center for Maternal and Child Health. In accordance with the 2008 Declaration of Helsinki, written informed consent was obtained from all surveyed participants to participate in the study.

To assess the clinical state of the periodontium, a standard set of index indicators was used - bleeding gums, depth of pathological pockets (ac-

cording to Kőtschke), tooth mobility, gum inflammation (PMA according to Parma and GI according to Loe-Silness), oral hygiene (OHI-S index according to Green- Vermillion). At the same time, in all cases, the indicators were determined in the area of the lower 6 frontal teeth. To avoid a possible subjective error in determining dental parameters, each examination was duplicated and separately performed by two qualified specialists. Periodontal indicators were determined during the last week of the gestational period.

The results of clinical studies were statistically processed and analyzed according to the Student's method (with the compilation of variation series and the calculation of mean values, mean error, etc.), as well as the calculation of the coefficient of reliability of the difference in indicators (t), analysis of variance (ANOVA, F-test), correlation analysis and determination of chances -odds/ratio indicator. Statistical analysis was carried out using the SPSS Statistics 17 computer program.

Results and discussion

As a result of our dynamic observation, preterm birth was noted in 72 cases (13.82%), on the basis of which the subjects were divided into two groups: pregnant women with normal terms of labor - 449 observations and pregnant women with preterm labor - 72 observations. At the same time, in the first group, the average term of delivery was 39.34±0.03 weeks, and in the case of Preterm labor - 32.35±0.15 weeks ($t = 46.6$; $p < 0.01$).

In these groups, an assessment of periodontal diseases and their individual indicators was carried out, as well as their intergroup comparative analysis. In the group of pregnant women with preterm birth, the prevalence of periodontal diseases was registered in 97.22%, while in the first group this indicator was only 71.49%. At the same time, the analysis of the odds ratio showed that the presence of inflammatory periodontal pathology is a risk factor for Preterm labor (odds/ratio = 13.95). In addition, in the group of persons with preterm labor, a more unfavorable situation was noted in terms of the differentiated picture of periodontal diseases, in particular, the predominance of lesions accompanied by deep destructive phenomena of periodontal tissues (Fig. 1).

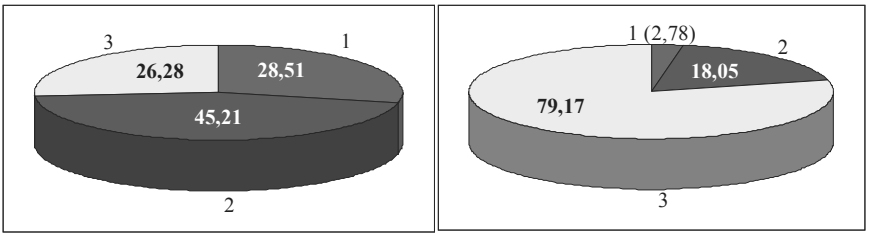

Fig. 1. The prevalence of periodontal diseases in the comparative groups (in%): on the left - persons with normal terms of labor; on the right - group with preterm labor

(1 - absence of periodontal pathology, 2 - gingivitis, 3 - periodontitis)

From this point of view, the analysis of the odds ratio in relation to the risk of preterm birth revealed the following picture: for gingivitis - odds/ratio = 4.09, and for periodontitis - odds/ratio = 10.66. At the same time, when calculating the odds ratio for periodontitis, the comparison was not made with persons without clinical manifestations of periodontal pathology, but those who were pregnant with gingivitis were also included in the latter (otherwise, with the exclusion of pregnant women with gingivitis, the odds ratio for periodontitis was odds/ratio = 30.89).

Comparative data of individual clinical indicators of periodontal disease and other indicators in the groups are presented in Table 1,

Table 1. Average values of radontal and other indicators in groups.

Indicators	Groups				
	Normal labor n=449	Preterm labor n=72	Reliability of the difference (t)	F – test* (ANOVA)	p
Age	25,67±0,21	27,67±0,55	3,39	2,003	0,002
Pregnancy number	1,65±0,04	2,25±0,18	3,33	7,242	<0,01
Terms of labor	39,34±0,03	32,35±0,15	46,6	-	<0,01
Newborn weight (in grams)	3361,78±12,40	2379,58±33,05	27,82	23,110	<0,01
OHI-S	1,95±0,03	2,62±0,05	11,17	7,404	<0,01
PMA	1,75±0,05	2,69±0,07	10,93	16,979	<0,01
GI	1,51±0,05	2,39±0,07	10,23	21,323	<0,01
Gum bleeding	0,98±0,04	1,60±0,07	7,75	10,077	<0,01
Depth of pathological pockets	1,07±0,08	3,72±0,42	6,16	115,055	<0,01
Tooth mobility	0,11±0,02	0,83±0,07	10,28	70,718	<0,01

** Fisher's coefficient (F-test) is indicated in relation to the timing of delivery.*

As the data in Table 1 show, preterm birth was statistically significantly more frequent in persons who had more pregnancies (t = 3.33; F = 7.242) and older (t = 3.39; F = 2.003). Naturally, in the comparative groups, there are also significant differences in relation to the average weight of the newborn (t = 27.82; F = 23.110).

As for the index indicators characterizing the clinical state of the periodontium, it should be noted that in the group of pregnant women with preterm labor, the most unfavorable clinical condition is observed. In particular, in this group, the indicator of oral hygiene was more than 34% higher than that of the comparative group, and the index indicators of the degree of inflammation of the gums (PMA and GI), respectively, by 53.7% and 58.3%, and the indicator of bleeding gums - by about 63%. It is noteworthy that in the group of pregnant women with preterm labor, the indicators of destructive changes in periodontal tissues (average values of the depth of the pathological pocket and tooth mobility) showed the highest values and much exceeding the comparative group, which, first of all, is evidenced by the results of analysis of variance (respectively - F = 115.055 and F = 70.718).

The latter judgment is also confirmed by comparative results of correlation analysis between groups. First, taking into account the preliminary data obtained, it was quite expected that inverse correlations should be revealed between the terms of labor and the clinical parameters of the periodontium. At the same time, in relation to the value of the correlation coefficient, certain differences were also assumed in the differentiated consideration of periodontal diseases (gingivitis and periodontitis). So, between the timing of labor and indicators of inflammation of periodontal tissues (PMA, GI, gum bleeding and oral hygiene), the value of the correlation coefficient was in the range of small values of feedbacks (from -0.262 to -0.307), while the analysis of similar relationships between the timing of labor and the indicators of destructive processes in the periodontium revealed the value of the correlation coefficient in the range of average feedback values: in the case of the depth of pathological pockets, this coefficient was -0.484, and in the case of the indicator of tooth mobility - 0.545.

Conclusion

Thus, our clinical studies allow us to conclude that, firstly, inflammatory periodontal diseases (gingivitis and periodontitis) are risk factors for the occurrence of preterm labor with prematurity. From this point of view, the greatest threat is especially those lesions that are accompanied by destructive changes in the periodontal tissues - periodontitis.

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CLINICAL BIORHYTHMOLOGY OF HUMANISTS AND PEACEMAKERS

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Studies of monthly biorhythms of families of famous people in the world have revealed fundamental differences in biorhythmological situations in the families of humanists and peace-loving heads of government and those in the families of aggressive people with latent mental damage. To analyze the biorhythmological situation, the author proposed the calculation of the monthly biorhythmological index and the construction of circular biorhythmograms. Also proposed is family planning, taking into account the phases of monthly biorhythms of co-living relatives, designed to promote the birth of mentally and somatically healthy children.

Keywords: monthly biorhythms, humanists, peacemakers, mental health, heads of government.

Our research (1993-2020) made it possible to reveal that in families of healthy people the biorhythmological situation is characterized by the closeness of co-living relatives and by the phases of biorhythms. These studies concerned mainly the bodily (somatic) health of patients. This work is devoted to the mental and social aspects of the health of relatives living together.

To analyze the biorhythmological situation in the family, we used the calculation of the monthly biorhythmological index (MBI), which in healthy people is equal to 2.25±0.27 with fluctuations from 1 to 5.2 conventional units. [1]

The calculation of the MBI and the construction of graphs were carried out according to the calendar of new moons (see appendix) or the Solar-Lunar calendar of Southeast Asia. [2]

Biorhythmograms of families of an unfavorable third type of those individuals who in the past unleashed wars, accompanied by numerous victims, are given in the previous work. [3]. Their MBI ranged from 6.0 to 8.7 conventional units.

For a biorhythmologically favorable type of families, in which, as a rule, mentally and physically (somatically) healthy children are born, closeness in the phases of monthly biorhythms is characteristic. These are the so-called families of the first type, in which people who were distinguished by humanity lived and live and whose children were born and grew up not only worthy of their parents, but even sometimes glorifying them and their country (Fig. 1-10).

The biorhythmologically prosperous parental family was with the King of Sweden Fredrik I. He was a complacent and gentle monarch ... Under him the country practically lived without war for 30 years.

Fredrik I of Hesse (Swed. Fredrik I) was born (B) on April 28, 1676 in the full moon (FM) - King of Sweden since 1720.

His father (F). Karl of Hesse-Kassel (German *Karl von Hessen-Kassel*; Born (b.) August 3, 1654 1 over 5 days after the full moon (FM+5).

Mother (M). Maria Anna Amalia von Kurland b. June 12, 1653 2 days after full moon (FM+2)

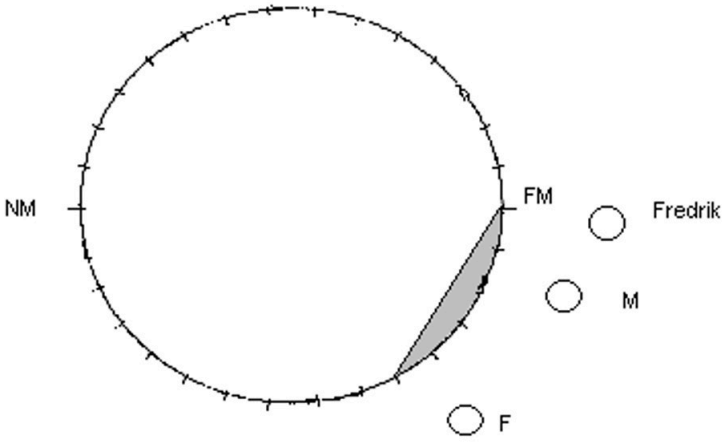

Fig. 1. Circular (monthly) biorhythmoplantogram of the parental family of Fredrik I

Legend: NM-new moon, FM- full moon. The circles indicate the "monthly" dates of birth of co-living relatives: M-mother, F-father of Fredrik.

Fredrik's MBI =2,3

An example of a favorable biorhythmological situation can be that of the poet I.V. Goethe

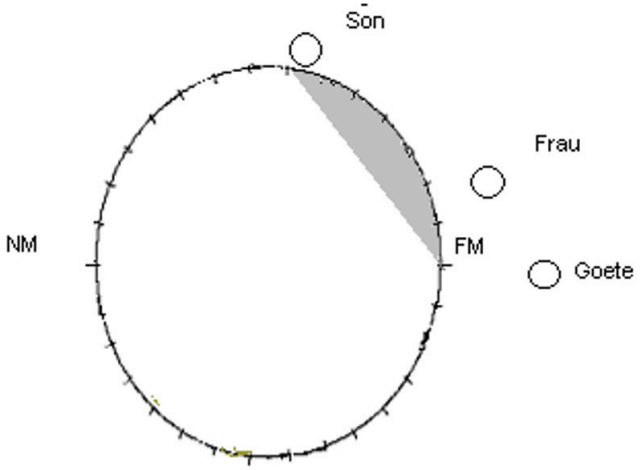

Fig. 2. Circular biorhythmoplantogram of the family of the great German humanist, scientist and poet I.W. Goethe

An example of a politician originally from Germany, but, nevertheless, for a long time (more than 30 years) and successfully ruled the Russian state can be Catherine II (nicknamed the Great). She was born on May 2, 1729, 4 days after the new moon (NM+4)., In Prussian Szczecin. Her parents: father Prussian Field Marshal Christian Anhalt-Zerbst (born November 29, 1690 2 days before the new moon (NM-2), and mother Johann, born October 24, 1712 4 days before the new moon (NM-4), matched each the other in terms of the phases of monthly biorhythms.Catherine's MBI in the parental family is 2.6, which, as mentioned above, is typical for healthy children.

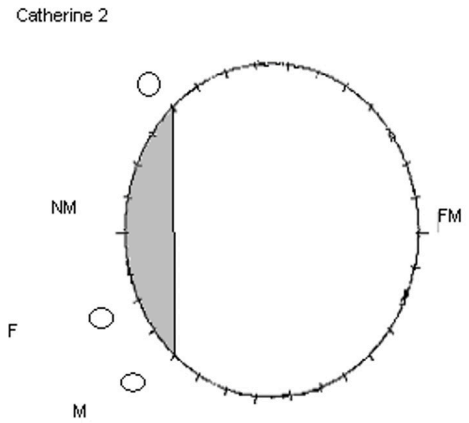

Fig. 3. Circular biorhythmoplantogram of the family of Catherine II's parents.

The future Russian empress grew up as a frisky, inquisitive, playful girl. Parents were not always happy with their daughter's behavior, but they were satisfied that Frederick took care of her younger brother Friedrich August. He was born 5 years after Sofia on August 8, 1734, 9 days after the new moon (NM+9) and was optimally close to his sister in terms of the phases of monthly biorhythms, since they were only 5 days apart. Their MBI was 2.5.

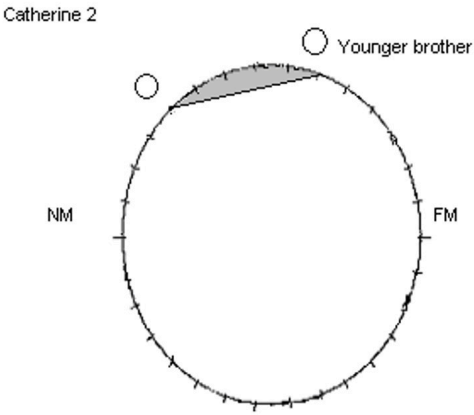

Fig. 4 Circular biorhythmoplantogram of Catherine II and her brother.

Despite the fact that Catherine II, by and large, cannot be attributed to humanists and peacekeepers, during her reign, the Russian army either repulsed the attack of the aggressors, or went to help those who asked for it.

Below in Fig. 5. the biorhythmoplantogram of the family of the French Marshal Bernadotte, who became the emperor of Sweden during the Napoleonic wars and peacefully ruled the country, who laid the foundation for a new dynasty of emperors of Sweden and the peaceful successful development of the country, is given.

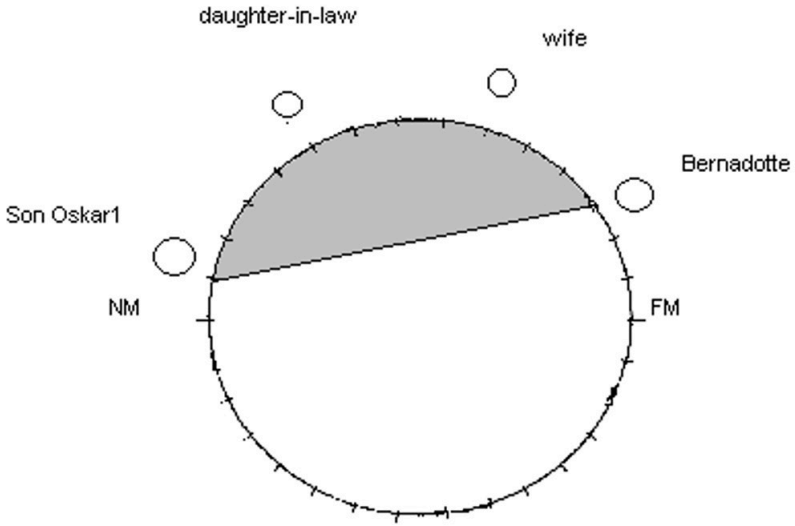

Fig. 5. Circular biorhythmoplantogram of the family of the French Marshal Bernadotte. MBI=5,2

Consider also the biorhythmograms of the families of politicians, whose peacekeeping is generally recognized.

Russian Emperor Alexander III. MBI = 5

Born (b.): March 10, 1845 FM+6.

His father, Alexander II Nikolaevich, b. April 29, 1818 FM-2
Mother Maria Aleksandrovna b. August 8, 1824 FM-1,

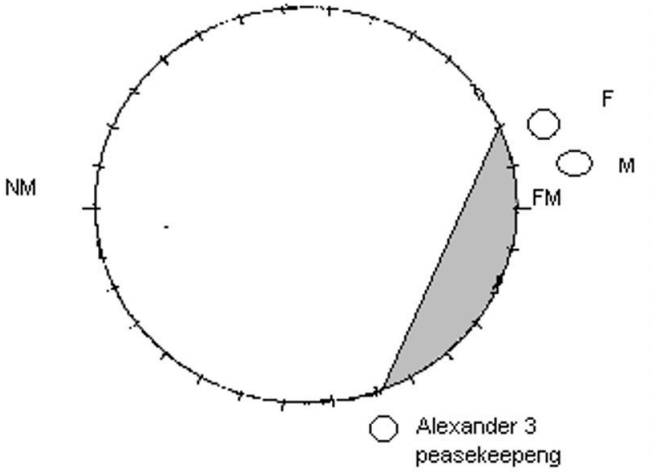

Fig. 6. Circular biorhythmoplantogram of the Alexander III family.

World famous anti-fascist writer, seriously wounded during the First World War, and after that wrote the book "All Quiet on the Western Front", translated into many languages by Erich Maria Remarque.

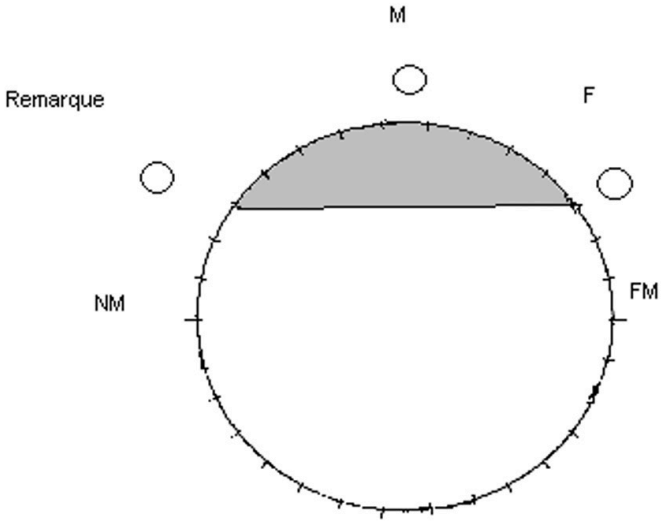

Fig. 7. Circular biorhythmoplantogram of the family of E.M. Remark

B.: June 22, 1898, NM+3 in a biorhythmologically prosperous family MBI = 3.7
• Father b. 14.6.1867 NM+12 (FM-3)
Mother b. 21.11 1871 13 NM+8

Also on the biorhythms of the families of the heads of government who prevented the third world war, at a time when the world during the "Cuban missile crisis" was on the verge of a nuclear conflict.

John F. Kennedy b.: May 29, 1917 NM+8, MBI = 3.6
Parents: Mother Rose Elizabeth Fitzgerald Kennedy b. July 22, 1890 NM+5
Father Joseph Patrick "Joe" Kennedy Sr. September 6, 1888 New Moon (NM) - Prominent American businessman and politician.

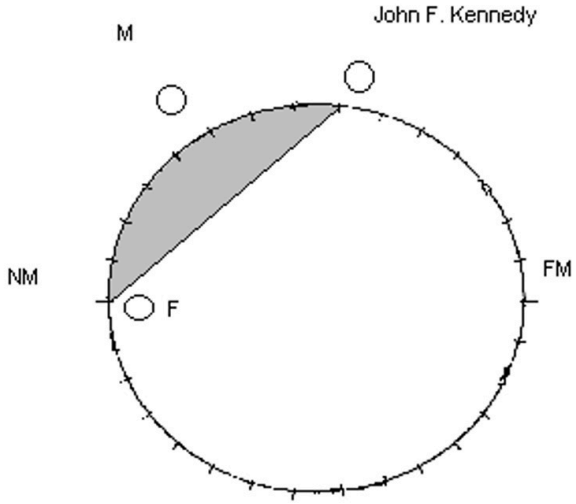

Fig. 8. Circular biorhythmoplantogram of the D. Kennedy family

Khrushchev N.S. b.: April 15, 1894, FM-6

His mother Ksenia Ivanovna b. January 24, 1872 full moon FM. Unfortunately, the author does not know the date of birth of his father.

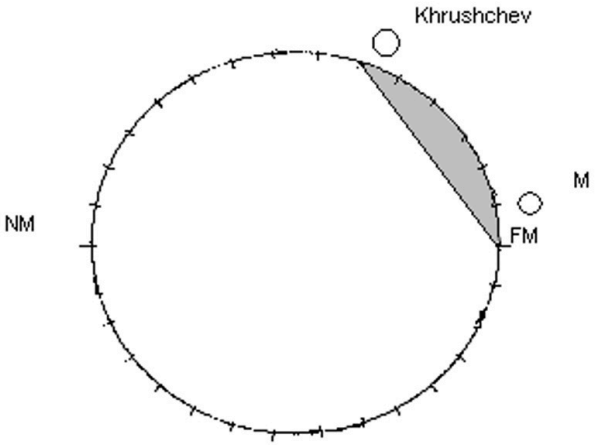

Fig. 9. Circular biorhythmoplantogram of the family of N.S. Khrushchev (in his childhood). MBI = 3

It is not difficult to notice the similarity in the phases of monthly biorhythms of relatives in the above families.

And one more modern politician who heads the government of his country, pursuing a peaceful course and not seeking to seize foreign territories.

Justin Pierre James Trudeau b. December 25, 1971, Ottawa NM+8 MBI = 4.3

Father. Joseph Philippe Pierre Yves Elliott Trudeau, b. October 18, 1919, 23 NM-5 fifteenth Prime Minister of Canada in 1968-1979 and 1980-1984.

Mother. Margaret Joan Trudeau b.: September 10, 1948 3 NM+8 (71 years old),

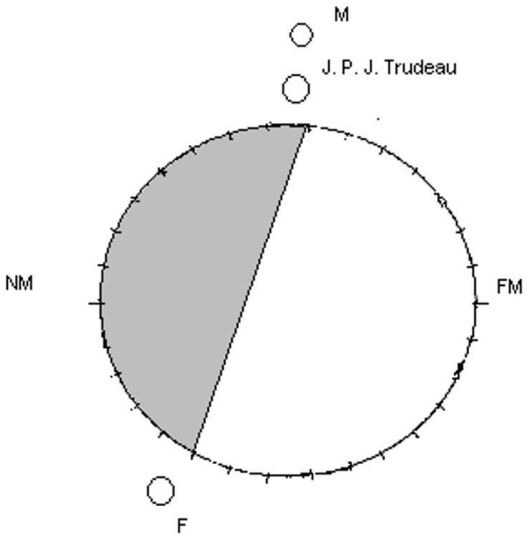

Fig. 10. Circular biorhythmoplantogram of the family of D.P. Trudeau

It is not difficult to notice that a somatically and mentally healthy child was born in this family, who eventually became the peace-loving leader of the government of his state.

Conclusion.

So, it is advisable to plan families based on the biorhythmological characteristics of relatives living together. At the same time, for mental and somatic health, it is necessary to have closeness in the phases of the biorhythms of the child with the parents (or at least with one of the co-living relatives). This can be done by knowing the monthly dates of birth of parents and cohabitating relatives (see the calendar in the appendix) and taking into account the regularity we have discovered that the monthly period of birth coincides with the period of conception in full-term pregnancy.

Biorhythmologically favorable families in which children are close in biorhythm phases to their parents or at least one of them, most often characteristic of humane people, and in big politics - peacekeepers.

In order to preserve peace in the whole world, it is possible to recommend only such people who were born and live in biorhythmologically safe (compact) families and who are not prone to pathological aggressiveness from childhood, to be selected and nominated to the government (especially to the post of Minister of Defense) and leaders of states.

Appendix 1.
Calendar of new moons

Years

1900	1	2	3	4	1905	6	7	8	9	10	11	12	13	14	15	16	17	18
1919	20	21	22	23	1924	25	26	27	28	29	30	31	32	33	34	35	36	37
1938	39	40	41	42	1943	44	45	46	47	48	49	50	51	52	53	54	55	56
1957	58	59	60	61	1962	63	64	65	66	67	68	69	70	71	72	73	74	75
1976	77	78	79	80	1981	82	83	84	85	86	87	88	89	90	91	92	93	94
1995	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	10	11	12	13
2014	15	16	17	18	2019	20	21											

months	N	E	W		M	O	O	N		D	A	T	E	S				
1	1 31	20	9	28	17	6	25	14	3	22	11	29	18	8	26	15	5	23	12
II	1 28	18	8	27	15	5	23	13	2	20	9	28	17	6	25	14	3	22	11
III	1 31	20	9	28	17	6	25	14	3	22	11	1 29	18	8	26	15	4	23	12
1V	1 29	19	8	26	15	5	23	12	2 31	20	9	27	17	6	25	14	3	22	11
V	29	18	7	26	15	4	23	12	1 30	19	9	28	16	5	24	13	3 31	21	10
VI	28	16	6	24	14	2	21	10	29	18	7	26	15	4	23	11	1 30	20	9
VII	27	16	5	24	13	2 31	21	9	28	18	7	26	14	3	22	11	1 30	19	8
VIII	25	14	4	23	11	1 29	19	9	27	16	5	24	12	2 31	20	9	28	18	6
IX	24	13	2	21	10	29	17	6	25	15	3	22	11	1 30	19	8	26	16	5
X	23	12	1 31	20	9	28	17	6	24	14	3	22	11	1 29	19	8	26	15	5
XI	22	11	1 30	19	8	27	16	5	23	13	2	21	9	28	17	6	25	14	3
XII	22	11	30	18	7	26	15	5	23	12	1 31	20	9	28	17	6	24	14	1 31

Modified solar-lunar calendar (E.G. Bazaron "Essays on Tibetan Medicine").

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THE USE OF IMMUNOFLUORESCENCE AND POLYMERASE CHAIN REACTION FOR LABORATORY DIAGNOSIS OF VIRAL INFLAMMATORY EYE DISEASES

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Among inflammatory eye diseases of an infectious nature, researchers assign a significant place to the viral etiology of the process, primarily to representatives of the Herpesviridae family. Herpes simplex virus type 1 is a common pathogen that affects the vast majority of people around the world.

Purpose: *comparative evaluation of the results of molecular express methods of etiological diagnosis of herpes-viral infection in patients with inflammatory eye diseases - keratitis and keratoconjunctivitis.*

Materials and research methods. *We examined 20 patients with a diagnosis of keratitis and keratoconjunctivitis. To confirm the etiology of the inflammatory process, a direct immunofluorescence reaction of smears was used - prints from the cornea and conjunctiva of the affected eye (RIF). We used kits manufactured by Dako, Denmark, according to the attached instructions. The preparations were examined using a Nikon Eclipse 50i fluorescent microscope, Japan. Domestic kits manufactured by Vector-Best were used for PCR.*

Research results. *Biomaterial from the patient's conjunctiva was applied to a glass slide, fixed, and stained with polyclonal rabbit antibodies conjugated with fluorescein isothiocyanate (FITC) against herpes simplex virus type 1. When examining patients, the herpes-viral nature of the pathology using RIF and PCR was confirmed in 75-80% of patients.*

Conclusion. *It was shown that molecular methods of etiological rapid diagnosis of herpetic keratitis give comparable results: the sensitivity and specificity of RIF in relation to PCR in our study was 94.1 and 100.0%, respectively.*

Keywords*: inflammatory eye diseases, herpes viruses, keratitis, keratoconjunctivitis, RIF, PCR.*

Among inflammatory eye diseases of an infectious nature, researchers assign a significant place to the viral etiology of the process, primarily to representatives of the *Herpesviridae* family. It is known that human herpes simplex viruses type 1 and 2 are capable of persisting in the human body throughout life. According to literature data, more than 90% of the world's population is infected with these viruses. Herpes simplex virus type 1 (HSV-1) is a ubiquitous pathogen that affects the vast majority of people worldwide [1,2,3].

Most commonly, viral replication is limited to the epithelium and persists in activating sensory neurons, periodically reactivating to cause localized recurrent lesions. HSV-1 corneal infection begins with the entry of the virus into cells through a multi-step process that involves the interaction of viral glycoproteins and host cell surface receptors. Once inside, HSV-1 elicits a chronic immune-inflammatory response leading to corneal scarring, thinning, and neovascularization. This leads to the development of various eye diseases such as herpetic stromal keratitis, which leads to visual impairment and possible blindness. HSV-1 can also enter the central nervous system, leading to encephalitis and systemic diseases, especially in newborns and immunocompromised patients [4,5,6].

Antiviral therapy allows for continuous and significant improvement in the treatment of both primary and recurrent infections. However, the resistance of HSV-1 to currently available drugs and toxicity are challenging. Therefore, a promising direction can be considered the development of antiviral vaccines and the search for targeted cytokines [7].

Before treating this pathology, it is necessary to verify the etiology of the disease. To identify and identify the causative agent of viral keratitis, culture studies, polymerase chain reaction (PCR), immunofluorescence reaction (RIF), as well as some other methods, in particular, enzyme im-

munoassay, are used. The titer of virus-specific antibodies in blood serum is determined by enzyme-linked immunosorbent assay (ELISA). Viral keratitis is differentiated from other types of keratitis: fungal and bacterial keratitis. However, the fastest and most effective methods of specific diagnostics are PCR and RIF, since they allow to establish the etiology of the disease in a short time and with a high degree of reliability.

Biomicroscopy of the eye, confocal and endothelial microscopy of the cornea, pachymetry and keratometry, determination of the sensitivity of the cornea helps to assess the condition of the cornea. A fluorescein instillation test is performed to detect corneal erosions and ulcers. For greater reliability of the instillation test before it, it is necessary to avoid other eye examinations. However, in the literature there is no unambiguous attitude to the diagnostic significance of modern molecular research methods in proving the etiology of keratitis and keratoconjunctivitis.

Purpose of the study was a comparative assessment of the results of molecular express methods of etiological diagnosis of herpes-viral infection in patients with inflammatory eye diseases - keratitis and keratoconjunctivitis.

Patients, materials and research methods

We examined 20 patients with a diagnosis of keratitis and keratoconjunctivitis in the age group from 20 to 40 years (9 men, 11 women). On examination, a fluorescein instillation test (FIT) was performed. Used test strips "Oftolik", manufactured in India, impregnated with fluorescein, which were placed in the outer third of the lower eyelid, withstood exposure for 2 minutes. Then the surface of the eye was examined with a slit lamp using a blue filter. Disorders of the integrity of the corneal epithelium and the presence of tears with a characteristic “tree” configuration were detected.

To confirm the etiology of the inflammatory process, the direct immunofluorescence (RIF) reaction was used. Swabs were taken from patients - prints from the cornea and conjunctiva of the affected eye, applied to a glass slide, fixed over the flame of an alcohol lamp, and stained with polyclonal rabbit antibodies conjugated with fluorescein isothiocyanate (FITC) against herpes simplex virus type 1. We used kits manufactured by Dako, Denmark, according to the attached instructions. The preparations were examined using a Nikon Eclipse 50i fluorescent microscope, Japan. The presence of a specific green luminescence in epithelial cells was considered a positive result and was evaluated semi-quantitatively according to the following gradation (Table 1).

Table 1
Criteria for semi-quantitative assessment of drugs using RIF

Microscopy result	Specific glow intensity
Bright fluorescence along the cell periphery, clearly contrasting with the cytoplasm and nucleus	+ + + + (4 «+»)
Bright fluorescence along the cell periphery	+ + + (3 «+»)
Weak fluorescence that does not contrast with the cell body	+ + or + (2 "+" or 1 "+")
Lack of fluorescence	-

Control studies were performed using traditional PCR diagnostics (polymerase chain reaction) using a kit manufactured by Vector-Best (RF).

For statistical processing of the results, the χ^2, criterion was used, which was calculated using the PC program IBM Statistica 9.0 for a confidence level of $p < 0.05$.

Research results

Of the 20 examined patients with suspected viral keratitis, the diagnosis of herpetic keratitis by RIF was confirmed in 15 (75%) and 16 (80%) by PCR. Confirmation of the diagnosis was based on anamnestic, clinical, instrumental data and the results of RIF and PCR. However, out of 15 patients with positive RIF in all cases, the PCR result was also positive (100%), and of 16 patients with positive PCR, the result of RIF was positive in 15 patients (94.1%). Thus, these methods of laboratory research gave close results in terms of specificity and sensitivity and made it possible to exclude the herpes-viral nature of keratitis in 5 and 4 patients, respectively.

Figure 1 shows a photograph of the result of the fluorescein instillation test (FIT). Among patients with a confirmed diagnosis of herpetic keratitis, the intensity of specific fluorescence according to gradation 4 "+" was three (20%), with intensity of fluorescence 3 "+" - one (7%). The rest were assigned to the group with luminescence intensity 2 "+" or 1 "+" (73%).

Micrographs of different RIF results are shown in Fig. 1-3.

Discussion of the results

The importance of timely diagnosis of viral keratitis is beyond doubt. The decisive factor in prescribing adequate treatment and preserving the vision of patients is timely diagnosis, and it is precisely the identification of the etiology of the process. The choice of a specific diagnostic method depends on the possibility of laboratory support. In this regard, molecular methods of RIF and PCR diagnostics deserve attention.

In our opinion, the RIF method is the most acceptable in clinical practice. The time to get the result is 1.5 - 2 hours, as opposed to PCR (4 - 6 hours). The equipment can be domestic, as well as reagents: for example, a luminescent microscope of the "Mikmed" series, manufactured by JSC "LOMO", and sets for RIF "Herpes Slide", manufactured by "Galart Diagnosticum" LLC.

It should be noted that if the appropriate equipment is available, PCR has a certain advantage over RIF - it excludes subjectivity in evaluating the results. In addition, PCR makes it possible to quantify the presence of the virus at the site of inflammation. Nevertheless, in our opinion, the use of RIF for the diagnosis of viral keratitis is preferred in wide clinical practice, especially when PCR is not possible.

Conclusion

Molecular methods of etiological rapid diagnosis of herpetic keratitis give comparable results: using RIF, the herpes-viral etiology of clinically diagnosed keratitis was confirmed in 75% and in 80% by PCR. The sensitivity and specificity of RIF in relation to PCR in our study was 94.1 and 100.0%, respectively.

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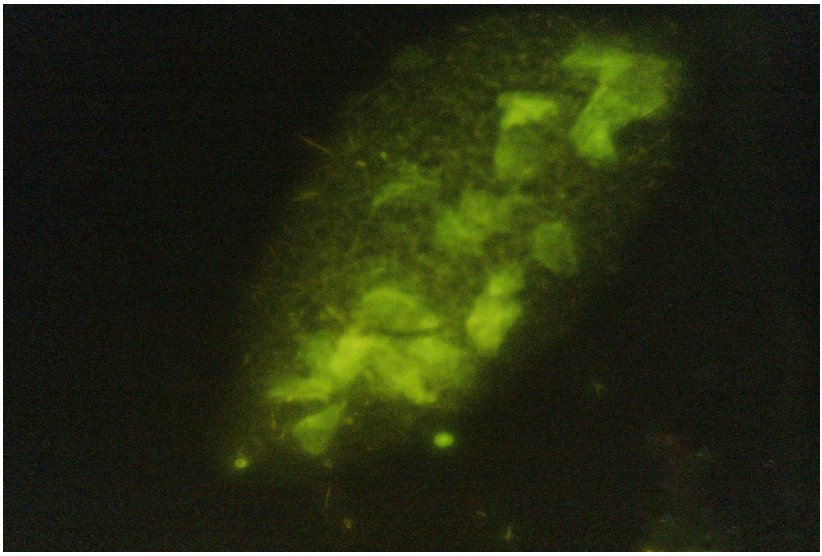

Fig. 1. RIF result. Grade 4 "+".

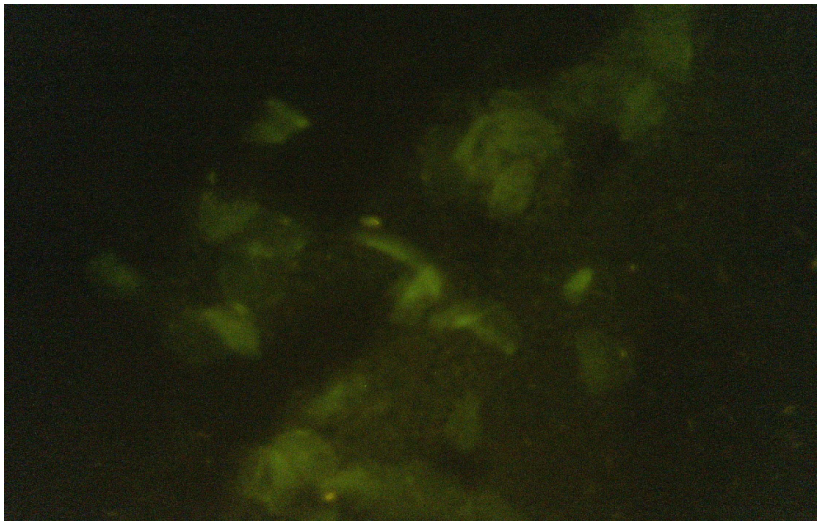

Fig. 2. RIF result. Grade 1 "+" – 2 "+".

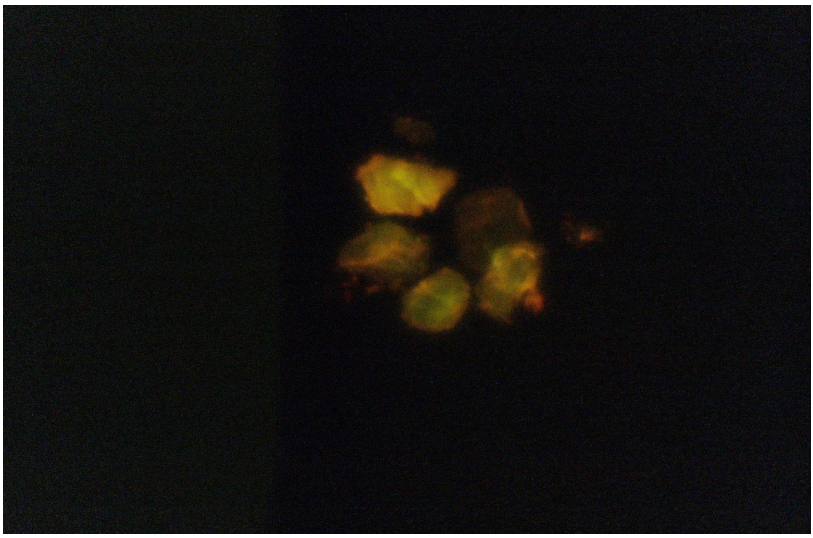

Fig. 3. Negative RIF result.

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COMPARATIVE ASSESSMENT OF MORTALITY IN THE MOSCOW OBLAST OF THE RUSSIAN FEDERATION IN THE CONTEXT OF THE COVID-19 CORONAVIRUS PANDEMIC

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The article presents the results of a comparative analysis of the structure, volumes and levels of mortality of the population in the territory of the Moscow Oblast of the Russian Federation in the first half of 2018-2020, which indicate that the decrease in total mortality by 2.4% in 2019 was replaced by its growth by 15.0% in 2020

More than 90% of the total increase in mortality was recorded in April-June. The proportion of COVID-19 as the cause of death was 10.5% in the second quarter of the year, and the share of COVID-19 in the increase in mortality by month was 24.7% in April, 46.5% in May and 58.4% in June with an average value of 41.3%.

By classes of diseases, the most intensive increase in mortality was from diseases of the respiratory system (by 41.4%), mental and behavioral disorders (by 35.9%), diseases of the nervous system (by 17.4%) and

diseases of the digestive system (by 15,2%). The largest increase in mortality for these classes of diseases was also noted in the second quarter of the year, with peaks in May 2020.

Keywords: number of deaths, mortality, classes of diseases and causes of death, COVID-19.

Introduction

Continuous dynamic observation, study and analysis of the mortality rate of the population is a mandatory subject of social hygiene, public health and health care organization. These studies acquire particular relevance and significance in the context of massive spread (epidemics, pandemics) of diseases, including previously unknown ones, characterized by intensive growth rates, high mortality and mortality rates.

The purpose of this study was to examine the actual and possible impact of COVID-19 on changes in mortality in the territory of the Moscow Oblast of the Russian Federation (Russia) in the first half of 2020.

Methodological support

The object of research is the mortality rate of the population. The subject of the research is the change in the volumes, levels and structure of mortality in the compared periods of the first half of 2018-2020.

Information support is the database of the Moscow Oblast Medical Information and Analytical Center (MIAC) based on 158 112 death certificates for persons who died in the periods of January-June 2018-2020. The observation unit was the case of death.

The second component for calculating the mortality rate was the population size of Moscow Oblast at the beginning of 2018-2020.

The research methodology included the grouping of deaths by years, months, classes of diseases and causes of death (ICD-X), calculation and assessment of their quantitative changes, the structure of causes of death, and the mortality rate (per 100 thousand population) in the periods studied.

To determine the number of deaths from COVID-19, the ICD-10 codes were used U07.1 - Coronavirus infection COVID-19 (Virus identified) and U07.2 - Coronavirus infection COVID-19 (Virus not identified) [1]. The number of deaths from these causes was 1875 and 1495 population, respectively (3370 population in total).

Discussion of the results

The study was based on Moscow Oblast, which ranks second among the subjects of Russia in terms of population and socio-economic development. In July 2012, its administrative boundaries were revised [2], respectively, the number of the assigned population, the absolute number of deaths and indicators of the vital movement of the population, in this case,

mortality, changed.

For the period 2013-2020 population of the subject (at the beginning of the year) consistently increased by 642,779 population (by 9.1%) and reached 7,690,863 population [3]. The average annual population growth rate for this period was 1.30% per year.

In 2013-2019, there was also an annual steady and consistent downward trend in overall mortality (at the end of the year) from 13.9 to 12.0 (per 1,000 population) [3] - by 13.7% in general, or on average by 2.28% per year.

An analysis of the mortality rate of the population of Moscow Oblast for the first half of 2018-2020 showed that in the structure of mortality in these three periods, diseases of the circulatory system (class IX) occupied the first rank as the cause of death. Their proportion of percentage gradually decreased from 41.6% in 2018 to 39.1% in 2019 and 36.4% in 2020.

The second ranking place was occupied by diseases of the nervous system (class VI) with a gradual increase in their proportion of percentage from 15.5% to 16.2% and 16.6%, respectively.

The third rank as the cause of death was occupied by neoplasms (class II) - 13.3%, 13.9% and 11.1%, respectively.

The fourth ranking place belonged to external causes (classes XIX-XX) - 8.3, 8.1% and 7.1%.

In the fifth position, as the cause of death, in 2018-2019 were diseases of the digestive system (class XI) - 5.2% and 5.3%, respectively, however, in the first half of 2020 (value 5.3%) they moved to seventh place, yielding to the emerging cause of death - COVID-19 (class XXII) - 5.8% and the increased mortality from mental and behavioral disorders (class V) - 5.7%.

In 2018-2020 consistently reduced the proportion of deaths from symptoms, signs and deviations from the norm (class XVIII) - 3.7%, 3.2% and 2.7% and of the endocrine system (class IV) - 3.5%, 2, 9%, 2.5%.

The proportion of respiratory diseases as a cause of death increased and were 2.5%, 2.6%, 3.2%.

The proportion of deaths from diseases of the genitourinary system (class XIV) did not fundamentally change - 2.0%, 1.9% and 1.9%.

The number of deaths on the territory of Moscow Oblast in the first half of 2019 compared to the same period in 2018 decreased by 592 population, or 1.2%, and amounted to 49784 population.

During this period, the most intensive decrease in the number of deaths was observed from diseases of the endocrine system (class IV) - by 16.7% (by 290 population), from causes related to the group of symptoms, signs and deviations from the norm (class XVIII) - by 15.4% (by 285 population)

and diseases of the circulatory system (class IX) - by 7.1% (by 1476 population).

The number of deaths from diseases of the genitourinary system (class XIV) decreased slightly by 1.0% (by 10 population) and increased from diseases of the digestive system (class XI) by 0.7% (by 17 population).

The number of deaths from neoplasms (class II) increased by 3.3% (by 221 population), diseases of the nervous system (class VI) - by 3.1% (by 244 population), respiratory diseases (class X) - by 2.3% (by 29 population).

The number of deaths from external causes (classes XIX-XX) decreased by 3.0% (by 126 population).

It should be especially emphasized that in the first half of 2019 the number of deaths from mental and behavioral disorders (class V) almost doubled by 95.9% (by 1,179 population),

In total, the proportion of causes of death related to the mentioned 11 classes of diseases in 2019 was 98.1% of deaths, and in 2018 was 97.9%.

At the end of 2019, a new coronavirus infection was recorded in the PRC [3], and in March 2020 WHO declared a pandemic of the coronavirus COVID-19 [4], spreading, including in the territory of the Russian Federation, and potentially affecting the level and structure of mortality in the country and its subjects.

The mortality trends emerging in Moscow Oblast in previous years have undergone the following changes.

Compared to 2019, in January-June 2020, the number of deaths in the subject increased by 8,168 population or by 16.4% and amounted to 57,952 cases. The overwhelming proportion of this increase - 92.8% - fell on April-June, that is, in the second quarter of the year.

Among the leading classes of diseases as causes of death, in the first half of 2020, in terms of growth rates, the number of deaths from respiratory diseases (class X) increased most significantly, by 43.7% (by 550 population), mental disorders and behavioral disorders (class V) by 37.5% (by 904 population), diseases of the nervous system (class VI) by 18.8% (by 1,521 population), diseases of the digestive system (class XI) by 16.6% (by 435 population) and diseases of the genitourinary system (class XIV) by 13.6% (by 132 population).

The largest increase in deaths on the territory of Moscow Oblast in January-June 2020 compared to the same period in 2019 was recorded from diseases of the circulatory system (class IX) - by 1,648 population, which was 8.5% of the increase.

The number of deaths from external causes (classes XIX-XX) increased insignificantly, by 1.8% (by 74 population), from diseases of the endocrine system (class IV) practically insignificant by 0.6% (9 population).

From neoplasms (class II), as the cause of death, 7.2% fewer population died (by 501 population).

The number of deaths from causes related to symptoms, signs and deviations from the norm (class XIII), despite the fact that this class of causes of death belongs to the group of so-called "junk codes", which are not very informative for establishing the true cause of death, has not increased.

In March-June 2020, the total number of registered deaths from COVID-19 was 3,370, which brought this cause to the fifth rank, after death from diseases of the circulatory system (21,120 population), diseases of the nervous system (9,594 population), neoplasms (6 426 population), and external causes (4 122 population).

The total proportion of causes of death related to the mentioned 11 classes of diseases accounted for 92.4% of cases, and including COVID-19 as the cause of death (5.8%) was 98.3%.

The proportion of COVID-19 as the cause of death in the second quarter of 2020 was 10.5%.

The proportion of COVID-19 in the increase in mortality was 24.7% in April, 46.5% in May and 58.4% in June.

An analysis of the age structure showed that 77% of those who died from COVID-19 were at the age of 60 or more, including 40% at the age of 60-74. The proportion of those who died before 25 years old is 0.2%, and those who died at 25-59 years old was 23%.

Summarized data on the number of deaths and mortality of the population, and their changes in January-June 2018-2020 are presented in Table 1.

From the materials of Table 1 it follows that there is no pronounced dynamics in mortality rates for the first quarters of 2018-2020: -0.5%;+1.2%. In 2018-2019, the difference in mortality between the first and second quarters is also insignificant and was +1.2% and -2.7%.

Mortality in the second quarter of 2020 is 24.4% higher than in the first and 29.3% higher than in the same period of 2019. Excluding COVID-19 as the cause of death, these excess were 11.3% and 15.8 % respectively.

The absolute increase in the number of deaths in the second quarter of 2020, compared to 2019, amounted to 7578 population, and in the first was 590 population.

By classes of diseases in 2020 compared to 2019, the most intensive increase in mortality from diseases of the respiratory system (by 41.4%), mental and behavioral disorders (by 35.9%), diseases of the nervous system (by 17.4%) and diseases of digestive organs (by 15.2%). The largest increase in mortality for these classes of diseases was observed in the sec-

ond quarter, with pronounced peaks in May 2020 (Table 2).

The increase in mortality from diseases of the genitourinary system, in terms of intensity, was in fifth position (by 12.3%), with the largest growth rates in June and February, and then in May and March and a decrease in mortality in April.

The mortality rate from diseases of the circulatory system increased by 7.2%. The largest monthly increases were observed in April, May and February, with a decrease in mortality in June.

Conclusion

In January-June 2020, the total mortality rate of the population of the Moscow Oblast of the Russian Federation increased by 15.0% compared to the same period of 2019. The number of deaths increased by 8,168 population (by 16.4%). In the previous six months of 2018-2019, there was a decrease in mortality by 2.4%.

Provided the value of the total mortality rate remains at the level of 2019, the number of deaths in 2020 could increase by only 597 population, or 1.2%, and with a possible trend decrease in mortality by 2.2%, it could even decrease by 511 population, by 1.0 % and therefore it is quite permissible to talk about the formation of excess mortality in population of the Moscow Oblast in 2020, numbering 7,571 - 8,679 population or 98.44 - 112.85 cases per 100 thousand population.

Excluding the data obtained in the study on the additional mortality from COVID-19 (43.82 per 100 thousand of population), this excess is 54.62 - 69.03 (per 100 thousand of population) or 4.2 - 5.3 thousand population (7.2% - 9.1% of the total number of deaths).

In January-June 2020, the actual excess mortality rate is 2.25 times higher than the death rate determined by the COVID-19 coronavirus infection, and this is alarming.

It is possible that with further in-depth studies on the presented problem, especially on the study of the coding of causes of death in the context of a new coronavirus infection, the number of deaths and, accordingly, the mortality rate from COVID-19 may undergo some, and maybe even significant, changes, however, from our point of view, the results obtained already at present indicate the presence of certain problems in the existing system of organizing medical care for the population, especially in the face of threats of a rapidly spreading infection.

The resources of the national health care system should be optimally allocated and rationally redistributed to solve individual, including operational tasks, and the assessment of the current situation should be reliable and objective.

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Table 1

The number of deaths (population), mortality (per 100 thousand of the population) and their growth (population,%) in the territory of the Moscow Oblast of the Russian Federation from all causes and COVID-19 for January-June 2018-2020.

	January	February	March	April	May	June	Total
Deaths (population)							
2018	8396	7660	8982	8663	8223	8442	50376
2019	9209	7742	8286	7908	8504	8135	49784
2020	9031	8301	8495	9771	12102	10252	57952
Increase/decrease in deaths (population)							
2019/2018	+813	+82	-706	-755	+281	-307	-592
2020/2019	-178	+559	+209	+1863	+3598	+2117	+8168
Increase/decrease in deaths (%)							
2019/2018	+9,6%	+1,1%	-7,7%	-8,7%	+3,4%	-3,6%	-1,2%

	January	February	March	April	May	June	Total
2020/2019	-1,9%	+7,2%	+2,5%	+23,6%	+42,3%	+26,0%	+16,4%
Mortality (per 100 thousand population)							
2018	111,90	102,09	119,71	115,45	109,60	112,51	671,38
2019	121,08	101,87	109,03	104,06	111,90	107,04	655,08
2020	117,43	107,93	110,46	127,05	157,36	133,30	753,52
Increase/decrease in mortality (%)							
2019/2018	+8,2%	-0,2%	-8,9%	-9,9%	+2,1%	-4,9%	-2,4%
2020/2019	-3,0%	+5,9%	+1,3%	+22,1%	+40,6%	+24,5%	+15,0%
The number of deaths (population) and mortality (per 100 thousand population) from COVID-19 in 2020							
Died from COVID-19	-	-	1	460	1673	1236	3370
Mortality from COVID-19	-	-	0,013	5,98	21,75	16,07	43,82
Share of COVID-19 as a cause of death	-	-	0,01%	4,7%	13,8%	12,1%	5,8%
Share of COVID-19 in mortality growth	-	-	0,48%	24,7%	46,5%	58,4%	41,3%

Table 2

Mortality rate (per 100 thousand population) and the rate of increase/decrease in mortality (%) for certain classes of diseases on the territory of the Moscow Oblast of the Russian Federation for January-June 2018-2020.

	January	February	March	April	May	June	Total
Respiratory diseases							
2018	2,11	2,35	2,96	3,39	2,99	2,85	16,63
2019	3,01	2,74	2,91	2,76	2,72	2,66	16,80
2020	3,24	3,22	2,60	4,24	6,32	4,13	23,76
Increase/decrease in mortality (%)							
2019/2018	+42,7%	+16,6%	-1,7%	-18,6%	-10,0%	-6,7%	+1,0%
2020/2019	+7,6%	+17,5%	-10,7%	+53,6%	+132,4%	+55,3%	+41,4%

Mental and behavioral disorders							
2018	2,07	1,59	2,32	2,45	3,48	4,48	16,38
2019	6,49	4,66	4,95	4,66	5,63	5,30	31,69
2020	5,23	5,16	6,05	8,05	9,84	8,74	43,06
Increase/decrease in mortality (%)							
2019/2018	+213,5%	+193,1%	+113,4%	+90,2%	+61,8%	+18,3%	+93,5%
2020/2019	-19,4%	+10,7%	+22,2%	+72,7%	+74,8%	+64,9%	+35,9%
Diseases of the nervous system							
2018	13,51	14,11	16,34	17,77	19,63	22,99	104,35
2019	20,04	17,05	18,12	16,62	17,44	16,96	106,23
2020	17,92	17,38	18,83	20,84	26,80	22,99	124,75
Increase/decrease in mortality (%)							
2019/2018	+48,3%	+20,8%	+10,9%	-6,5%	-11,2%	-26,2%	+1,8%
2020/2019	-10,6%	+1,9%	+3,9%	+25,4%	+53,7%	+35,6%	+17,4%
Diseases of the digestive system							
2018	5,78	4,98	5,93	5,66	5,72	6,70	34,78
2019	6,43	5,37	5,92	5,59	5,76	5,47	34,57
2020	6,55	5,41	6,38	7,03	7,78	6,66	39,81
Increase/decrease in mortality (%)							
2019/2018	+11,2%	+7,8%	-0,2%	-1,2%	+0,7%	-18,4%	-0,6%
2020/2019	+1,9%	+0,7%	+7,8%	+25,8%	+35,1%	+21,8%	+15,2%
Diseases of the genitourinary system							
2018	1,56	1,69	2,01	2,15	2,73	2,92	13,06
2019	2,20	1,97	2,07	2,42	2,37	1,74	12,76
2020	2,25	2,34	2,38	2,41	2,73	2,23	14,33
Increase/decrease in mortality (%)							
2019/2018	+41,0%	+16,6%	+3,0%	+12,6%	-13,2%	-40,4%	-2,3%
2020/2019	+2,3%	+18,8%	+15,0%	-0,4%	+15,2%	+28,2%	+12,3%
Diseases of the circulatory system							
2018	52,58	46,43	54,34	51,18	39,30	35,33	279,18
2019	47,50	40,50	41,95	40,37	44,08	41,82	256,22
2020	49,38	44,73	43,99	46,57	49,31	40,63	274,61
Increase/decrease in mortality (%)							
2019/2018	-9,7%	-12,8%	-22,8%	-21,1%	+12,2%	+18,4%	-8,2%
2020/2019	+4,0%	+10,4%	+4,9%	+15,4%	+11,9%	-2,8%	+7,2%

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CHOOSING THE SAFEST OPTION FOR ANESTHETIC SUPPORT OF ELDERLY PATIENTS WHEN PERFORMING KERATOPLASTY

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Features of the corneal transplantation operation - keratoplasty - include a sufficient duration of the intervention (from 1 to 3 hours), exclusion of the slightest movement of the patient, which determines the need for general anesthesia. This completely eliminates the effect of the patient's "presence" at the operation, creates optimal conditions for the surgeon, excludes the patient's motor activity. Anesthesia should be administered according to the physiological status of the patient. It is necessary to avoid a significant decrease in blood pressure, since for elderly patients, burdened by somatic pathology (hypertension, post-infarction and post-stroke states), even short episodes of arterial hypotension, as well as their correction with vasopressors or volemic load, are far from safe. Older adults are more sensitive to drugs that act on the central nervous system, so the choice of anesthetics, hypnotics, pain relievers and muscle relaxants must be carefully considered.

Keywords. Ophthalmic surgery, keratoplasty, general anesthesia, safety, elderly patients.

Between 50 and 70% of The S.Fyodorov Eye Microsurgery Federal State Institution is made up of elderly people who, according to the WHO, have reached the age of over 65 years [1,2]. Old age increases the risk of perioperative complications and death by 3 times, this is due to the presence of diseases such as hypertension, coronary heart disease, heart failure, obstructive pulmonary disease, diabetes mellitus, kidney disease, arthritis and dementia.

When choosing a method of anesthetic support in elderly patients in the case of planning keratoplasty, it is important to remember about the age-related anatomical, physiological and pharmacological characteristics of elderly patients (Table 1) [3]. A decrease in cardiac output is now considered a manifestation of age-related diseases, since with a good general level in the elderly, this indicator can remain normal [4, 5].

Table 1

Normal age-related changes and the most common diseases in the elderly (Morgan Jr. D.E., Mikhail M.S., 2012)

Normal age-related changes	Diseases
The cardiovascular system	
Decreased elasticity of arteries Increased afterload Increased BP Left ventricular hypertrophy Decreased adrenergic activity Decrease in HR Weakening of the baroreceptor reflex	Atherosclerosis IHD Hypertonic disease Heart failure Arrhythmias Aortic stenosis
Respiratory system	
Decreased lung compliance Decreased alveolar surface area Violation of ventilation-perfusion relations Decreased O2 content in arterial blood Increased chest rigidity Decreased muscle strength Reducing the effectiveness of the cough Weakening the reaction to hypercapnia and hypoxia	Emphysema Chronical bronchitis Pneumonia Lung cancer Tuberculosis
Kidneys	
Decrease in renal blood flow Decrease in channel filtration rate Decrease in kidney mass Impaired sodium and water reabsorption Impaired ability to concentrate urine Impaired ability to dilute urine Decreased ability to excrete drugs, potassium Decreased reactivity of the renin-aldosterone system	Diabetic nephropathy Nephropathy due to arterial hypertension Urinary tract obstruction associated with prostatic hypertrophy Heart failure

In addition, it is necessary to take into account the age-related characteristics of the pharmacokinetics and pharmacodynamics of drugs used in the perioperative period. With aging, the total and intravascular volume of water decreases, the fat content increases, which affects the pharmacokinetics and pharmacodynamics of drugs. As a result of deterioration in the function of the liver and kidneys, the duration of action of drugs increases, the biotransformation of which occurs in these organs. In elderly patients, the concentration of plasma albumin, which binds drugs with a predominantly acid reaction (for example, barbiturates, benzodiazepines, opioids), is reduced and the plasma concentration of α_1-glycoprotein, a protein that binds drugs with an alkaline reaction (for example, local anesthetics), is increased [3].

For the clinical effect, the elderly need smaller doses compared to younger patients, and the duration of action is prolonged.

Halogenated inhalation anesthetics

A decrease in cardiac output in the elderly accelerates the induction of inhalation anesthesia, but a pronounced violation of the ventilation-perfusion relationship may, on the contrary, slow the onset of the effect. The MAC of volatile anesthetics decreases with age (about 4% for every 10 years over 40 years), in parallel with a decrease in cerebral metabolic requirements for O_2 [4].

In elderly patients, inhalation anesthetics can cause a pronounced cardiodepressant effect, reducing cardiac output without a compensatory increase in heart rate. Deterioration of liver function, a decrease in the intensity of gas exchange in the lungs and an increase in the volume of distribution against the background of an increased content of fat in the body leads to a delayed awakening after inhalation anesthesia. Xenon, which is the drug of choice for general anesthesia in elderly patients with compromised myocardium, does not have such effects [6].

Xenon.

When studying the effect of xenon on hemodynamics during balanced multicomponent endotracheal anesthesia, researchers, first of all, note the stability of hemodynamic parameters: an increase in stroke volume, cardiac index, left ventricular function, a tendency to bradycardia during anesthesia. It has been shown that xenon does not have a cardiodepressant and proarrhythmogenic effect, does not affect peripheral vascular tone [7, 8, 9]. In addition, xenon has a pronounced cardioprotective effect: preconditioning with xenon before occlusion of the coronary arteries reduces the focus of the heart attack [10].

Intravenous anesthetics

The elderly have a reduced need for barbiturates, benzodiazepines and opioids.

Barbiturates: at 80 years old, the dose of thiopental for induction of anesthesia is more than 2 times lower than at 20 years old due to the slow rate of redistribution of drugs from the central chamber to the peripheral. Prolonged duration of action reflects increased volume of distribution and lengthening T1/2β.

It is required to reduce the induction dose of *propofol* in elderly patients by 20%, compared with young patients, it takes more time to achieve a sufficient depth of anesthesia, and with age, awakening from anesthesia occurs more slowly. With the same plasma concentration of propofol, the decrease in blood pressure is significantly more pronounced in the elderly than in young patients. Longer administration of the drug minimizes this negative hemodynamic effect of propofol in elderly patients.

Benzodiazepines: Elderly patients require a lower plasma concentration of diazepam to achieve a pharmacological effect. The lipophilic drug accumulates in fat depots, and its volume of distribution increases, and elimination, respectively, slows down. The use of diazepam in the elderly can lead to confusion, lasting several days due to the fact that the half-life of diazepam is 36 hours. In elderly patients, an increased sensitivity to midazolam is also observed: although at low pH values midazolam is a water-soluble drug, at physiological values it becomes fat-soluble, therefore aging affects its pharmacokinetics in a similar way to diazepam. Lorazepam is less soluble in fats than diazepam, so age does not significantly affect its half-life. Thus, benzodiazepines should be used with greater caution in elderly patients; a 75% reduction in dosage is recommended.

Opioids: the need for opioids is reduced due to a reduced initial volume of distribution, lengthening half-life, and increased sensitivity of the brain to opioids. The main risk of opioid use is respiratory depression, the frequency of which increases markedly with age.

Muscle relaxants

- Due to a decrease in cardiac output and blood flow in skeletal muscles, the onset of action of muscle relaxants in elderly people is twice as long as in middle-aged people.
- Decreased renal clearance is the reason for the delayed recovery of neuromuscular conduction (methocurin, pancuronium, doxacurium, tubocurarine); reduced hepatic clearance increases the duration of action of rocuronium and vecuronium. To avoid the cumulative effect of these drugs, it is necessary to increase the intervals between injections.

• The effect of atracurium and pipcuronium does not depend on the patient's age, because inactivation of these drugs occurs by elimination of Hoffman (plasma hydrolysis of the ether).

• Due to a decrease in plasma cholinesterase levels in older men (but not women), the duration of action of succinylcholine may be slightly increased.

• In elderly patients, the use of sugammadex provides a rapid recovery of neuromuscular conduction, contributing to earlier extubation and a decrease in postoperative respiratory complications [11].

Local anesthetics: doses of these drugs for peripheral blockade in ophthalmoanesthesiology in elderly patients are lower due to a decrease in the number of neurons in the central nervous system, the number of axons in peripheral nerves and the amount of myelin. When using a 0.5% solution of ropivacaine for peripheral blockade, age is the main factor determining the duration of the motor and sensory block.

General anesthesia.

In most cases of ophthalmic surgery in elderly patients, there is no need for general anesthesia. However, in extended, prolonged and painful operations, in ophthalmology oncology, as well as in patients with difficulty in contact, general anesthesia is the method of choice in elderly patients in ophthalmic surgery. At the stage of the operation, when the pathologically altered cornea is removed and a new one is fixed, the patient's eyeball is completely open, and the intraocular pressure is equal to atmospheric pressure. In this case, any movement of the patient can cause loss of intraocular content, leading to blindness. Therefore, surgeons prefer to work under general anesthesia [12].

Considering that the use of halogenated inhalation anesthetics is associated with a negative effect on hemodynamics, xenon is preferred as the main anesthetic [9].

For induction under general anesthesia, usually performed with barbiturates, diazepam derivatives, propofol, if there is a likelihood of developing arterial hypotension, a ***combination of ketamine and propofol*** (in a ratio of 1: 4 - 1: 5) is safer [13].

Mask ventilation can be difficult in the elderly due to the absence of teeth, arthritis of the temporomandibular joint or cervical vertebrae, this situation is further complicated by low resistance to hypoxia. Airway patency in this case can be improved with an airway. In addition, in this contingent of patients, overextension of the neck is unsafe due to possible insufficiency in the vertebrobasilar section, and lateral displacement of the cricoid cartilage can displace atherosclerotic plaques in the carotid artery.

Laryngoscopy or insertion of a laryngeal mask under conditions of insufficient anesthesia can overstimulate the sympathetic nervous system, which can be critical in the setting of underlying hypertension or coronary artery disease. Fluctuations in blood pressure and heart rate should not exceed 25% of the original.

To *maintain anesthesia,* low-flow inhalation anesthesia or total intravenous anesthesia is used, taking into account the increased sensitivity of elderly patients to all drugs, including hypnotics, inhalation anesthetics, narcotic analgesics, muscle relaxants and local anesthetics. The use of intravenous anesthetics prolongs the recovery from anesthesia and arousal; it is necessary to take into account the risk of developing episodes of hypoxia in the immediate postoperative period, therefore, it is advisable to use additional oxygenation during awakening.

Extubation after ophthalmic surgery, unless contraindicated, is usually performed with restored spontaneous breathing at a deep level of sedation, which effectively prevents cough and other reactions to extubation, especially in patients with asthma, COPD, or patients with acute upper respiratory tract infection. Infusion of propofol as total intravenous anesthesia (TIVA) or as an adjunct to volatile agents can also effectively prevent coughing and expectoration in smokers and postoperative delirium [14].

Complications in the postoperative period in elderly patients are more likely to developed from the cardiovascular system: myocardial infarction, thromboembolism, serious arrhythmias and heart failure. Disorders of mental activity in old people can be after the use of benzodiazepines, atropine, opioids, antihistamines and are in the nature of a transient syndrome that lasts 1-3 days. At the same time, there is evidence that postoperative intellectual dysfunction can occur regardless of the technique of anesthesia, incl. and with local anesthesia [15].

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THE USE OF XENON FOR GENERAL COMBINED ANESTHESIA IN CORNEAL TRANSPLANTATION

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The need for general anesthesia in corneal transplantation is determined by several factors: the intensity of nociceptive impulses, the duration of the surgery, and the absolute requirement for complete akinesia of the eye. A significant proportion of patients with corneal pathology requiring surgical intervention are elderly people. A prospective comparative study analyzed the safety of anesthesia with xenon, sevoflurane and isoflurane during corneal transplantation. The monitored and calculated parameters of hemodynamics (MAP, HR, TPR, stroke volume), the frequency of critical

incidents (arterial hypotension and hypertension), the volume of infusion and the need for vasopressor support were studied. Analysis of the data obtained showed that xenon anesthesia is the safest, characterized by stable hemodynamics and quick and comfortable awakening.

Keywords. Ophthalmic surgery, general anesthesia, xenon, corneal transplantation, safety.

Introduction. One of the most common operations in elderly patients requiring general anesthesia is penetrating keratoplasty (corneal transplant). The duration of its implementation can be 1-3 hours or more. There are several methods of keratoplasty operations, namely perforating (penetrating) keratoplasty, descemet desensitic automated endothelial keratoplasty, membrane endothelial keratoplasty, deep lamellar endothelial keratoplasty and keratoprosthetics. In some types of keratoplasty operations, ophthalmic surgeons prefer analgosedation with preserved consciousness in combination with a retrobulbar block. However, at a certain stage of keratoplasty, when the pathologically altered cornea is removed and the donor cornea is fixed, the patient's eyeball remains completely open. At this point, any movement of the patient can cause loss of intraocular contents, leading to blindness. Elderly patients may wake up with deep sedation in the middle of surgery and start moving without warning. Their movement is also difficult to control due to inadequate response. Therefore, general anesthesia is considered to be the method of choice for anesthesia in corneal transplantation.

In the Krasnodar branch of The S. Fyodorov Eye Microsurgery Federal State Institution, xenon has been used for general combined anesthesia in ophthalmic operations since 2009, including the longest (up to 2-3 hours) corneal transplantation. Penetrating keratoplasty (PKP) is the most common ophthalmic operation requiring general anesthesia in elderly and senile patients. According to the Krasnodar branch (KB) of The S. Fyodorov Eye Microsurgery Federal State Institution in 2014, out of 9.5 thousand patients operated on using anesthesia, 40% were patients aged 50 to 70 years old and 38% - over 70 years old. Old age significantly increases the risk of perioperative death and complications due to the presence of concomitant diseases: arterial hypertension, ischemic heart disease, diabetes mellitus [1].

KB has accumulated significant experience in xenon anesthesia during ophthalmic operations. Comparison of the quality of anesthesia, hemodynamic reactions, awakening time after surgery showed the advantage of xenon anesthesia over sevoflurane anesthesia in terms of hemodynamic stability, quick and comfortable recovery from anesthesia [2, 3].

Purpose of the study: compare the safety of anesthesia: hemodynamic profile and frequency of unwanted incidents when using xenon (Xe), sevoran (Sev) and isoflurane (Iso) as the main anesthetics in patients with PKP operations. As part of the study, 32 patients aged 50 years and older were examined, who underwent PKP surgery (with or without anticataract intervention) under general combined laryngeal mask anesthesia. All patients were divided into 3 groups. In group I (Xe) - 12 people (65±7 years), xenon was used as the main anesthetic; in group II (Sev) - 10 people (57±8 years), sevoran was used and in III (Iso) - 10 people (59±9 years) - isoflurane.

Anesthesia in groups was carried out according to the following algorithm (Table 1). Standard oral premedication was given the day before; In the operating room, 5 mg Relanium was injected intravenously (i/v). Induction was performed with i/v propofol 1.5-2 mg/kg and fentanyl - 3 μg/kg. After induction of anesthesia, an appropriately sized laryngeal mask was placed. In most cases, spontaneous breathing persisted, ventilation adequacy was assessed in terms of CO_2, respiratory minute volume (RMV), tidal volume (TV) and respiratory rate (RR). With respiratory depression and an increase in hypercapnia, mechanical ventilation was connected.

Maintenance of anesthesia with sevoran and isoflurane was carried out according to the standard technique, with an anesthetic MAC concentration of 0.8-1% for sevoran and isoflurane in a low-flow circuit (fresh mixture flow 0.3-0.5 l/min). Xenon anesthesia was carried out with the Xena-010 apparatus in a complete reverse breathing circuit according to the standard technique (denitrogenation, saturation with xenon for 8±4 min, maintenance of anesthesia with xenon at a concentration of 48-55%). At the stage of basic anesthesia, patients of all groups received fentanyl 50-100 mg bolus as an analgesic every 15-20 minutes.

Table 1
Anesthesia technique in the study groups

	1 group (Xe)	2 group (Sev)	3 group (Iso)
Premedication:	ataractics on the eve of surgery, relanium 5 mg i.v. in the operating room		
Induction:	i.v.: propofol 1.5-2 mg/kg + fentanyl - 3 μg/ kg or by inhaling the sevorane		
Installation of laryngeal mask	Spontaneous breathing with flow support. Monitoring indices of CO_2, MV, respiratory volume. If necessary, the ventilator was connected.		

	1 group (Xe)	2 group (Sev)	3 group (Iso)
Anesthesia maintaining:	Anesthesia with xenon ("Xena-010" apparatus, closed reversible breathing circuit: denitrogenisation, xenon saturation (8±4 min), target concentration Xe 48-55%	Anesthesia with sevoflurane (0.8-1.0 MAC, O_2 0.3-0.5 l/min)	Anesthesia with isoflurane (0.8-1.0 MAC, O_2 0.3-0.5 l/min
Analgesia:	fentanyl 50 - 100 μg every 15-20 minutes		

Monitoring included ECG, mean arterial pressure (MAP), heart rate (HR) and saturation ($SatO_2$), capnography, gas composition monitoring. Non-invasive monitoring was performed with a PVM-2703 Nihon Kohden cardiac monitor. Central hemodynamic parameters: heart stroke volume (HSV) and total peripheral vascular resistance (TPR) - were determined by the calculation method [4]. Research stages: stage 1 - before the onset of anesthesia (baseline), stage 2 - after premedication, stage 3 - 20 minutes after the onset of anesthesia, 4th stage - after 40 minutes of anesthesia, 5th stage - after 60 minutes of anesthesia.

Infusion support was started 20-30 minutes before the onset of anesthesia, since the use of propofol during induction of anesthesia suggested a possible decrease in blood pressure. Considering the age of the patients, the increased sensitivity of their cardiovascular system to the volemic load, the volume and rate of preinfusion were minimal.With a significant decrease in MAP (up to 70 mmHg), colloids (voluven) were connected during anesthesia. In severe peripheral vasoplegia (MAP ≤ 60), vasopressors were used - norepinephrine 0.05-0.2 μg/kg/min.

Removal of the laryngeal mask in all groups, if there were no contraindications, was carried out with restored spontaneous breathing at a deep sedation level to exclude cough and arterial hypertension as a reaction to extubation.

Results. In the period before the onset of anesthesia, the mean arterial pressure (MAP), stroke volume, and total peripheral vascular resistance (TPR) did not differ significantly between the groups. After induction of anesthesia, the hypotensive effect of propofol was observed: in group I (Xe) MAP practically did not change, and in groups II (Sev) III (Iso) it decreased by 24 and 10%, respectively. TPR in groups I (Xe) and II (Iso) practically did not change at this stage, and in group III (Sev), where the intravenous anesthesia was supplemented with sevoran inhalation, this indicator decreased by 20%.

The analysis of the 3rd stage of the study revealed significantly ($p<0.05$) lower MAP indices in groups II (Sev) and III (Iso), compared with group I

(Xe). TPR practically does not change in the group with xenon anesthesia and significantly decreases in groups II (Sev) and III (Iso) - by 27 and 48%, respectively ($p < 0.05$).

After 40 and 60 min of anesthesia, MAP in group I (Xe) remains at the same level. Arterial hypertension in this group was recorded in only one patient and was successfully corrected by intravenous $MgSO_4$. In the groups where the main anesthesia was carried out with halogenated anesthetics, MAP remained at a low level ($p<0.05$ compared with group I (Xe), despite the administration of colloidal solutions and, in 2 cases, inotropic drugs. TPR on the 4th and 5th stages of the study in group I (Xe) - exceeded the initial level by 13%, in groups II (Sev) and III (Iso) it remained below the initial level by 35% ($p < 0.05$ compared to xenon).

To stabilize hemodynamics in the groups of halogenated anesthetics, a relatively larger amount of infusion was required: 1.4±0.5l in the 2nd (Sev) and 1.6±0.4l in the 3rd (Iso) ($p<0.05$ compared with the 1st group) than in the xenon group - 1.0 0.4 l.

The vasopressor norepinephrine was used to stabilize hemodynamics in 5% of cases in the 2nd (Sev) and 10% in the 3rd (Iso) groups ($p < 0.05$ and $p<0.005$, respectively, compared with the 1st group). At the same time, there was no need to use vasopressors in the xenon group.

The recovery time of consciousness in groups II (Sev) and III (Iso) - 17±2 minutes and 18±3 minutes, respectively; in group I (Xe) - 5 ± 1 min ($p<0.005$).

The average consumption of xenon in the 1st group during the operation was 10±1.7 liters.

Discussion. As a result of the analysis of literature data and the results obtained in our work, we can present data on the clinical and circulatory effects (Table 2).

Table 2

Clinical and circulatory effects of xenon, sevorane and isoflurane

Parameters	Xe	Sev	Iso
Application for induction	Limited due to the cost of anesthetic	Used in adults and children	Limited due to irritation
$PaCO_2$	Doesn't change	Increases	Increases
MAP	Doesn't change or increases	Reduces	Reduces
HR	Cuts down	Cuts down	Intensifies
HSV	Doesn't change or increases	Reduces	Increases
TPR	Doesn't change or increases	Reduces	Reduces

The data obtained are consistent with the literature data. It has been shown that xenon does not have a cardiodepressive and proarrhythmogenic effect, does not affect peripheral vascular tone [2, 5]. At the same time, halogenated volatile anesthetics have a pronounced vasoplegic effect [6]. In addition, xenon has a pronounced cardioprotective effect: preconditioning with xenon before occlusion of the coronary arteries reduces the heart attack focus [7].

If patients at a young age with an initial moderate arterial hypotension relatively safely tolerate a decrease in MAP to 60 - 65 mmHg, then for elderly patients with somatic pathology (hypertension, postinfarction and post-stroke states) even short episodes of arterial hypotension, as well as their correction by vasopressors or volume load is far from safe. In such patients, hypotensive reactions can cause complications, both in the operating room and in the postoperative period, ranging from vascular ischemic disorders to problems in the emotional and cognitive spheres [1].

Conclusion and findings

Analysis of changes in peripheral hemodynamics during anesthesia with xenon and halogenated anesthetics allows us to unambiguously conclude that the former is safer, especially in elderly patients. The safety of xenon anesthesia is determined not only by the absence of a pronounced vasoplegic effect of xenon, compared to sevoflurane and isoflurane, but also by a positive inotropic effect that compensates for peripheral vasoplegia, and cardioprotective properties, manifested in the compensation of metabolic disorders in the myocardium. Sevoran and isoflurane should be used only against the background of infusion therapy, including colloidal solutions, which makes it possible to compensate for a significantly decreasing TPR. In addition, in some cases, it may be necessary to administer inotropic drugs.General anesthesia with isoflurane is undesirable for elderly patients with concomitant cardiovascular pathology, given the pronounced vasoplegic effect and the ability to cause tachycardia.

Thus, xenon is the anesthetic of choice for general combined anesthesia in elderly patients with concomitant cardiac pathology during prolonged keratoplasty operations. The course of anesthesia is characterized by stable hemodynamics, recovery from anesthesia is quick and comfortable.

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SEARCH OF THE MECHANISM FOR CONTROLLING TUMOR REGRESSION

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The process of ascidian embryos resorption before they become dormant is probably an evolutionary precursor of tumor regression. If it is true, to understand how the mechanism of tumor regression works, it is important to understand how the mechanism of resorption of embryos preparing for dormancy works in ascidians.

Keywords: evolutionary approach, colonial ascidia, atavism.

To achieve success in any business, it is necessary that the idea of the object to be influenced corresponds to reality. The validity of the prevailing concept of cancer is questionable. The prevailing opinion is that cell malignancy is not a process controlled by the body, but a consequence of the accumulation of mutations in it and the loss of its ability to restore damaged DNA. Based on this belief, oncologists have failed to propose a reliable treatment for cancer and prevent an increase in the number of deaths from it. If the search for treatment does not lead to the desired result, it is necessary to change the direction of research. The purpose of this article is to suggest how to do this.

The proposal is based on the hypothesis stated below about the nature of carcinogenesis. The hypothesis is as follows. According to the superstructure principle of L.A. Orbeli [3] the essence of evolution is such that the former physiological mechanisms do not completely disappear. They are only suppressed by new, more perfect mechanisms. Pathological processes are a return to the mechanisms of normal ontogenesis of ancestors. The first Precambrian Metazoa on Earth were probably like modern sponges, hydroid and coral polyps, bryozoans, intra-powdery and colonial ascidians, had a sedentary lifestyle and were, like them, colonial. They also reproduced sexually and asexually. Asexual reproduction is the formation of new individuals from a set of somatic cells. They, like the named

invertebrates, had two methods of asexual reproduction. With the help of one they formed embryos developing without a dormant period, with the help of the other - embryos developing with a dormant period.

In the above invertebrates, in preparation for the seasonal deterioration of the environment, large body-regulated destruction occurs in the body [1]. They probably also occurred in the Precambrian Metazoa. The cells of specialized tissues in them, like in the above invertebrates, were absorbed or dedifferentiated, and embryos were formed from the dedifferentiated cells by reproduction, which served to experience an unfavorable season for life. As a result, the colony ceased to exist. It turned into a collection of dormant early embryos isolated from each other. In the course of evolution, this device was replaced by others, more advanced. But the mechanism of formation of resting somatic embryos has been preserved. It functions in pathological situations when new, more advanced mechanisms cannot cope with their work.

Since the mechanism of formation of dormant embryos ceased to ensure the passage of normal ontogenesis, it ceased to be an object of natural selection. Selection could no longer free it from mutations. They accumulated and distorted it. Over the hundreds of millions of years that have passed since the Precambrian, mutations have radically changed it. It was also changed by evolutionary strata on the ontogeny of an individual. As a result, the mechanism of formation of resting embryos was transformed into a mechanism of carcinogenesis. Carcinogenesis is a return to asexual reproduction of very distant ancestors. A malignant tumor is an atavistic growing somatic embryo preparing for rest. Cancer is like pregnancy. Removing a tumor is analogous to artificially interrupting it.

Carcinogenesis is a process regulated by the body. It is regulated by morphophysiological mechanisms of normal ontogenesis of very distant ancestors that have lost their adaptive significance. The mechanism that causes cell malignancy prior to tumor growth is a regulatory mechanism that provided dedifferentiation of somatic cells in Precambrian Metazoa, prior to the formation of dormant embryos. The mechanism that controls the multiplication of tumor cells is the regulatory mechanism that controlled the multiplication of somatic cells of the embryo preparing for rest in the Precambrian Metazoa. The mechanism governing the destruction that occurs during carcinogenesis is a regulatory mechanism that caused adaptive destruction in the body in Precambrian Metazoa, which provided the transition of the colony to a state of dormancy. This is the hypothesis about the nature of carcinogenesis [2, 6]. From it follows the recommended direction of the search for a method of cancer treatment set out below.

The property of a colony of the listed invertebrates to pass from one mode of asexual reproduction to another is evidence of the functional plasticity of its reproductive system. These invertebrates can be divided into two groups. Representatives of the former can move from the formation of embryos developing without a dormant period to the formation of resting embryos, but the reverse transition is not available to them. Representatives of the second reproductive system is functionally more flexible. In them, the reverse transition is also possible, that is, from the formation of dormant embryos to the formation of embryos developing without a dormant period. Of the representatives of the second group, I know of only two species. These are colonial ascidians [4, 5]. In them, embryos preparing for rest can be absorbed. At the same time, the colony stops preparing for the termination of its existence and returns to the formation of embryos, developing without a dormant period. The mechanism of resorption of embryos preparing for dormancy in ascidians is an evolutionary precursor of the tumor regression mechanism. The study of the mechanism of resorption in ascidians preparing for dormancy of embryos is the way to understanding the mechanism of tumor regression. Once you understand how it works, you can then learn to artificially run it in cancer patients.

The presence of a tumor regression mechanism in humans can be explained as follows. Our Precambrian ancestors lived in the sea. The less stable conditions a species lived, the more functionally plastic its reproductive system was. The hydrological regime was unstable in estuaries. It was more stable on the high seas. Species capable of passing from the formation of embryos, developing without a dormant period, to the formation of dormant embryos, but incapable of the reverse transition, lived in the open sea. Species in which the reproductive system was functionally more plastic and which could change the mode of reproduction in both directions, inhabited estuaries. In humans, tumor regression is possible because the ancestors of vertebrates were the inhabitants of estuaries.

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IN SEARCH OF A MECHANISM THAT CONTROLS ONCOGENESIS

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The physiological mechanism governing oncogenesis is inherited from the ancestors. It provided them with the passage of normal ontogenesis. This mechanism was regulated by their intercellular interactions. Oncogenesis is therefore also regulated by intercellular interactions.

Keywords: evolutionary oncology, modular animals, plant physiology.

To understand how oncogenesis is regulated by an organism, it is necessary to find out how its evolutionary predecessor was regulated at the passed stages of evolution in normal ontogeny. The author proceeds from the hypothesis [1-3], according to which the evolutionary predecessor of oncogenesis was the formation of dormant somatic embryos of the first Metazoa on Earth, which were sedentary and modular. To elucidate how the formation of dormant somatic embryos in these long-extinct ancestors of modern Metazoa was regulated by the body, the author considers the regulation of the formation of these embryos in sedentary modular animals - sponges, hydroid and coral polyps, bryozoans, intra-powdery and colonial ascidians. The article is devoted to the presentation of the hypothesis according to which the mechanism governing the formation of resting somatic embryos in them is an analogue of the evolutionary predecessor of the mechanism used in normal ontogenesis by the first Metazoa on Earth, and is now governing oncogenesis.

The similarity of adaptations to the experience of an unfavorable season for life in sedentary modular animals and in plants

The evidence presented in this section of the similarity of adaptations to experiencing an unfavorable season for life in sedentary modular ani-

mals and in plants are needed in order to make a judgment on the regulation of the formation of resting somatic embryos in sedentary modular animals. On the basis of this judgment, at the end of the article, an assumption will be made about how the body controls the course of oncogenesis.

Resting somatic embryos (dormant modules) in sedentary modular animals serve to experience an unfavorable season for life. They are formed by asexual reproduction. Actively functioning modules in these animals are formed by asexual reproduction that is not fully completed [4]. The formation of somatic resting embryos in sedentary modular animals occurs in each species according to a hereditarily fixed program, and embryo dormancy occurs at a strictly defined stage of their development. These dormant stages arose as an adaptation to annually recurring changes in nature. Therefore, they can be called diapause. In sponges, diapausing somatic embryos are called gemmules, in creeping ones - podocysts, in bryozoans - statoblasts, in colonial ascidians - resting buds. In plants, resting somatic embryos - buds. In trees and shrubs, they are on the branches, in herbaceous plants - on tubers, roots and rhizomes. Resting somatic embryos of plants and animals are similar structures.

In plants and sedentary modular animals, the body contains sections of embryonic tissue, the cells of which divide and form new modules. In plants, this embryonic tissue is called the meristem. Its cells remain embryonic from the time of their emergence from the seed embryo meristem [5]. In sedentary modular animals, embryonic tissue is formed each time before asexual reproduction by anew dedifferentiation of specialized cells [4]. The dedifferentiated totipotent cells of the embryonic tissue in these animals begin to multiply, in order to then differentiate in new directions in the developing active modules or in the awakened diapaused offspring.

The formation of dormant somatic embryos in animals and plants is accompanied by the simultaneous death of all actively functioning modules. In trees and shrubs, leaves fall off, in herbaceous plants, the aboveground part dries out, in sedentary modular animals, actively functioning modules dissolve. Thus, in sedentary modular animals and plants, due to the attached lifestyle and a low level of integrity of the individual on a different genetic basis and on the basis of the mechanism of asexual reproduction, a mechanism for the formation of resting somatic embryos was formed. Destruction in the body plays an important role in its work. The mechanism of formation of diapausing somatic embryos probably

lies at the basis of the multistage hierarchical physiological regulatory system of all Metazoa.

Cell dedifferentiation, with which preparation for embryonic diapause begins in sedentary modular animals, is the beginning of the transition of an individual from a systemic response to environmental deterioration to a response based on individual cell resistance

This section is needed in order to explain, from the point of view of the hypothesis on the nature of oncogenesis [1-3], why the malignancy of cells is their dedifferentiation. Let us first discuss why somatic diapausing embryos serve as somatic diapausing embryos in sedentary modular animals to experience an unfavorable season for life, and not zygotic ones, as is the case in hydras, turbellaria, oligochaetes, gastrotrichs, rotifers, and crustaceans. Sedentary modular animals form somatic diapausing embryos, probably because they are the lowest integrated among Metazoa. The integrity of plants is also very low and therefore they also form somatic embryos to experience an unfavorable season for life. But their embryos and zygotic seeds fall into a state of dormancy. Why hydra, an organism of low integration for experiencing an unfavorable season for life, has zygotic diapausing embryos, and not somatic ones, I do not know.

The formation of diapausing somatic embryos is the phylogenetically primary method of diapause in Metazoa. Zygotic resting embryos, that is, latent eggs, diapause at the blastula or gastrula stage. In sedentary modular animals, somatic embryos diapause in most cases at a stage similar in structure to gastrula [4]. Thus, embryonic diapause emerged independently in different evolutionary lines of primitive invertebrates at morphologically similar developmental stages. Why?

The answer seems to be this. The least differentiated cells have the highest individual resistance to damage. The need for cleavage of the zygote before embryo diapause is due to the fact that the oocyte, and therefore the zygote, are highly differentiated cells and therefore their resistance to damage is low. Differentiated somatic cells, from which somatic diapausing embryos are formed, are also sensitive to damage. In the course of cleavage of the zygote and cell division of the somatic embryo preparing for diapause, the specialization features inherited from the zygote and from specialized somatic cells are lost, and the embryo's resistance to damaging factors increases. Diapause in a zygotic embryo occurs at the blastula or gastrula stage and at structurally similar stages of development of the somatic embryo, because at this time the loss of

specialization traits inherited from differentiated somatic cells and from the zygote is completed, but specialization associated with further post-diapause differentiation of embryonic cells. Cell dedifferentiation preceding diapause of somatic and zygotic embryos is necessary to increase their resistance to damaging factors. This dedifferentiation of them is the evolutionary precursor of cell malignancy.

The transition of a sedentary modular animal with the onset of an unfavorable season for life from a systemic response to environmental changes to a response based on individual cell stability is due to thermodynamic

Asexual reproduction is always associated with destruction in the body of an individual [6]. In asexual reproducing animals, the greatest amount of destruction in normal ontogenesis is observed in sessile modular species, when they form somatic embryos preparing for diapause. Their body at this time undergoes complete disintegration. Probably, this destruction is the evolutionary precursor of the destruction that occurs during oncogenesis [1-3]. Therefore, the answer to the question - what adaptive value they have in sedentary modular animals, is needed in order to understand - why destruction occurs in the body during oncogenesis.

Actively functioning modules are the most complex part of a modular individual. Diapausing somatic embryos are simpler. The transition of a sedentary modular individual to embryonic diapause is a simplification of its structure. This simplification reduces its energy needs and allows it to maintain an energy balance in conditions when its metabolism is disturbed by external forces and its power is insufficient to actively counteract damaging factors. Instead of actively counteracting external destructive forces, based on the energy-intensive process of interaction of cells differentiated in different directions, the body uses the individual stability of very little differentiated cells that requires less energy consumption.

The preparation for diapause in a sedentary modular animal is probably controlled by intercellular interactions

If the hypothesis about the nature of oncogenesis [1-3] is correct, then to explain how the formation of diapausing somatic embryos is regulated by the body of sedentary modular animals, it means, firstly, to explain how this process was regulated in the first Metazoa on Earth, and, secondly, explain how oncogenesis is regulated. However, this explanation

is hindered by the lack of information on the regulation of preparation for diapause in sedentary modular animals. They are unknown to me. An explanation of the regulatory processes that control the growth of somatic embryos preparing for diapause can only be hypothesized. In plants, the regulation of the formation of dormant somatic embryos is being studied [8, 9].

In plants, the meristem produces auxin, a hormone that moves through the body and causes it to attract nutrients from the formed modules and absorb them [5]. A donor-acceptor bond arises between the old and emerging (meristem) modules. The formed modules become donors, the formed ones become acceptors. With the formation of buds preparing for dormancy in plants, the outflow from the formed modules of nutrients into the meristems, in comparison with this outflow, which occurs during the formation of actively functioning modules, increases. This explains the simultaneous and rapid destruction of all formed actively functioning modules at the end of the growing season. The property of multiplying cells of the meristem to attract nutrients from the formed modules to itself is called apical dominance [9].

The strategy of adaptation to the environment in sedentary modular animals and in plants is similar [10]. Therefore, it is likely that the mechanisms regulating preparation for experiencing an unfavorable season for life are similar for them. If this is so, then in sedentary modular animals the formation of diapausing somatic embryos is also controlled by the apical dominance mechanism. The centers attracting nutrients are likely to be multiplying dedifferentiated cells of developing embryos. These centers, like the meristem of plants, probably secrete some substances that have an effect on the entire organism, forcing it to provide them with food. Formed actively functioning modules, depleted by the outflow of nutrients, are weakened and the body of the invertebrate is destroyed. Apical dominance is probably a universal mechanism of interaction between old and newly formed modules in different phylogenetic lineages of sessile modular animals and plants.

Embryonic tissue in plants and sedentary modular animals is only involved in managing the preparation for seasonal environmental degradation at the local level. At the level of the whole organism, its resources are redistributed between the newly formed modules by the regulatory physiological system of the whole modular individual. The existence of this regulatory physiological system is evidenced by the fact that the responses of a sedentary modular individual to changes in the environment are timely and appropriate [11].

Sponges have no nervous and endocrine systems. Their physiological regulatory system works on the basis of intercellular interactions. Apical dominance in sponges is ensured by intercellular interactions. Consequently, the growth of embryos preparing for dormancy and the disintegration of the formed modules are directed by intercellular interactions. Since apical dominance is possible without the participation of the nervous and endocrine systems, it is likely that in other sessile modular species, the growth of somatic embryos preparing for diapause and the disintegration of the organism accompanying this growth are also controlled by intercellular interactions.

Let us now discuss how the preparation for diapause is switched on in a sedentary modular animal. It begins with the emergence of zones in the modules, the cells of which are dedifferentiated. As a result of this dedifferentiation and reproduction of dedifferentiated cells, diapausing somatic embryos are formed. The dedifferentiation of cells preceding the formation of somatic embryos preparing for diapause is the result of the work of the regulatory physiological system of the animal. In sponges, it works on the basis of intercellular interactions. This means that cell dedifferentiation, which precedes the formation of diapausing somatic embryos, is possible without the participation of the nervous and endocrine systems. Consequently, this dedifferentiation is initiated and controlled by intercellular interactions not only in sponges, but, probably, in other sessile modular species as well.

The transformation of the mechanism of formation of diapausing somatic embryos into the mechanism of oncogenesis - is a side effect of the growth of the integrity of an individual that occurred during evolution.

In species forming diapause somatic embryos, the mechanism of preparation for diapause has not yet turned into a mechanism of oncogenesis. Their oncogenesis is impossible. It is also impossible in plants for the same reason. Oncogenesis is a pathology of unitary species, that is, species that reproduce only sexually. Freely mobile modular ids, that is, species that reproduce sexually and asexually, are also likely to suffer from cancer. These are ctenophores, turbellaria, nemerteans, annelids and echinoderms.

Modular species became unitary when asexual reproduction became impossible in them due to an increase in the differentiation of cells and a decrease, as a result, of the ability of cells to re-differentiate. A unitary

individual is a module of a modular individual that has lost the ability to reproduce asexually and has switched to a freely mobile lifestyle. The program for the formation of diapausing somatic embryos contained each module of the modular individual of the first on Earth Metazoa. A unitary individual also contains it. A tumor is an atavistic transition to embryonic diapause. The mechanism of this transition is inherited from the first Metazoa on Earth.

What was said above about the dedifferentiation of cells prior to the formation of diapausing somatic embryos explains the nature of cell malignancy that precedes tumor growth. Malignancy is aimed at changing the adaptation strategy, at the transition of a unitary individual from a systemic response to environmental changes to a response based on individual cell resistance. It is not possible to complete this change of a unitary individual with cancer. It dies long before its completion from the destruction taking place in the body. In sedentary, doodled animals and, probably, in the first on Earth Metazoa, these destruction were reversible. In unitary species, due to the increased differentiation of cells in the course of evolution and the decreased because of this their ability to re-differentiate, they have become irreversible.

Oncogenesis is probably controlled by intercellular interactions

It was said above that in the body of a sedentary modular animal, before the seasonal deterioration of the environment, zones arise, the cells of which are dedifferentiated in order to then multiply and become diapause somatic embryos. This process of cell dedifferentiation, which precedes the formation of somatic embryos preparing for diapause, is an evolutionary precursor, as mentioned above, of cell malignancy. Consequently, cell malignancy is governed by intercellular interactions, as is the dedifferentiation of cells, which precedes the formation of diapausing somatic embryos. In sedentary modular animals, the formation of diapausing somatic embryos is an evolutionary precursor of tumor growth and destruction in the body that occurs during its growth. The formation of these embryos in sedentary modular animals is governed by the process of apical dominance. This means that oncogenesis is also controlled by it. The mechanism of apical dominance is based on intercellular interactions. Consequently, the growth of a malignant tumor and the destructive processes accompanying its growth are also controlled by intercellular interactions. These two findings are based on assumptions. Therefore, they should also be taken as tentative.

But if they are correct, then in order to decipher the processes that control oncogenesis, laboratory animals of oncologists should not be rats and mice, but sponges. In rats and mice, the mechanism of regulation of the formation of diapausing somatic embryos is masked by later evolutionary layers. It is found in its purest form on the sponges. Sea and lake sponges are difficult to cultivate. Easily cultivated species are needed to study the evolutionary precursor of oncogenesis. These are probably the sponges of African rain puddles. Other sessile modular invertebrates can also be used to decipher the mechanism governing oncogenesis.

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ABOUT TUMOR REGRESSION FROM EVOLUTIONAL POINT OF VIEW

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It is discussed which part of the more general problems is the problem of tumor regression and in what direction studies should be conducted in order to decipher the mechanism of self-healing from cancer.

Keywords: tumor regression, embryonic diapause, asexual reproduction, functional plasticity of the reproductive system.

In some rare cases, a cancer patient recovers without anticancer treatment. If it would be possible to understand how the mechanism of tumor resorption works and to start it artificially, then this would greatly facilitate the treatment of cancer and, moreover, would make it painless. To decipher the mechanism of tumor resorption, it would be useful to find out, a particular case of which more general problem or which more general problems is the problem of self-healing from cancer. The purpose of this article is to discuss this issue. It is conducted from the standpoint of the hypothesis about the nature of oncogenesis, proposed by me and V.V. Khudoley [1,2].

The system of physiological regulation of the body is multistage. It is structured in a hierarchical manner. It was formed in the course of evolution through the development of more and more efficient and economical compensatory-adaptive mechanisms. Waste and ineffective morphogenetic mechanisms of ancient adaptive reactions lost their activity, but their program in the genome was preserved. It is realized in pathological situations. In the dynamics of pathological processes, one should see not an arbitrary violation of structures and functions, but a natural retreat to the passed stages of evolution and exposure of the ancient regulatory physiological mechanisms leading latent activity. Pathological processes are the processes of normal ontogenesis of ancestors regulated by the body [3]. Consequently, oncogenesis is the result of activating the program of one of these processes. Which one exactly?

The answer to this question is offered by our hypothesis [1, 2]. The mechanism of oncogenesis, according to it, is inherited from the first Metazoa on Earth, which were sedentary and modular. Oncogenesis is an atavistic process of preparation for the seasonal deterioration of the environment, and a tumor is an atavistic growing somatic embryo preparing for diapause. In the first Metazoa on Earth, probably somatic early embryos diapaused. Embryonic diapause is widespread among modern sedentary modular animals. They also have somatic early embryos diapause [4]. In sponges, these are gemmules, in cnidaria, podocysts, in bryozoans, statoblasts, in intra-powdery and colonial ascidians, resting buds. The transition to diapause of these animals is accompanied by great destruction in the body [4]. Probably the first on Earth, too. Metazoa, the transition to diapause was accompanied by great destruction in the body. The ancient program of transition to embryonic diapause, which ensured the passage of normal ontogenesis in Precambrian ancestors, is present, according to our hypothesis, in the genome of all Metazoa. Its implementation in species in which it does not participate in normal ontogenesis causes cancer.

If this hypothesis corresponds to reality, then the consequences follow from it, which are presented below. Some of them are contrary to conventional wisdom. The destruction of the organism that occurs during oncogenesis is the atavistic processes of destruction that occurred in the first Metazoa on Earth in preparation for diapause. Oncogenesis is an atavistic refusal from active adaptation to an unfavorable deterioration of the environment and a transition to passive submission to it. It is not possible to complete the formation of an atavistic diapausing early embryo, which provides passive resistance to adverse influences, in an individual with cancer. Death interrupts this process in it long before it ends.

Diapausing somatic embryos of modern sessile modular invertebrates are formed from a set of dedifferentiated cells [4]. The notion that all tumor cells are descendants of one transformed cell [5] contradicts our hypothesis. If a tumor is an atavistic embryo preparing for diapause, then it, like this embryo, arises as a result of dedifferentiation of a set of cells, that is, a separate multicellular zone, a zone of atavistic blastogenesis.

The multiplication of malignant cells is a consequence of their not getting out of the regulatory influence of the body, as E.M. Imyanitov thinks [5], but a process initiated and regulated by the body, since the reproduction of dedifferentiated cells of the forming somatic embryo preparing for diapause in sedentary modular ancestors was a regulated and organism-initiated process.

The regulation of any process is carried out by inhibiting and stimulating it. The immune system inhibits tumorigenesis. But a tumor can and grow and there is reason to believe that its growth is not the result of overcoming immunological surveillance by tumor cells, but the result of the body stimulating their reproduction. The connective tissue of experimental animals promotes the proliferation of cells of the grafted tumor [6]. It is also favored by the ingrowth of vessels into it [7]. Immune and humoral cellular reactions can lead to an increase in tumor growth [8]. Among the lymphocytes infiltrating the tumor, T-, B- and plasma cells were found capable of stimulating tumor growth [9,10]. During metastasis, lymphoid cells and macrophages destroy tissues, facilitating tumor spread [11]. Macrophages, fibroblasts, dendritic cells, T-lymphocytes, pericytes, endotheliocytes, nerve cells, as well as non-cellular components, contribute to the initiation and control of tumor growth at all stages of oncogenesis [12-16]. Stimulation of tumor growth by the body is an atavistic process of its preparation for the seasonal deterioration of the environment.

Malignancy of cells is their dedifferentiation. It is an atavistic reaction that ensured the maximum decrease in the role of systemic adaptive reactions in the first on Earth Metazoa and an increase in the role of defense reactions based on individual cell resistance. Systemic adaptive reactions require more energy for their implementation than reactions based on the individual resistance of cells. The dedifferentiation of cells of the first on Earth Metazoa during the formation of diapausing somatic embryos was aimed at reducing the energy requirements of the individual. In a sedentary modular individual, the death of specialized tissues and the formation of diapausing somatic embryos made it possible to reduce its energy requirements, thereby preserving the energy balance in a deteriorated environment and avoiding death during an unfavorable season for life. A unitary individual cannot solve its energy problems in this way. It has the inclusion of an outdated adaptation mechanism based on passive adaptation to the environment - a pathology.

Reproduction of dedifferentiated cells in modern modular invertebrates stops in most species at a stage similar to the gastrula stage, at which diapause occurs [4]. The same was probably the case with the first Metazoa on Earth, the distant ancestors of all modern unitary, that is, incapable of asexual reproduction, species. According to Gateff [17], an increase in the number of tumor cells is only a stage of tumor growth, followed by the termination of their multiplication. It is rarely possible to observe this due to the death of the patient, who usually does not survive to this stage of tumor development. This arrest of the multiplication of tumor

cells represents the transition of the tumor (atavistic somatic embryo) to the diapause state.

Reproduction of tumor cells according to A.I. Golubev and V.M. Dilman [18] is their preparation for differentiation. They do not explain what kind of differentiation they are preparing for. Based on our hypothesis, one should think that their reproduction is an atavistic preparation for post-diapause differentiation of cells of the forming atavistic early somatic embryo.

The formation of diapausing somatic embryos in sessile modular species is a response not to damaging factors, but to signaling factors that warn the individual about the impending seasonal deterioration of the environment. Carcinogenic factors are atavistic signaling factors that triggered the process of preparation for diapause in the first Metazoa on Earth. The factors causing the preparation for diapause in modern invertebrates can be of a chemical, physical or biological nature. The variety of causes, including the mechanism of diapause, explains the variety of causes of cancer.

One of the adaptations of the diapausing somatic embryo of sessile modular invertebrates - paranecrosis - is a set of nonspecific defense reactions that have arisen according to existing concepts [19, 20] at the premetazoic stage of evolution. Paranecrosis is a switch of the body to ancient stable metabolic pathways. In diapausing invertebrates, oxidative phosphorylation is replaced by anaerobic glycolysis, and resistance to damaging factors is increased [21]. These are indicators of paranecrosis [19, 20]. Paranecrotic reactions are aimed at preserving the diapausing somatic embryo in a deteriorated environment, including in a dried and frozen state [22].

Paranecrotic reactions are also included in tumors. Aerobic metabolism is suppressed in it. Instead, the anaerobic pathway of carbohydrate oxidation is used. The tumor can tolerate anoxia and hypothermia [23-26]. Due to paranecrotic reactions, tumor cells of vertebrates, when dried, do not die [27-32], but normal vertebrate cells do not dehydrate. Consequently, the tumor cells with which the cited authors worked, acquired the ability to maintain viability in a dehydrated state during tumor growth, as did diapausing somatic embryos during preparation for diapause. The logic of the presentation gives reason to believe that the inclusion of paranecrotic reactions in a tumor occurs closer to the end of its growth, when its transition to an atavistic diapausing state approaches.

The predisposition to the formation of tumors in individuals of the population varies and is an inherited trait. The predisposition to diapause in individuals of the population also varies and is also inherited.

Since the process of formation of diapausing somatic embryos in different evolutionary lines of sessile modular species arose independently many times, the process of oncogenesis also appeared many times in different evolutionary lines. The similarity of oncogenesis in representatives of different evolutionary lines is convergent. It is explained by the similarity of the processes of formation of diapausing somatic embryos in representatives of different evolutionary lineages of the first on Earth Metazoa.

It is impossible to induce the formation of tumors in species forming diapausing somatic embryos. Their process of preparation for diapause has not yet turned into oncogenesis. The stated consequences of our hypothesis give reason to believe that the problem of oncogenesis is an integral part of the problem of embryonic diapause. The problem of oncogenesis is also an integral part of the problem of asexual reproduction, since diapausing somatic embryos are formed by asexual reproduction. Therefore, the problem of tumor regression is also an integral part of these two problems.

But the problem of tumor regression is part of another problem - the problem of functional plasticity of the reproductive system. Preparation for diapause in sedentary modular invertebrates is sometimes reversed. This is because diapause, in the presence of conditions that allow active life, leads to a weakening of the positions won by the individual in the struggle for environmental resources. Being in diapause under favorable conditions for life threatens to displace an individual from the biotope, which will be occupied by other individuals. Therefore, if the unfavorable season for life is not very severe and it can be survived in an active state, the somatic embryos preparing for diapause, which have not yet completed their formation, the individual dissolves, and the vital organs of actively functioning modules that have begun to decay are restored. This process is described in colonial ascidians [33, 34].

Colonial ascidians asexually reproduce in two ways. They form somatic embryos that develop without stopping and somatic embryos that flow into diapause. These two types of somatic embryos differ greatly in appearance, physiological properties, and in the way they are formed by a colony [4]. During the formation of both of them, destruction occurs in the colony [35], but the volume is much larger during the formation of embryos preparing for diapause than embryos developing without it [4]. The transition of colonies from the process of formation of diapausing somatic embryos to the formation of somatic embryos that develop without stopping is a manifestation of the functional plasticity of the reproductive system of the colony. The resorption of somatic embryos in colonial ascidians preparing for diapause is an evolutionary precursor of vertebrate tumor regression.

The functional plasticity of the reproductive system has also been described in the Jerusalem artichoke plant, or tuberous sunflower, and in cladocerans. Resting plant buds are analogous to somatic diapause of animal embryos, and the process of their formation is analogous to the transition to diapause of sedentary modular animals. Jerusalem artichoke forms two types of buds - developing without a period of rest and resting. Having begun to form tubers (intended for surviving at rest in winter) with buds preparing for dormancy on them, Jerusalem artichoke can stop this process and continue the formation of buds that develop without a dormant period [36].

Cladocerans form only zygotic embryos. They have two types - falling into diapause and developing without it. Some species of these crustaceans, having begun to form embryos preparing for diapause, can stop this process and proceed to the formation of embryos that develop without stopping. Other species of cladocerans are not capable of this [38]. The reproductive system probably has functional plasticity in many species of animals and plants. The problem of functional plasticity of the reproductive system did not attract the attention of biologists and therefore is not being developed. If the above hypothesis about the nature of cancer is correct, then the problem of tumor regression is part of this problem as well. Deciphering the mechanism of functional plasticity of the reproductive system of primitive animals and plants - the way to deciphering the mechanism of tumor regression.

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MECHANISMS OF SEX DETERMINATION IN MOLLUSKS *LITTORINA SAXATILIS* AND *L. OBTUSATA* (GASTROPODA: LITTORINIDAE)[1]

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The mechanisms of sex determination in dioecious mollusks of the genus Littorina are insufficiently studied. The aim of our study was to test the hypothesis of chromosomal sex determination in type XX: XY littorina by the nature of cleavage in F1: representatives of both sexes should be found in equal proportions. Gender segregation was studied in the offspring of 8 Littorina obtusata females and 7 L.saxatilis females. In most cases, gender segregation was as expected. However, in the offspring of one L.saxatilis female, sex segregation was absent. The most likely reason for the lack of cleavage in this case is a mutation causing a sex transformation associated with a maternal effect. The data obtained confirm the existence of a heterogametic sex in littorina and indicate a certain similarity in the molecular genetic mechanisms of sex determination in littorina and Drosophila.

Keywords: sex determination, chromosomal sex determination, maternal effect, Littorina saxatilis, Littorina obtusata

Littorina saxatilis and *L. obtusata* are dioecious molluscs, with a sex ratio in populations close to 1: 1. The mechanisms of sex determination in littorina are not well understood. It was shown that the diploid set of chromosomes in males and females of both species consists of 17 pairs (2n = 34) (Janson et al., 1983). In one case, data were obtained on the presence of a heteromorphic pair of chromosomes, which suggests chromosomal

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sex determination by type XX: XY for females and males, respectively (Rolan-Alvarez et al., 1996). There is no other evidence for the existence of a heterogametic sex. The aim of our study was to test the hypothesis of heterogameticity of one of the sexes in *Littorina saxatilis* and *L. obtusata.*

Materials and methods.

It is possible to check the assumption about the heterogamety of one of the sexes by the nature of splitting in F1: males and females must meet in equal proportions. For this purpose, we studied sex segregation in the offspring of 8 females of *L.obtusata* and 7 females of *L.saxatilis*. In the case of *L. obtusata*, the sex ratio was analyzed in juveniles obtained from clutches laid in laboratory conditions; in the case of *L. saxatilis*, in juveniles extracted from brood chambers of brood females during dissection. Each group of offspring (hereinafter referred to as a family) was grown in a separate aquarium. Upon reaching a shell diameter of 3 - 4 mm, the sex of the molluscs was determined (by the presence/absence of a penis). In all *L. obtusata* families and in three *L. saxatilis* families, using molecular genetic markers (microsatellite DNA), groups of full sibs corresponding to the offspring of different fathers were identified (Kozminsky et al., 2008).

Results.

In the case of *L. obtusata,* sex segregation was found in all colonies (Table 1, *A*). In 17 identified groups of full siblings, the proportion of males ranged from 30.0% to 71.4%. No statistically significant differences from 50% were found. The proportion of males equally often deviated from 50%, both upward and downward. The sex ratio, calculated as the average for all groups of full siblings, was 50.3% of males and 49.7% of females, i.e. was almost perfect 1: 1.

In the case of *L. saxatilis*, gender segregation was observed in 6 out of 7 families (Table 1, *B*). The proportion of males in families №1- №5 (as a whole) and in family №6 (in groups of full siblings) varied from 41.3% to 61.5%. Deviations upward predominated, however, significant differences from 50% were found only in one case. The sex ratio, on average across all families, was 55% of males and 45% of females. Thus, in most cases, the sex ratio in the offspring of *L. saxatilis* also corresponds well to 1:1, which confirms the hypothesis of the existence of a heterogametic sex.

In the offspring of the seventh female *L.saxatilis*, sex segregation was absent; only males were represented in the offspring. Most of them had an embryonic (60.3%) or underdeveloped (29.3%) penis, in 6.9% of indi-

viduals it was almost normal, and in 3.4% - the genital ducts and tonsils were even filled with secretions. There were no doubts about the correctness of sex determination in all cases. The probability that only males are accidentally included in the sample is negligible and amounts to about $9x10^{-20}$. Paternity analysis indicated that female №7 was mated with three different males.

Discussion.

The results obtained are in good agreement with the assumption of the existence of a heterogametic sex in littorinas, with the exception of splitting in the offspring of *L.saxatilis* female №7. The most likely reason for the lack of cleavage is a mutation that causes a sex transformation associated with a maternal effect.

It is known that sex determination in *Drosophila* occurs according to the same type that is assumed in littorina (XX: XY). The key role in sex determination is played by the ratio of the products of three genes - *da*, *sis-a* and *sis-b*. To start the development of the zygote along the female pathway, a sufficient number of complexes consisting of protein molecules - the products of these genes - are required. The *da* protein enters the egg from the mother; its amount corresponds to two doses, since it is read from genes located in two maternal autosomes. The *sis-a* and *sis-b* proteins are synthesized in the egg; their number depends on the number of X chromosomes in which the corresponding genes are located. In female zygotes, two doses of *sis* proteins are formed, in males, only one. A mutation "da^1" has been described (Estes et al., 1995), which disrupts the formation of the protein product of this gene, which results in a decrease in the number of *sis/da* protein complexes. In the offspring of females - carriers of the mutant allele, only males are formed.

The available data indicate that the same variant of sex determination is realized in littorina as in Drosophila. Therefore, we can assume a certain similarity in the molecular genetic mechanisms of sex determination, in particular, the existence of an autosomal gene similar in action to the *da* gene of Drosophila. The female examined by us may be, for example, heterozygous for such a gene, but phenotypically normal, because at the zygote stage, received the required amount of *da* protein from the mother's body. At the same time, its daughters will receive only part of the required protein and their development will follow the male path.

Thus, our data confirm the existence of a heterogametic sex in littorina and, in addition, suggest a certain similarity in the molecular genetic mechanisms of sex determination in littorina and Drosophila.

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Tab. 1. Splitting by sex in the offspring of two species of littorina.

I	II	*n*	PM	*SL*
A. *Littorina obtusata*				
1	1-1	10	0.400	0.754
	1-2	12	0.583	0.774
	1-3	10	0.400	0.754
2	2-1	37	0.378	0.143
	2-2	20	0.600	0.503
3	3-1	25	0.400	0.327
4	4-1	32	0.406	0.377
	4-2	9	0.333	0.344
	4-3	9	0.556	0.754
5	5-1	12	0.583	0.774
	5-2	7	0.714	0.727
	5-3	6	0.667	0.688
6	6-1	38	0.579	0.226
7	7-1	21	0.429	0.523
	7-2	10	0.300	0.344
8	8-1	10	0.500	--
	8-2	7	0.714	0.727
B. *Littorina saxatilis*				
1	1-1	46	0.413	0.302
2	2-1	67	0.612	0.114
3	3-1	52	0.519	0.890
4	4-1	51	0.569	0.332
	4-2	21	0.524	0.832
5	5-1	32	0.594	0.377
6	6-1	25	0.640	0.169
	6-2	17	0.824	0.008
	6-3	7	0.429	0.727
7	7-1	38	1.000	--
	7-2	19	1.000	--
	7-3	1	1.000	--

Notes: I – numbers of females participating in the experiment. II – groups of full siblings. *n* – the number of individuals in the group of full siblings. PM – the proportion of males in the group of full siblings. SL – the level of significance when testing the hypothesis of a sex ratio of 1:1.

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BIOLOGY OF TREMATODES OF THE SUBFAMILY ECHINOCHASMINAE ODHNER, 1910 IN ECOSYSTEMS OF THE SOUTH OF WESTERN SIBERIA

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The results of long-term investigations (1994-2018) of infectiousness of first intermediate host (Bithyniidae snails) and final host (birds) trematodes subfamily Echinochasminae Odhner, 1910 from ecosystems of South of Western Siberia – are discussed. A total of 16,213 bithyniid snails were inspected for trematode infestation. Partenites and cercariae of trematodes Echinochasmus beleocephalus, E. coaxatus; Epishmium bursicola; Schiginella columbi and Monilifer spinosus have been recorded for the first time in Bithyniidae from the water bodies of Western Siberia. M. spinosus was recorded for the first time in the basin of Lake Chany, and S. columbi was recorded for the first time in Western Siberia.

Keywords: bithyniid snails, Echinochasmidae, Psilostomidae, Bithynia tentaculata, Bithynia troscheli, Western Siberia

The large subfamily Echinochasminae Odhner, 1910 unites trematodes of predominantly fish-eating birds, less often mammals are included in the family Echinostomatidae Dietz, 1909 [11]. The subfamily includes 13 genera, of which ten are registered in the Palaearctic [17]. In Western Siberia, the final hosts of trematodes of the subfamily Echinochasminae are herons, grebes, harriers, gulls, terns, and ducks [2, 4, 21]. Marits found in birds of the south of Western Siberia are classified as ten species, of which 5 species are in the ecosystem of Lake Chany, and 7 species are in the ecosystem of Karasuk lakes.

In 1977 V.E. Sudarikov and E.M. Karmanova [18], based on the study of the life cycles of a number of species, very reasonably proposed to transfer the subfamily Echinochasminae to the rank of the family Echinochasmidae Odhner, 1911. Later, other researchers came to the same conclusions [6]. The life cycle of trematodes of the subfamily Echinochasminae follows the trixenous type (mollusk - fish - bird). However, it should be noted that, unlike most type species of this family (Echinostomatidae), parthenogenetic stages of trematodes of the subfamily Echinochasminae develop **only** in prosobranch molluscs. Thus, in different parts of the Paleactic, the role of the first intermediate hosts of echinochasmids is played by prosobranch mollusks of the genera *Bithynia, Semisulcospira,* and *Juga* [see review 15]. The role of the first intermediate hosts for trematodes of the family Echinostomatidae (echinostomatid), as a rule, is played by pulmonary molluscs. It is no secret that for a long time the discovered larvae of trematodes were identified according to the "cercaria" classification, without indicating the family, but only the group of cercariae according to the Lühe system, 1909. Typical representatives of the family Echinostomatidae have an adoral disc at the front end of the body, which carries an armament in the form of chitinous spines. Their number, size and location on the collar are different in different species. And trematodes of the subfamily Echinochasminae are assigned to the group of unarmed - Gymnocephala. Since this system is based only on morphological characters, representatives of different families fell into one group. This caused a certain confusion in the compilation of systematic lists of trematode parthenitis in faunistic studies. For example, cercariae found in mollusks of the Bithyniidae family included representatives of Echinochasminae and Psilostomidae Odhner, 1913 in the group of unarmed - Gymnocephala [3]. This is due to several similar features of their cercariae: they develop in redia, the tail is simple, undivided, and two excretory canals along the body of the cercariae. Despite the similarity of the morphological structure of cercariae (group of unarmed - Gymnocephala), developing in redia, they have a number of differences in structure and biology. Therefore, before characterizing the species composition of the parthenite and cercariae of the trematodes of the subfamily Echinochasminae, we indicate the characters by which they differ. Thus, the presence of rhabditoid cells is characteristic only for cercariae of trematodes of the subfamily Echinochasminae. The excretory granules in the siphons of the excretory canals are large and arranged in one row, and not in several rows, as is typical for cercariae of the family Psilostomidae[1]. Some differ-

[1]With the exception of genus Sphaeridiotrema Odhner, 1913

ences are associated with the peculiarities of the biology of cercariae. The mass emission of Echinochasminae cercariae is characterized by early morning hours, rather than midday, which is typical for cercariae of the family Psilostomidae. Cercariae of both groups have positive phototaxis. However, after emerging from the mollusk, the cercariae of the family Echinochasminae go to brightly lit places, and not to areas illuminated by diffused light. Cercariae of the family Psilostomidae, after emerging from the mollusk, avoid direct rays of the sun, rushing to shaded areas [13]. The lifespan of cercariae of the subfamily Echinochasminae is more than a day, while cercariae of the family Psilostomidae does not exceed several hours. The metacercariae of trematodes of the family Echinochasminae form only on the gills of fish, and not in the external environment or on the inner side of the shell of mollusks, which is typical of trematodes of the family Psilostomidae.

Since parthenites of trematodes of the subfamily Echinochasminae were recorded only in mollusks of the family Bithyniidae under the conditions of freshwater bodies of Western Siberia [5, 12, 15], the infestation of the latter reflects the prevalence of trematodes of this subfamily in the ecosystems of this region. For over 25 years we have been studying trematodes associated with the Bithyniidae. The purpose of this study is to show the prevalence of different species of trematodes of the subfamily Echinochasminae, and to present the features of their biology in the ecosystems of the south of Western Siberia.

Materials and methods.

The basis of this work was the materials collected from May to August 1994-2018 More than one hundred water bodies were examined in 15 districts of the Novosibirsk Oblast. The mollusks were collected manually from 4–6 plots with an area of 0.25 m^2 at a depth of 0.1 to 0.7 m. The census of the number of mollusks from the floodplain of the Ob River (below the dam of the Novosibirsk HPS) was collected once a month in 1996-1997 from May to August, and in 1995 and 1998-2012 only once per season (in the last days of May or June). Bithyniidae from the estuaries of the Kargat River (Lake Chany basin) was carried out 1-3 times a decade from July to September 1994 from May to September (1995-2000, 2002-05), only in June 2006-07 and June-July 2012-13 d. In the rest of the reservoirs, one-time collection was carried out (Table 1). The discovered mollusks of the Bithyniidae family belonged to two species: *Bithynia troscheli* (Paasch, 1842) and *Bithynia tentaculata* (L., 1758) [19]. In order to identify mature cercariae (i.e., independently leaving the shell of the host mollusk), all collected mollusks were individually placed in transparent cells of im-

munological plates with a capacity of 3-5 ml, which were pre-poured with filtered river water and left for 1-2 hours, under natural light. Then, without removing the mollusks, the water in the cells was viewed under a 16-fold magnification of the "MBS-10" binocular, after which the mollusks were transplanted into the cells with clean river water. The observations were carried out for at least 24 hours, the infected mollusks continued to be kept in the laboratory individually (until September), and the uninfected ones were immediately examined by compressor. Before opening, the shell height was measured in mollusks and the age was determined [14]. Sex and infection with trematodes (parthenogenetic stages and metacercariae) were determined at autopsy. The extent of invasion (EI%) of mollusks was assessed based on compressor openings: 5357 *B. tentaculata* and 10856 *B. troscheli*.

In the course of species identification of parthenitic trematodes of the subfamily Echinochasminae, the morphology and morphometry of mature cercariae were studied using the works of E.M. Karmanova [7-10]. In the absence of mature cercariae, trematodes are identified as *Echinochasminae sp.* Along with the species identification of parthenitis and cercariae of trematodes of the family Echinochasmidae, observations were made of their daily and seasonal rhythms of cercariae. Experimental infection of more than a hundred sterile mollusks (grown in an aquarium, not infected with helminths) of 8 species of four families [Bithyniidae (2 species), Physidae (1), Lymnaeidae (3) and Planorbidae (2)] and juvenile fish (ide, roach, crucian carp) was conducted.

Results

Frequency of occurrence of trematodes of the subfamily Echinochasminae in ecosystems of the south of Western Siberia

From 1994 to 2018, we surveyed more than one hundred reservoirs of Novosibirsk Oblast. Bithyniidae are found and studied from 23 water bodies (Table 1). Both species of molluscs are the first intermediate hosts of trematodes of the subfamily Echinochasminae. The total prevalence in all the reservoirs we examined, carried out on the basis of compressor dissected, was 0.18±0.042% *B. troscheli* and 0.14±0.063% *B. tentaculata.* Parthenites of the trematodes Echinochasminae were found in Bithyniidae of five populations from 4 water bodies. *B. tentaculata* was recorded as the first intermediate host in four water bodies. The level of infection with *B. tentaculata* at the mouth of the Kargat River (54° 37′76″, 78° 13′07″) was 0.24±0.238%; in the floodplain of Ob River (54°53′23″, 83°05′18″) - 0.09±0.064%; in Inya River (54°09′17″, 83°07′31″) - 2.08±2.061%; in Lake Krotovo (53°43′30″, 77°51′31″) - 0.55±0.548%. Information on the infec-

tion of one population with *B. troscheli* is presented by 15-year data. Mature cercariae were found in *B. troscheli* with a shell height of 7.2–10.5 mm. The long-term mean prevalence of *B. troscheli* infected by trematode parthenites in the Kargat river estuary was 0.22±0.053%, varying from 0.07±0.075% (in 2003) to 0.59%±0.417 (in 2000). Using this population as an example, we analyzed the Host - Parasite *B. troscheli* system - parthenites of trematodes of the subfamily Echinochasminae. It was revealed that the prevalence of yearlings (1+) was 0.048±0.048%. The infection rate of two-year-olds (2+) increases to 0.253±0.096%; three-year-olds (3+) - up to 0.690±0.229%, and in four-year-old individuals, a decrease in the level of infection to 0.351±0.350% was noted. According to long-term average data, underyear old mollusks (0+) and five-year-old individuals were not infected.

Seasonal and daily emissions of cercariae of the subfamily Echinochasminae in ecosystems of the south of Western Siberia

Observations began in late May or early June in different years. However, the emission of cercariae of the subfamily Echinochasminae was recorded from late June to early August, in all years of observation (Fig. 1). It was found that the mass emission of cercariae was noted in the early morning hours. Cercariae of this subfamily have a positive phototaxis and, after emerging from the mollusk Bithyniidae, move to brightly lit places, preferring them to areas illuminated by diffused light. They remain active for a long time, sometimes for a couple of days. Fry and sterile mollusks were kept individually for 3-4 days, adding 20-30 cercariae each, then they were moved to a common aquarium and opened after 30-45 days. Metacercariae were able to grow only on the gills of ide fry. All experiments on mollusc infestation were negative.

Species assignment of trematodes of the subfamily Echinochasminae in the ecosystems of the south of Western Siberia

The discovered parthenites and cercariae of trematodes of the family Echinochasminae belonged to four genera of five species.

Type genus *Echinochasmus* Dietz, 1909. Ten species of this genus were recorded in the Palaearctic. In Western Siberia, seven species of marita have been found [2, 4].

E. coaxatus (Dietz, 1909)

We found marita *E. coaxatus* in the intestines of juveniles of the great grebe (*Podiceps cristatus*) in September 2006 [16]. Earlier, they were also noted in grebes - great and black-necked (*P. nigricollis*) in the basin of Lake Chany [2]; in the region of the Karasuk lakes, only near the chamga [4]. *B. tentaculata* was previously registered as the first intermediate host

of the *E. coaxatus* trematode [9]. In the basin of Lake Chany, parthenites and cercariae of *E. coaxatus* were found in *B. troscheli* in June 2000 and 2005; in July 1996 and 2004, as well as in *B. tentaculata* in July 2005.In addition, they were recorded in *B. tentaculata* from the Inya River (a tributary of the Ob), end of June 2000.

E. beleocephalus (Linstow, 1837)

Marita *E. beleocephalus* parasitize in the intestines of heron birds. Earlier, in the basin of Lake Chany and in the region of the Karasuk Lakes, the marita *E. beleocephalus* were found in the gray herons *Ardea cinerea* [2, 4] and in the mallard *Anas platyrhynchos* [21]. When studying the life cycle of *E. beleocephalus*, *B. tentaculata* was registered as the first intermediate host [9]. In the Lake Chany basin, parthenites and cercariae of *E. beleocephalus* were found in *B. troscheli* in July 1996 and 2003.

Genus *Epishmium* Lühe, 1909

The small genus was previously part of the genus *Echinochasmus*; in the Palaearctic it is represented by two species. Localization of the type species cloaca and bursa of heron birds.

E. bursicola (Creplin, 1837)

Maritas *E. bursicola* in the basin of Lake Chany were found in the gray heron [2]. In birds in the area of Karasukskie lakes it was not recorded [4]. When studying the life cycle of *E. bursicola, B. tentaculata* was registered as the first intermediate host [8]. In the Lake Chany basin, parthenites and cercariae of *E. bursicola* were found in *B. troscheli* in July 1998 and 2004.

Genus *Monilifer* (Dietz, 1909)

A small genus uniting intestinal parasites, mainly grebes, which were previously part of the genus *Echinochasmus*.

M. spinosus (Rudolphi, 1809) Dietz, 1909 (syn.*Cercaria helvetica* XVII Dubois, 1929)

The life cycle of *M. spinosus* has been studied [7]. *B. tentaculata* was registered as the first intermediate. *Marita M.* spinosus have not been recorded in birds in the basin of Lake Chany; in the region of Karasuk lakes, the crested ducks (*Aythya fuligula*) and red-headed ducks (*Aythya ferina*) have been recorded as the final owners [4]. In the basin of Lake Chany, parthenites and cercariae of *M. spinosus* were found in *B. troscheli.* at the end of June 1997 and 2000 and in July 1995 and 2004.

Genus *Schiginella* Karmanova, 1974

Monotypic genus with a single species that was previously attributed to the genus *Epishmium*. However, when studying the life cycle [10], it was shown that cercariae of this species have a giant tail, which was one of the reasons for justifying this genus. The mollusks *B. tentaculata* were

registered as the first intermediate hosts, the cyprinids were the second intermediate hosts, and maritas were found in grebes.

S. columbi (Schigin, 1956)

Marita *S. columbi* were first discovered by A. A. Shigin in 1956 in the great grebe. When examining birds in the basin of Lake Chany and in the region of Karasuk lakes, no maritas of this species were found [2, 4, 21]. The life cycle of the *S. columbi* trematode was studied by E.M. Karmanova [10]. In the basin of Lake Chany, we found *S. columbi* parthenites and cercariae in *B. troscheli* at the end of June (1999, 2005, and 2012) and in July 2002. Earlier, cercariae with a giant tail and a similar morphology, called *Cerkaria Kazachstanica sp. VIII* were recorded in Bithyniidae from water bodies of Kazakhstan [1].

Long-term observations of the timing of the emission of trematode cercariae formed in Bithyniidae in the ecosystems of southern Western Siberia revealed that representatives of the subfamily Echinochasminae were recorded in the period from late June to early August. In August, the release of cercariae stopped. This pattern was traced throughout all the years of observations (Fig. 1), and did not change, even when the mollusks were kept in laboratory conditions. It is known that cercariae live off the nutrients accumulated by them during development in the body of the host mollusk, therefore, their lifespan is short, for the trematodes of the indicated species it rarely exceeds 48 hours. Cercariae need to find a second intermediate host and penetrate it during this time. Consequently, the period of emission of cercariae should coincide in time with the presence of second intermediate hosts in the reservoir. Or in other words, the formation of so-called "transmission windows" is necessary for the realization of the life cycles of trematodes. Since in different water bodies, in years with different temperature regimes, as well as in mollusks kept in the laboratory, the maturation time of cercariae did not change, we analyzed the features of the biology of the second intermediate and final hosts of trematodes of these families using the example of a model ecosystem of Lake Chany. The second intermediate hosts of the trematodes of these families are carp fishes of the family Cyprinidae. According to E.N. Yadrenkina [20], representatives of the indigenous fauna of Western Siberia - ide *Leuciscus idus* and roach *Rutilus rutilus* - reproduce in the desalinated areas of the reservoir until the end of May. Organogenesis of larvae (during the development of the digestive system and organs of movement) is accompanied by mass elimination during the transition to exogenous nutrition. Ontogenetic development of larvae and fry is completed by July. From the end of June and throughout July, the surviving

part of the fish generation passes to the next stage - underyearlings. This age group is characterized by the completion of morphophysiological development, which leads to an increase in viability compared to individuals of younger ages, and in July, along with overwintered cyprinids, they can play the role of second intermediate hosts in the developmental cycles of trematodes of this subfamily. Researchers who have studied the life cycles of representatives of the family Echinochasmidae [7-10] have shown that metacercariae of trematodes of these families become invasive after 30-40 days; metacercariae formed in fry in the middle of summer will become invasive in late August-September of this year. This was confirmed by our research, when in autumn 2006 marita *E. coaxatus* were found in juveniles of the Greater Grebe.

Thus, it was revealed that in the conditions of the south of Western Siberia, the period of emission of trematode cercariae of the subfamily Echinochasminae lasts 30-40 days in the middle of summer, however, it is this period that is the most successful for the formation of "transmission windows" allowing their life cycles to be realized.

Partenites and cercariae of trematodes *Echinochasmus beleocephalus, E. coaxatus; Epishmium bursicola; Schiginella columbi* and *Monilifer spinosus* in Bithyniidae from water bodies of Western Siberia are recorded for the first time. The molluscs *B. troscheli* were registered for the first time as the first intermediate host of trematodes of the subfamily Echinochasminae. The species *M. spinosus* was first recorded in the basin of Lake Chany, and *S. columbi* - in Western Siberia.

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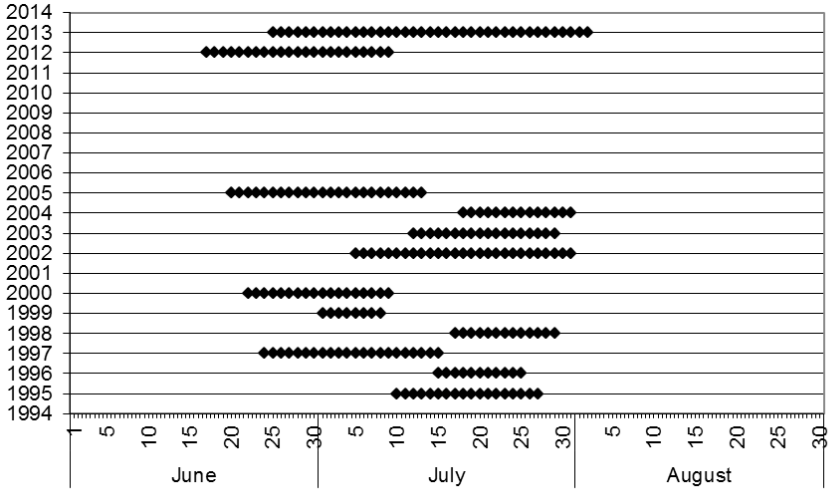

Fig. 1 Long-term and seasonal emission of cercariae of the subfamily Echinochasminae in the ecosystem of the Kargat River estuary (south of Western Siberia)

Note* In 2001 and from 2009 to 2011, no observations were made in this ecosystem. In 2006-2007, studies were carried out only in June.

Table 1. Sampling sites and number of examined bithyniid snails in water bodies of the Novosibirsk Oblast in 1994–2018

Sampling site / Geographical coordinates (N, E)	Years	Bithyniid snails
Ob river downstream Novosibirsk HPS dam / 54°53′23′′, 83°05′18′′	1995–2018	5914
Ob reservoir right coast Berdsky bay/54°47′04′′, 83°05′43′′	2002, 2007, 2013	216
Suenga river, Berd' river tributaries/54°25′39′′, 84°32′33′′	2018	99
Talmenka river/54°42′25′′, 83°16′50′′ Karakan river /54°50′22′′, 82°44′94′′	2007	100
Tulka river /54°56′20′′, 82°65′46′′ Miltyush river / 54°65′57′′, 82°86′12′′ Sosnovka river / 54°68′43′, 82°96′71′′	2009	48
Ob river tributaries: Baksa river/ 55°99′21′′, 82°70′81′′ and 55°79′10′′, 82°30′80′′	1997	97
Uen' river /55°31′0, 83°16′0	1996, 1998, 1999, 2003	91
Inya river/54°09′17′′, 83°07′31′′	1998	48
Om' river tributaries: Icha river 55°99′, 82°70′ and Kama river / 55°79′, 82°30′	1996	30
Musikha river /55°52′16′′, 80°05′18′′	2008	62
Lake Murashevskoe/55°43′16′′, 75°34′39′′	2007, 2008	72
Lake Malye Chany/ 54°37′21′′, 78°09′21′′	2003, 2012	22
Zolotye Rossypi bay/54°34′12′′, 78°08′39′′	1996, 1997	93
Kargat river, estuary/ 54°37′76′′, 78°13′07′′	1994–2000, 2002–2007, 2012, 2013	8738
Kargat river, middle reaches /54°47′37′′, 79°06′	1995	76
Karasuk river /54°26′53′′, 80°55′50′′ and 54°09′53′′, 80°02′54′′ and53°45′19′′, 78°20′15′′ and 53°43′19′′, 77°56′29′′	2009	36
Kuria river / 53°50′56′′, 78°22′34′′	2007	7
Burla river/53°20′, 78°20′	2010	26
Lake Krotovo/53°43′30′′, 77°51′31′′	1994, 1995, 2006, 2007, 2009	317
In total		**16213**

Bithyniid snails from the Icha, Kama, and Baksa rivers were sampled by A.P. Yanovskii; those from the Musikha river by A.I. Chechulin; those from Lake Murashevskoe by S.N. Vodyanitskaya; those from the Kuria river by M.A. Mosina; those from the Orda and Suenga rivers by A.V. Katokhin; and those from the Burla river by K.V. Romanov.

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TO THE SEARCH FOR PHYSIOLOGICAL MECHANISM CONTROLLING TUMOR REGRESSION

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A malignant tumor sometimes resolves by itself and the patient recovers without treatment. This is called tumor regression. If it was possible to learn how to induce tumor regression by artificial means, it would save the patient from surgery, chemotherapy and radiotherapy, and therapeutic measures that are painful and not harmless to health. Resorption in colonial ascidians of buds preparing for diapause is probably an evolutionary precursor of tumor regression. The article is devoted to substantiating the point of view that in order to understand how the morphophysiological mechanism that initiates and regulates tumor regression works, it is necessary to understand how the morphophysiological mechanisms work in colonial ascidians and in plants, initiating and regulating the destruction of the buds preparing to experience an unfavorable season for life. Oncogenesis and tumor regression are processes regulated by the body. It is necessary to direct efforts not to the search for new ways to destroy the tumor, but to the search for ways of interfering with the morphophysiological processes that regulate tumor growth.

Keywords: evolutionary approach, embryonic diapause, modular organisms

A malignant tumor sometimes resolves by itself and the patient recovers without treatment. This is called tumor regression. If one could learn to artificially induce tumor regression in a cancer patient, it would save him from the agony of surgery, chemotherapy and radiotherapy. But so far, doctors do not know how to treat cancer otherwise. Their efforts still often lead not to the success of treatment, but to a tragic result for the sick person and his relatives. In any business, in order to achieve success in it, it is necessary that the idea of the object that needs to be influenced corresponds to reality. If the idea of an object does not allow to have the desired effect on it, this idea is probably wrong.

In the old days, epidemics of plague, cholera and other diseases broke out from time to time. Louis Pasteur has proven that many of them are caused by bacteria. This concept of infectious diseases is now the basis for their treatment, prevention and eradication. Is the modern concept of cancer true? It is believed that a malignant tumor occurs due to the accumulation of mutations in a single cell, which multiplies to create a tumor [2]. Oncologists who are guided by this concept of cancer have not been able to develop a reliable way to treat it. They could not stop the growth in the number of deaths caused by cancer in the world. And this is with a large number of researchers involved in solving this common human problem. Are they working in a dead-end direction? Shouldn't they, in order to defeat cancer, look for the correct explanation of its nature?

Me and V.V. Khudolei [3, 4, 10] published a hypothesis about the nature of cancer, based on the striking similarity of the processes occurring in the body of sessile colonial invertebrates during their transition to embryonic diapause and the processes occurring during oncogenesis. This similarity is striking when reading the book by O.M. Ivanova-Kazas [1], in which the transition to embryonic diapause of these invertebrates is described. The purpose of this article is to briefly outline our hypothesis and propose an evolutionary approach to find a cure for cancer. A re-statement of the hypothesis is necessary to substantiate the suggestion.

According to L.A. Orbeli [5], the essence of evolution is such that the previous physiological mechanisms during the transition of an individual from a low to a higher evolutionary stage do not completely disappear. They are only suppressed by new, more perfect physiological mechanisms. Pathological processes are a return to the mechanisms of normal ontogenesis of ancestors. Me and V.V. Khudoley agree with those researchers who believe that sedentary colonial invertebrates were the first multicellular animals on Earth. Modern sessile colonial invertebrates include sponges, hydroid and coral polyps, bryozoans, intra-powder and colonial ascidians. Since colonial sessile invertebrates were the first multicellular animals on Earth, all their descendants, including us humans, have passed the stage of colonial sessile invertebrates during evolution. In our genome and in the genome of animals at higher levels of the evolutionary ladder than sessile colonial invertebrates, the morphophysiological adaptive mechanisms of extinct sessile colonial invertebrates are latent.

Modern sedentary colonial invertebrates adapt to an unfavorable season for life using a mechanism not physiological, like most other animals, but morphophysiological. They form diapausing buds. In the same way, through the formation of buds that are resistant to harmful influences, that

is, through morphophysiological processes, the plants adapt to an unfavorable season for life. In these invertebrates, the buds preparing for diapause suck out nutrients from the body. Because of this, their body is depleted and destroyed [1]. Plants are also destroyed when they end the formation of buds preparing to experience the unfavorable season. In trees and shrubs, leaves fall, in herbaceous plants, the aerial part dies off. With the return of the favorable season for life, sessile colonial invertebrates and plants rebuild themselves from the buds that survived the unfavorable season. Probably, the first multicellular animals on Earth, sedentary colonials, also adapted to the seasonal deterioration of the environment in the same way.

The mechanism of cancer probably originated in the first multicellular animals on Earth. But for them it was not a pathological process, but provided the formation of buds, preparing for the experience of an unfavorable season for life. The growing bud of sessile colonial invertebrates preparing for diapause is an evolutionary precursor of a malignant tumor. Cancer is an atavistic morphophysiological adaptive process of preparation for embryonic diapause. A malignant tumor is not a structure that has become alien to the body due to mutations, as it is commonly thought [2], but an atavistic bud preparing for diapause. Its cells are genetically identical to all other cells of the body. Tumor growth is not the result of its disobedience to the body's regulatory signal, as it is believed [2], but the result of submission to them, submission to the atavistic morphophysiological mechanism that provided adaptation to the seasonal deterioration of the environment of our very distant ancestors. The destruction that occurs in cancer is an atavistic adaptive self-destruction process inherited from sedentary colonial ancestors and served them to prepare for embryonic diapause. This is ours with V.V. Khudoley hypothesis.

It follows from it that both oncogenesis and tumor regression are processes regulated by the body. Cancer treatment should not consist in the painful and harmful destruction of the tumor by surgery, chemical means, or radiation, but in the intervention in the morphophysiological process that initiates the appearance of the tumor and regulates its growth. Switching the process of tumor growth to the process of its regression is possible, since there is an evolutionary predecessor of this switch. It is the described in colonial ascidians [7, 9] the resorption of the buds preparing for embryonic diapause. **The switch of colonial ascidians from the formation of diapausing buds to the process of their resorption is probably the evolutionary precursor of tumor regression.**

In humans, tumor regression is a rare phenomenon and therefore it is difficult to study. It should be studied not on humans, not on other mam-

mals and not on birds, but on colonial ascidians. Having understood how the change in the formation of diapause buds to their resorption is controlled in them, it will be easier to understand how the change in tumor growth to its regression is controlled. And having understood this, it will already be possible to move on to solving the question of how to control this morphophysiological process, that is, how to treat cancer by artificially triggering the tumor regression mechanism in the patient.

The plant organism, as well as the organism of sedentary colonial invertebrates, sometimes destroys the buds that are preparing for rest in its body [8]. Their destruction in plants is an analogue of the resorption of such buds in colonial sessile invertebrates, as well as an analogue of tumor regression. Oncologists wishing to embark on the proposed path of finding a cure for cancer will have to delve into the physiology of plants and the physiology of sedentary colonial invertebrates, an area of knowledge that is poorly developed.

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EFFECTS OF «ACCENTUATED ECCENTRIC LOADING» ON MUSCLE ADAPTATION IN ATHLETES

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The purpose of this study was to compare the morphological and architectural adaptations of vastus lateralis muscle (VL) for traditional strength training and accentuated eccentric loading (resistance training employing a supramaximal external load during the eccentric phase). The training volume between the experimental groups was equalized. Strength-trained male subjects trained two times a week for 13 weeks. Morphological and architectural parameters of the muscles were evaluated using magnetic resonance imaging and ultrasonography. The results of the experiment showed that the most significant increase in anatomical cross-sectional area (ACSA), muscle volume, pennation angle, and physiological cross-sectional area (PCSA) of VL were obtained in the group using an accentuated eccentric loading. This effect can be associated with the use of higher intensity and as a consequence of the greater mechanical strain applied to the muscle, which caused a more pronounced adaptive response. Besides, it was shown that the pennation angle and PCSA increased to a greater extent than ACSA and muscle volume. Our data strongly suggest a close relationship between the pennation angle and muscular hypertrophy. An increase in this parameter that might be driven

by space constraints in the hypertrophying muscle can be a reliable indicator of the degree of muscle hypertrophy.

Keywords: hypertrophy, muscle architecture, pennation angle, eccentric contraction

Numerus studies show a link between the intensity of contractile element contraction and muscle hypertrophy [1, 2, 3], defining the mechanical factor as one of the most important stimuli for muscle growth [4]. In this regard, special attention should be paid to the eccentric mode of muscle contraction, during which skeletal muscle is capable of as much as 1.2 – 1.8 times more force production than during maximum isometric contraction [5] due to elastic elements such as a network of collagen fibrils of connective tissue and titin filaments in sarcomeres [6]. Given greater force generating capacity during eccentric contractions it is not surprising that the eccentric contractions require limited number of active motor units (MUs) and lower rates at which these motor units discharge action potentials (AP) if the same external load is moved both during eccentric and concentric phase [7]. Therefore, in order to equalize neuromuscular activity one should use greater contraction intensity in the eccentric phase. In particular, based on the data of sports exercises it was shown that the difference in maximum voluntary force between the two modes can reach 160% in some exercises [8]. The eccentric torque must be at least 30-60% higher than the concentric torque to achieve comparable values of the electromyogram amplitude (EMG) [9] or the level of voluntary muscle activation [5].

Despite it is well documented that eccentric training can produce greater muscle hypertrophy [1, 9, 10, 11, 12] and shifts towards faster myosin heavy chain (MHC) isoforms than concentric training [10, 13-17], not all studies come to consensus and found no difference in the anatomical Cross Sectional Area (ACSA) [18] or muscle volume [19, 20] changes between two contraction modes. On the other hand, it is not quite rightful to raise the question of the absolute effectiveness of a particular mode. It is obvious that the most rational way to increase the effectiveness of training is an optimal combination of both modalities. One such strategy may be the use of “accentuated eccentric loading” (AEL) resistance training, which assumes the presence of coupled eccentric and concentric actions but an additional external load is imposed during the eccentric phase. According to our data, there are currently only three studies that have studied the proposed method with the participation of strength-trained subjects [13, 21, 22]. These studies have showed a significantly greater increase in concentric [21] and

isometric strength [22], as well as the cross-sectional area of IIx muscle fibers [13] in a group that used an accentuated eccentric loading compared to conventional strength training, but all three protocols had a similar effect on the muscle ACSA. However, the typical measurement methodology may have influenced the interpretation of such results. Here it is important to take into account the fact that the change in ACSA caused by training and measured in a plane perpendicular to the longitudinal axis of the entire muscle may not be representative for assessing the change in the physiological Cross Sectional Area (PCSA), which is defined as the magnitude of muscle fibre area perpendicular to the longitudinal axis of individual muscle fibres multiplied by the cosine of the angle of pennation [23]. Since PCSA represents the total number of sarcomeres in the muscle located in parallel and therefore directly related with maximal force-generating capacity of a given muscle it is extremely important to consider architectural changes of the muscle caused by training along with morphological ones.

The purpose of this study was to compare the effects of conventional high-intensity strength training (CONV) with an accentuated eccentric loading (AEL) on morphological and architectural muscle adaptations in athletes adapted to regular weight training.

Methods. 30 male subjects (29,0±3,8 years) undertook 13 weeks of heavy-resistance strength training of the lower limb muscles. Participants were randomly divided into three groups: with an accentuated eccentric loading (AEL) (n = 11), with a traditional high-intensity training (CONV) (n = 10) and a control group (CONTR) (n = 9). Leg press («Hummer strength») was used as an experimental exercise. Subjects from the CONV group performed the exercise with the same external load for both concentric and eccentric phases in a standard way, each leg alternately. Subjects from the AEL group performed the concentric part of the movement with two legs, then one leg was removed from the platform of the exercise machine and the eccentric part of the movement was performed with the second leg, thus providing a load of 140% of the concentric 1RM (repetition maximum) for this leg. Then the same was done for the other leg. To ensure equivalence of total amount of work for both experimental groups, the training volume was calculated as follows: the CONV group performed (7 sets) x ([~6 concentric contractions x 80% of concentric 1RM] + [~6 eccentric contractions x 80% of the concentric 1RM]); the AEL group performed (5 sets) x ([10 concentric contractions x 70% of the concentric 1RM] + [5 eccentric contractions x 140% of the concentric 1RM]). Both groups performed the concentric and eccentric phases of the exercise action with a 3:1 s tempo. The rest time between sets was 4 minutes.

Participants conducted 2 sessions per week for 13 weeks. Subjects from the control group trained according to their traditional strength protocol without supervision. Measurements of muscle size and muscle architecture were assessed before and after training.

To study the muscle architecture sagittal ultrasound images were recorded in the Vastus lateralis (VL) using of a Vivid 7 Dimension (Vivid 7 PRO, General Electric, Norway) scanner with a 4.9 – 13.0 MHz linear array transducer. Sonographs were taken in the middle of the VL at 50% of the distance from the central palpable point of the greater trochanter to the lateral condyle of the femur while subjects were lying supine with their legs fully extended. VL fibre pennation angle (θ) was measured as the angle between VL muscle fibre fascicles and the deep aponeurosis of insertion. Fascicle length was defined as the length of the fascicular path between the superficial and deep aponeurosis.

ACSA and muscle volume were determined from axial T2-weighted MRI scans (Vantage Atlas, Toshiba, Germany; TR – 4400,0 ms; TE – 48,0 ms; slice thickness 7 mm). The ACSA of VL was measured by manually tracing the perimeter of muscle in every third image (i.e. every 21 mm) from the most proximal to the most distal image where the muscle was visible. The ACSA values for skipped images were evaluated based on a linear relationship. For comparative analysis of ACSA changes between groups, a section obtained at the level of 50% of the femur length was used. The muscle volume was calculated by summing the product of ACSA values and slice thickness (7 mm) of all images. PCSA was calculated using the equation: $PCSA = \frac{Vol}{FL \times cos\theta}$

where Vol is the muscle volume, FL is its fascicle length, and θ is the pennation angle [24].

Statistical analyses were performed with Statistica 13.3 software package. After tests of normality, significant main effects were assessed by a two-way analysis of variance with repeated measures (time [pre, post] and group [AEL, CONV, CONTR]) with Bonferroni adjustments used as posthoc tests. To examine between-group differences for relative changes (%Δ) of the studied parameters a paired t-test was used. The alpha level $p<0,05$ was set for all tests.

Results and discussion. The study revealed several important results: 1) even when matched for total work AEL protocol was more effective in stimulating muscle hypertrophy than the CONV protocol. 2) Fibre pennation angle (θ) and physiological CSA increased with training to a greater extent than anatomical muscle CSA and volume.

It is currently thought that muscle growth via resistance exercise occurs through a process of mechanotransduction, in which the mechanical stress of muscle contraction is converted into a chemical signal [25] that can regulate the rate of muscle protein synthesis. Based on these considerations, we attempted to potentiate the effects of strength training using the method of accentuated supramaximal eccentric loading, superiority of which is suggested to be mainly attributable to the higher torque (i.e., mechanical loading) achievable during eccentric contractions in excess of concentric 1RM**.** The results of the experiment, which are presented in table 1, showed that both training modalities (AEL and CONV) had anabolic effects, leading to significant increases in ACSA (12.2 ± 8.2% in the AEL group ($p < 0.05$) and 5,0 ± 1.6% in the CONV group ($p < 0.05$)) which was accompanied by an increase in the muscle volume (12,4 ± 8,2% in the AEL group ($p < 0,05$) and 5,4 ± 1,8% in CONV group ($p < 0,05$)) after 13 weeks of training. The increases in the AEL group were significantly greater than in CONV group ($p<0,05$). We tend to explain such positive results by using study design that accounted for all the factors intensifying the training that were not considered in previous studies. The majority of previous works that included eccentric-only training or training with eccentric overload used isokinetic dynamometers [9, 12-14, 16-21]. We used a traditional isoload training with constant external load (isoinertial). There is convincing evidence, that in the isoload modality, mechanical overloading due to gravity induces a greater initial limb acceleration compared to isokinetic eccentric contractions, which stretches the elastic component of the muscle–tendon unit. This rise in stretching velocity increases passive torque. Hence, the faster angular velocity coupled with greater torque levels at the onset of isoload contractions could stimulate muscle hypertrophy to a greater extent compared to isokinetic eccentric actions [26].

Table 1. Average outcome measures of anatomical cross-sectional area (ACSA), volume, pennation angle (θ), physiological cross-sectional area (PCSA) and fascicle length (FL) of the *Vastus lateralis* muscle (VL)

	Group	Pre-training	Post-training	Δ%
ACSA, cm^2	AEL	34,5 ± 7,7	38,4 ± 7,6*	12,2±8,2†
		32,3 ± 6,7	34 ± 7,1*	5,0 ± 1,6
	CONV	31,6 ± 6,4	31,7 ± 6,5	0,1 ± 1,5
	CONTR			

Volume, cm^3	AEL CONV CONTR	747 ± 164 704 ± 178 692 ± 109	835 ± 168* 742 ± 185* 693 ± 111	12,4 ± 8,2† 5,4 ± 1,8 0,1 ± 1,5
θ, deg	AEL CONV CONTR	19,9 ± 3,4° 20,1 ± 2,6° 17,9 ± 1,7°	24,8 ± 3,6°* 21,7 ± 2,7°* 17,7 ± 1,7°	25,5 ± 9,6°† 7,8 ± 0,9° –1,0 ± 1,8°
PCSA, $см^2$	AEL CONV CONTR	124 ± 20 123 ± 33 121 ± 28	143 ± 24* 130 ± 33 121 ± 27	15,2 ± 7,9† 6,1 ± 6,2 0,1 ± 1,8%
FL, mm	AEL CONV CONTR	60,3 ± 0,7 60,1 ± 1,7 65,1 ± 0,6	60,4 ± 0,6 60,2 ± 0,7 65,1 ± 0,6	1,1 ± 2,1 0,7 ± 4,1 –0,1 ± 2,4

Values are means ± σ.

* - $p < 0,05$ – significantly different from pre values.

† - $p < 0,05$ – significantly different from CONV and CONTR.

In addition, the growth of muscle mass in the present study could also be potentiated by a relatively high speed of the eccentric part of the movement. It is known that maximum torque decreases hyperbolically with increasing velocity during concentric contractions, while it increases with increasing velocity until a certain point (e.g., ~200°·s^{-1}) for the knee extensors during eccentric contractions. Thus, to accentuate the difference in the mechanical loading between the training modes, the velocity should be relatively fast. Indeed, it has previously been shown that high-speed eccentric contractions contribute to greater muscle hypertrophy compared to slow eccentric contractions [1, 27]. This suggests that high angular velocity may be a factor favoring protein synthesis. Another important factor that could contribute to sizeable hypertrophic response in present study was a mechanical load expressed in a relative intensity (% 1 repetition maximum [%1RM]). Studies, that have yielded inconsistent results and found no between-group differences in hypertrophic adaptations after eccentric and concentric maximal training [19, 20], might be using insufficient loading for the eccentric mode (the difference in the loads lifted between eccentric and concentric contractions

was about 20%). In present study, subjects in the AEL group performed the eccentric portion of the exercise with an intensity of 140% of the concentric 1RM, i.e., 60% more than participants in the CONV group. At the same time, to match for total work, participants from the CONV group performed ~40% more sets of the exercise. In summary, all these factors combined allowed participants from the AEL group to achieve higher rates of muscle growth.

No changes occurred in unsupervised control group (CONTR) within the experimental period in all measured muscle parameters.

Training-induced alterations in VL architecture were demonstrated, as manifested by an increase in VL muscle fibre pennation angle. We observed a significantly greater increase in the pennation angle in AEL group (25,5 ± 9,6%; $p < 0,05$) compared to participants in the CONV group (7,8 ± 0,9%; $p < 0,05$). Obviously, steeper fascicle angle has led to increase in PCSA (15,2 ± 7,9% in AEL group ($p < 0,05$) and 6,1 ± 6,2% in CONV group ($p = 0,052$)). These data are indicative of a strong relationship between muscle size and pennation angle, as has been previously reported [28]. Given that increases in fascicle angle allow a greater amount of contractile tissue to attach to the tendon and aponeurosis and that it promotes an increase in the PCSA, this increase in fascicle angle most probably contributes to the continuing increase in strength over the first months of resistance training.

We observed no changes in fascicle length within either training group. Our finding is not supportive of the mode of contraction being the dominant stimulus for fascicle length adaptation. Supposedly, fascicle length is influenced by the training range of motion (or muscle excursion range), which may have not be enough in our study.

In summary, mechanical stimuli stand out as the most likely and most potent hypertrophy stimuli. The skeletal muscle response is largely proportional to the magnitude of mechanical stimulus and a larger response has been observed in AEL group with regard to size and architectural changes in comparison with traditional strength training. In this sense, the employment of supramaximal eccentric training strategies to overcome the limitations of traditional resistance training is warranted for experienced strength athletes in order to further increase strength, force output and muscle mass. In addition, our data suggest that the increase in architectural parameters outstrips the increase of morphological ones and can be used as a reliable measure of muscle hypertrophy.

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INDUSTRY 5.0 AS INTEGRATION OF THE INTERNET OF KNOWLEDGE AND THE INTERNET OF THINGS

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A methodology for creating systems of the "Industry 5.0" class using artificial intelligence technologies is proposed. The methodology is based on multi-agent methods for creating knowledge bases and is suitable for the development of design and control systems for digital intelligent manufacturing. An integrated structure of the Internet of knowledge and the Internet of things has been developed. The life cycle of mechanical engineering products is analyzed and methods of using the Internet of knowledge and the Internet of things at various stages of this cycle are proposed. The functional decomposition of the main stages of the life cycle is presented. The conceptual foundations of the Internet of knowledge are given. Multi-agent methods for creating knowledge bases have been developed. Metaontology of engineering agents is proposed. The principles of constructing multi-agent systems for semi-automatic product design are described.

Keywords: Industry 4.0, Industry 5.0, digital production, Internet of knowledge, Internet of things, intelligent systems.

Introduction

Currently, the fourth industrial revolution (4IR) is taking place, for which the term Industry 4.0 is used. It is customary to distinguish a number of stages in the development of the productive forces of mankind. Stages 1.0 and 2.0 were related to agricultural development. The third stage - is the industrial revolution, the beginning of the mass use of industrial production. Stage 4.0 covers the period of general computerization, including technological equipment and stages of manufacturing products. The essence of the new revolution lies in the fact that the material world is connected with the virtual one, as a result of which new cyber-physical complexes are being born, united into one digital ecosystem. Phase 5.0 should cover all stages of the product life cycle (LC).

Article [1] provides an interview with a representative of a Japanese company about the development of a digital society. It is noted that Industry 4.0 is only a part of the process with the transition to Society 5.0, which is a stage following the information society [2]. Society 5.0 represents the optimization of the resources of society as a whole through the integration of physical and cyberspace.

The material [3] examines the integration concept of Industry 5.0 in three main areas: project management and digital economy, personality and competence development, industrial and home Internet. Industry 5.0 is described as an information system, providing planning, registration, processing and reflection of information on at least three dimensions of the elements of influence: in the areas that support and create the product, in the stages of implementation of activities and as part of the elements of management activities.

The foundation for 4IR is the *Internet of Things, IoT* — the concept of a computing network of physical objects ("*things*") equipped with built-in technologies for interacting with each other or with the external environment, considering the organization of such networks as a phenomenon that can rebuild economic and social processes that exclude from part of actions and operations the need for human participation. Industry 5.0 should cover the automation of absolutely all stages and processes, including the digital design of a product, the creation of a virtual copy of it, the collaboration of design engineers and technologists in a single digital space, etc., when products are not yet things, but exist in the virtual world in the form of information models.

The digital revolution should enable a non-programmable carrier of knowledge to enter it into a computer without intermediaries. This became possible using the *expert programming* methodology [4]. In this methodology, knowledge is described in the language of *business prose*, which is as close as possible to the literary language, but formalized so much that it is possible to automatically generate software that corresponds to the source texts.

The integration of industrial and digital revolutions must be considered in the aggregate of two worlds: the virtual world, realized by the Internet of *Knowledge, IoK*, and the real world, implemented by the Internet of things. The Internet of knowledge is built on an ontological basis, the root object of which is metaontology. From the point of view of artificial intelligence (AI), an *ontology* – is an explicit specification of the conceptualization of knowledge. Metaontology operates with general concepts and relationships that do not depend on a specific subject area. Metaontology should contain the concepts and relationships necessary for both the

subject ontology and the task and optimization ontologies. Metaontology includes three components: subject ontology, task ontology, and optimization ontology (Figure 1).

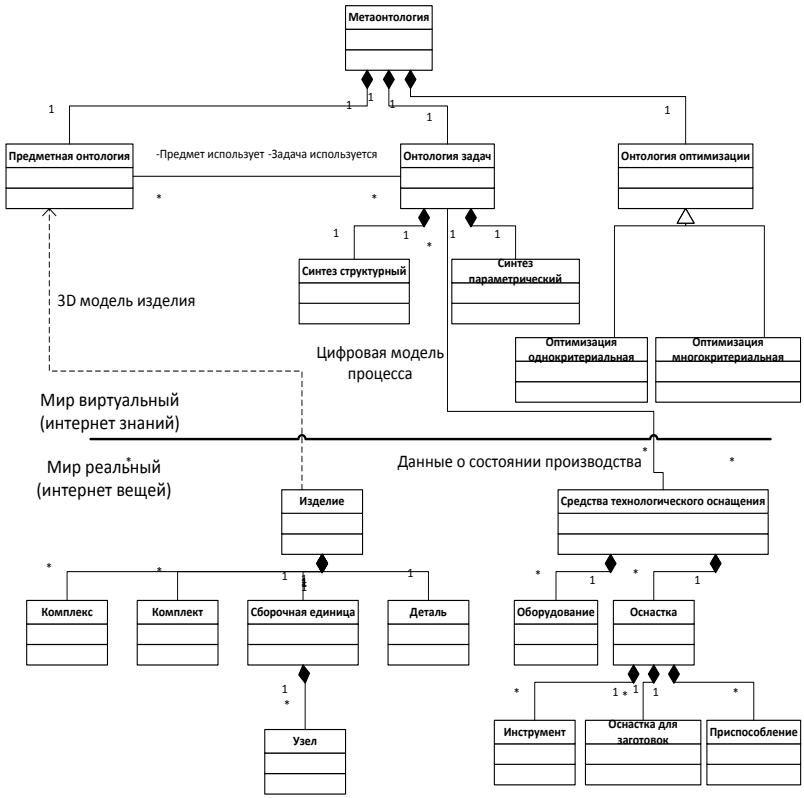

Figure 1 - Integrated structure of the Internet of knowledge and the Internet of things

A subject ontology consists of a hierarchy of concepts, their definitions and attributes, as well as associated axioms and inference rules. A subject ontology based on the use of tasks provides, based on technical specifications, the generation of 3D models of products that adequately represent products in the virtual world and satisfy the requirements of the tasks. The ontology of tasks includes tasks of structural and parametric synthesis of models of products and processes. With its help, the generation of digital models of processes and production is provided [4].

The third component of metaontology is the optimization ontology, which includes the components of single-criteria and multi-criteria optimization.

In the described approach, the world of things consists of products made using 3D printers or machine tools and robots that make up equipment as part of the technological equipment of a particular production and the equipment available in it. The manufacturing process is regulated by digital models generated using appropriate systems that include the necessary tasks.

Process design is done using production data from the Internet of Things.

1. Life cycle of mechanical engineering products

Figure 2 shows the life cycle (LC) of products and the integrated structure of the Internet of knowledge and the Internet of things. The LC of a product contains the stages: design, production, operation and disposal. At the stages of engineering and technological design, products and processes exist in the virtual world, in connection with which the Internet of knowledge is used. In the production process, products appear as things, so there is a possibility of joint use of the Internet of things and the Internet of knowledge.

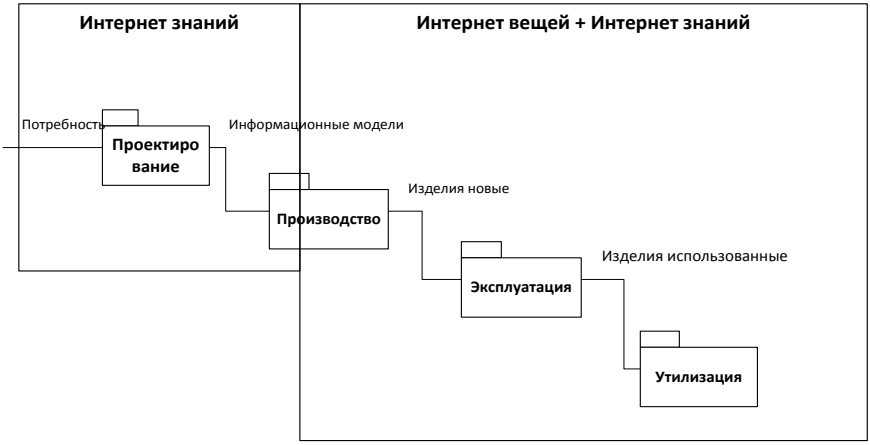

Figure 2 - LC of products and the integrated structure of the Internet of knowledge and the Internet of things

At the design stage, the product is presented as a formal system with the execution of the corresponding project documentation.

2. Conceptual foundations of the Internet of knowledge

The semantics of the Internet of Knowledge is defined by meta-ontology (see Figure 3). The root meta-object in this case is the Knowledge Base (KB), which has its own name, name-identifier and version. Methods connected to the KB allow you to sort and search for the knowledge modules that it consists of. A subset of knowledge modules combined into a semantic network is a method that can be exported to other KBs, as well as imported and merged into a single semantic network.

According to the Wiki technology, KB is a page. In this case, KB can be considered as a module within an integrated KB, which in this case consists of a set of pages. The structural components of KB are the KB dictionary and many modules.

The ability to replace the KB dictionary allows you to meet the conceptual requirement of wiki systems: the use of any languages of the world.

The second structural component of KB is a set of knowledge modules. Knowledge modules fulfill the main functional purpose of KB –transformation of the current state of data in order to obtain new objects that meet the design goals.

3. Multi-agent methods for creating KB

The most important methodological basis for the implementation of the concepts of i*ntegration, intellectualization* and *individualization* is the theory of multi-agent systems (MAS).

Let us consider the application of MAS on the example of intelligent systems (IS) design and management [4]. In machine-building systems, complexes, assembly units, parts and their elements, as well as technological processes (TP) of their manufacture, act as agents.

A generalized model of the class of engineering agents is shown in Figure 4. Any agent is an open system placed in a certain environment. In the case of CAD, this environment is a project generated in databases (DB), for which it is advisable to use an object type DB to represent the product model (*internal environment*), and a relational DB to search for standard and purchased products, material properties, etc. information (*external environment*). The external environment is usually networked.

The agent's *processor* is formed by its methods, which ensure the integration and processing of heterogeneous data, the development of appropriate responses to information about the state of the environment (project), and decision-making on the implementation of certain actions. In general, the processor defines the *behavior* of the agent, which can be observed, for example, in the graphics window, which displays generated

drawings and other geometric information.

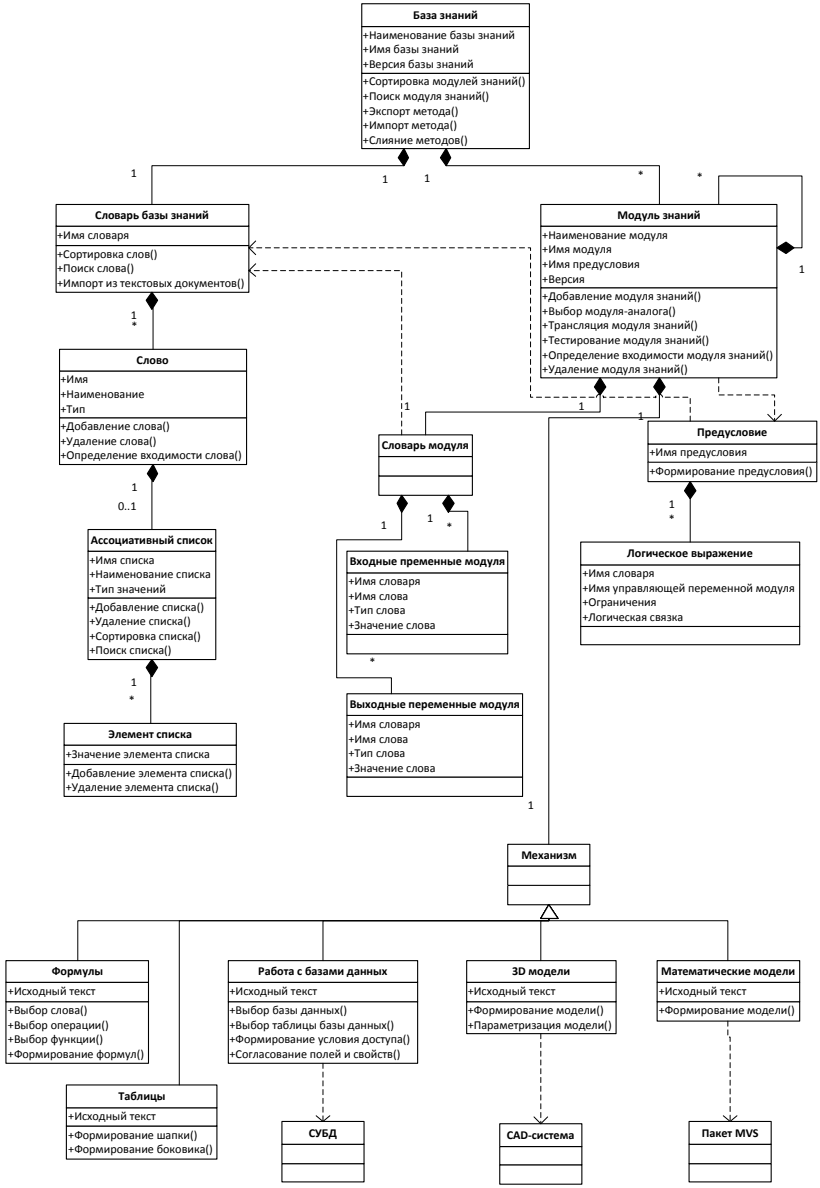

Figure 3 - Metaontology of the Internet of Knowledge

When creating IS, the first design phase is the formation of the nomenclature and organizational structure of agents. The nomenclature of agents is defined in the system dictionary. The organizational structure of agents is formed in the form of building a UML class diagram. Class diagrams are equivalent to design assembly drawings for software development.

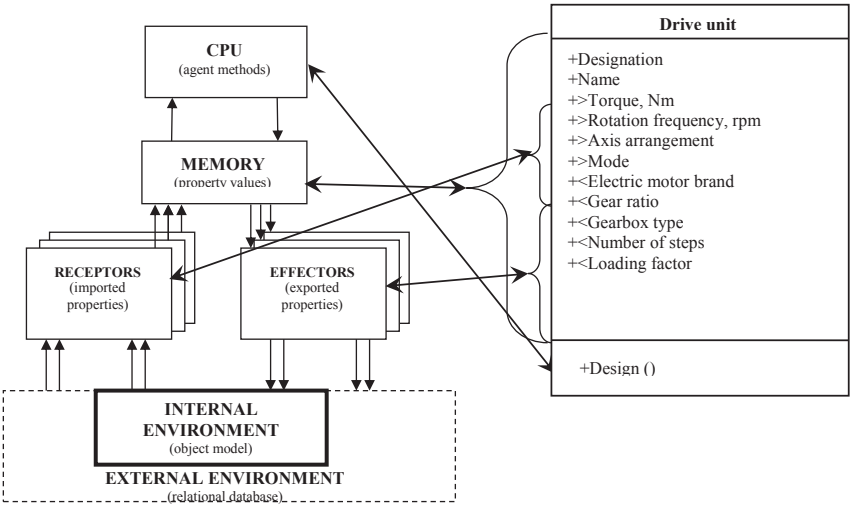

Figure 4 - Generalized model of the class of engineering agents

4. MAS of semi-automatic product design

There are two main ways to use AI technologies in design automation: embedding and building on. The first approach is used in a number of CAD systems, for example SolidWorks. The disadvantage of this approach is that non-design engineers, such as technologists, cannot use the intellectual capabilities of such systems. The article proposes to use a superstructure approach, which allows the use of AI methods at all stages of LC products.

The main static UML diagram is class diagram. The object class representation in it does not have the functionality required to describe MAS.

Figure 5 shows a modified class diagram for MAS. On it, using the example of a gearbox description, the input properties of the gearbox are denoted by the symbol >, and the outgoing ones, obtained as a result of the design, by the symbol <. The precondition for the intermediate shaft assembly is presented in the form of a restriction, in which it is written that this assembly appears when the gear ratio is more than 6.3.

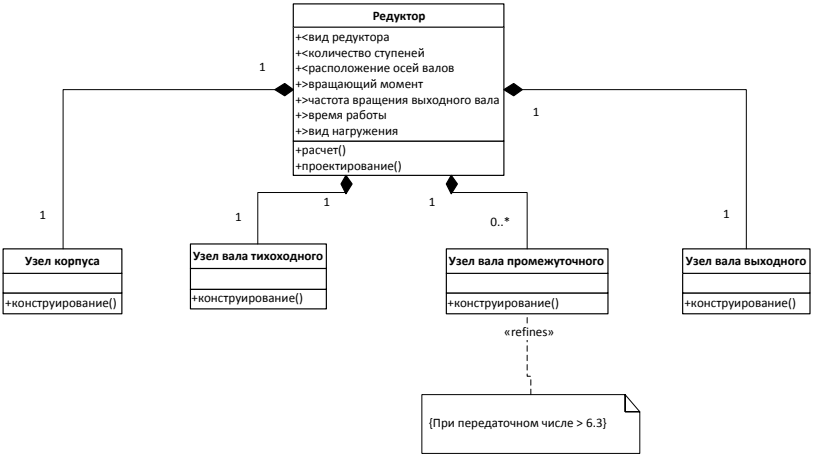

Figure 5 - Modified class diagram for MAS

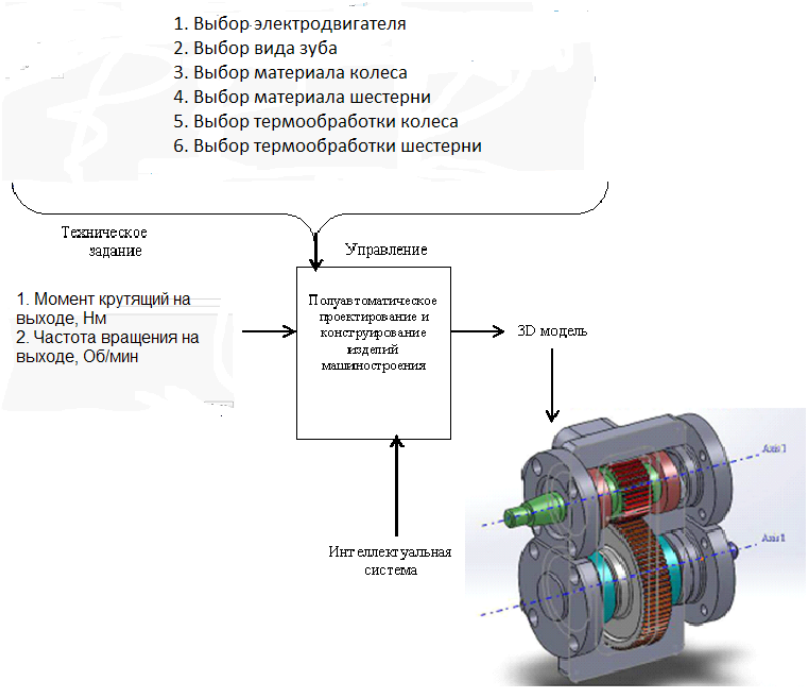

Figure 6 - Diagram of the functioning of a semi-automatic system

As for dynamic properties, methods of object classes are represented as state diagrams, in which preconditions are included inside modules.

Figure 6 shows a diagram of the functioning of a semi-automatic system in the design process of a single-stage gearbox.

At the entrance to the system, there is a technical specification (TS), which is formed using the appropriate window. There is a possibility of forming TS of different composition. Figure 6 shows a variant of the TS, including the values of the torque at the output shaft in *Nm*, the output speed in *rpm*, the transmission resource in *hours* and the number of products.

The design process is controlled by answering questions with a given nomenclature of variants of values displayed by KB. After answering all the questions, IS makes all the necessary calculations and generates documentation and 3D models. If, as a result of answering the questions, any restrictions built into the KB are violated, IS issues a refusal with an explanation of the reasons.

Conclusion

The foundation for 4IR is the Internet of Things. However, Industry 5.0 should cover the automation of all stages and processes, when products are not yet things, but exist in the virtual world in the form of information models.

On the eve of the upcoming Industry 5.0, it is necessary to consider in aggregate two worlds: the virtual world, realized by the Internet of knowledge, and the real world, implemented by the Internet of things. It is advisable to build the Internet of knowledge on an ontological methodology, which is based on the world of virtual agents representing object functions capable of generating new data based on available information. An attempt at such an integration, covering all stages of LC products, is presented in this article.

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CALCULATION OF THERMOELASTIC STRESSES FROM THEORETICAL AND EXPERIMENTAL VALUES OF MICROHARDNESS

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On the basis of theoretical and experimental studies, an analytical solution to the problem of the temperature field of a circular plate with a movable interface under uniform boundary conditions is obtained. It is shown that the formation of the coating occurs according to a certain autowave process. This result is confirmed by experimental data on measuring the microhardness over the sample surface. A formula has been obtained, which is the basis for calculating thermoelastic stresses from the experimental values of microhardness.

Keywords: Stefan problem, temperature field, autowave process, round plate, microhardness, thermoelasticity.

Introduction

In the process of ion-plasma deposition of coatings, a melt of the sprayed substance is formed on the substrate. Further, solidification and formation of the actual coating occurs. The process of melt crystallization occurs when the phase boundary moves. In this case, the thermal field of the plate must be calculated taking into account the velocity of this boundary. Such problems are related to the Stefan problem and cannot be solved by classical methods of the theory of heat conduction [1-3]. According to Stefan's problem, which describes many phenomena and processes associated with phase transitions, such as ice melting, crystal-

lization of melts, welding and others, many works have been published, the bibliography of which can be found in dissertations [4-8].

In this work, we will describe crystallization of finite dimensions at a moving interface [9], but taking into account the latest calculations, we will show how to find thermoelastic stresses.

Temperature field of a circular plate under uniform boundary conditions.

In this case, the problem from [9] takes the form:

$$\frac{\partial T}{\partial t} = Д\left[\frac{\partial^2 T}{\partial z^2} + \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial T}{\partial r}\right)\right] \tag{1}$$

$$\left.\begin{aligned} &T(r,z,t)\big|_{t=0} = 0;\\ &T(r,z,t)\big|_{r=R} = T_0 = \text{const};\\ &T(r,z,t)\big|_{z=0} = T_0 = \text{const};\\ &T(r,z,t)\big|_{z=\beta(t)} = T_0 = \text{const} \end{aligned}\right\}, \tag{2}$$

where T_0 is the value of the temperature on the surface of the cylinder and on the moving interface between the media. Then the general solution to the problem will take the form:

$$T(r,z,t) = \sum_{к=0}^{\infty} I_0(\lambda_{ок} r)\left\{e^{-Дt}\left[\frac{RI_1(\lambda_{ок}R)}{2\sqrt{\pi Д}}\int_0^t d\tau\int_0^H \frac{C_1}{\sqrt{t-\tau}}\times\right.\right.$$

$$\times e^{-Дt} e^{-\frac{(z-\xi)^2}{4Д(t-\tau)}} d\xi + \frac{1}{4\sqrt{\pi}}\int_0^t \frac{z}{[Д(t-\tau)]^{3/2}} e^{-\frac{z^2}{4Д(t-\tau)}} K_1(\tau)d\tau + \tag{3}$$

$$\left.\left. + \frac{1}{4\sqrt{\pi}}\int_0^t \frac{z-\beta(\tau)}{[Д(t-\tau)]^{3/2}} e^{-\frac{[z-\beta(\tau)]^2}{4Д(t-\tau)}} K_2(\tau)d\tau\right]\right\}.$$

We need to calculate the integrals:

$$I_1 = \int_0^t d\tau\int_0^H \frac{T_0}{\sqrt{t-\tau}} e^{-Д\tau} e^{-\frac{(z-\xi)^2}{4Д(t-\tau)}} d\xi, \tag{4}$$

$$I_2 = \int_0^t \frac{z}{[Д(t-\tau)]^{3/2}} e^{-\frac{z^2}{4Д(t-\tau)}} K_1(\tau) d\tau, \quad (5)$$

$$I_3 = \int_0^t \frac{z-\beta(\tau)}{[Д(t-\tau)]^{3/2}} e^{-\frac{[z-\beta(\tau)]^2}{4Д(t-\tau)}} K_2(\tau) d\tau. \quad (6)$$

For long measurement times t, the integrals I_2 and I_3 are negligible and $e^{-Дt} \to 1$. Then the problem is reduced to calculating the integral I_1:

$$I_1 = \int_0^t d\tau \int_0^H \frac{\gamma(\xi,\tau)}{\sqrt{t-\tau}} e^{-Д\tau} e^{-\frac{(z-\xi)^2}{4Д(t-\tau)}} d\xi = T_0 \int_0^t \frac{e^{-Д\tau}}{\sqrt{t-\tau}} I_1'(\tau) d\tau. \quad (7)$$

To calculate $I_1'(\tau)$ in (7) we make a change of variables $y = \frac{z-\xi}{\sqrt{4Д(t-\tau)}}$, then we get:

$$I_1'(\tau) = \sqrt{4Д(t-\tau)} \left[\int_0^{z_2} e^{-y^2} dy - \int_0^{z_1} e^{-y^2} dy \right], \quad (8)$$

where $z_1 = \frac{z}{\sqrt{4Д(t-\tau)}}$, $z_2 = \frac{z-H}{\sqrt{4Д(t-\tau)}}$.

The integrals in square brackets represent a function:

$$\operatorname{erf} z = \frac{2}{\sqrt{\pi}} \int_0^z e^{-y^2} dy. \quad (9)$$

Using formula (9) and its expansion in a series, after simple calculations we get:

$$I_1'(\tau) = \left[z e^{-\frac{z^2}{\sqrt{4Д(t-\tau)}}} - (z-H) e^{-\frac{(z-H)^2}{\sqrt{4Д(t-\tau)}}} \right]. \quad (10)$$

Substituting (10) into (7), and calculating, we get:

$$I_1 = \frac{2\sqrt{Д}}{z} \cdot U_1. \quad (11)$$

Restricting ourselves to the first term in sum (3), for the stationary temperature we have the following expression:

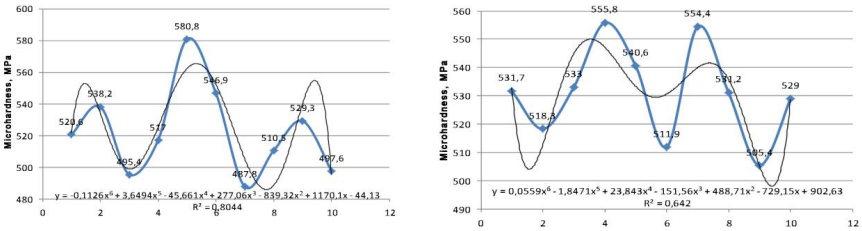
$$T(r,z)=\frac{T_0 R}{\sqrt{\pi z}}\,I_0\left(\frac{2r}{R}\right). \qquad (12)$$

When obtaining (12), we took into account $I_0(\lambda_{ок} r)=0$ that the equation implies $\lambda_0=2r/R$ and $I_1(2)=1$. The radial and axial components of the temperature gradient, taking into account (12), will be equal:

$$\frac{\partial T}{\partial r}=\frac{2}{z}\,\frac{T_0}{\sqrt{\pi}}\,I_1\left(\frac{2r}{R}\right), \qquad (13)$$

$$\frac{\partial T}{\partial z}=\frac{RT_0}{\sqrt{\pi}z^2}\,I_0\left(\frac{2r}{R}\right). \qquad (14)$$

Experimental results. We have repeatedly measured the microhardness every 0.5 mm on an electronic microhardness meter HVS-1000A. The results are shown in Fig. 1.



a) b)

Figure 1 - Autowaves in FeCrNiTiZrCu (a) and CrNiTiZrCu (b)

In both cases, a quasiperiodic structure is observed; wave process. Fig. 1 shows that the wavelength is about 10^{-4} m, i.e. the mass transfer rate is ~ 10^{-4} m/s. Since $V\approx\sqrt{D/t}$, then for the diffusion coefficient we obtain the estimate D ~ 10^{-8} m^2 s. This corresponds to the low diffusion regime. If we turn to equations (13) and (14), we see that both equations containing the Bessel functions $I_0(2r/R)$ and $I_1(2r/R)$ show the wave character of the coating solidification (Fig. 2b).

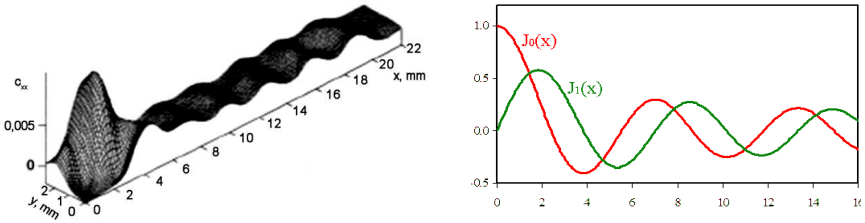


Figure 2 - Distribution of local elongations on FeSi (a) [10], graphs of Bessel functions (b)

Calculation of thermoelastic stresses from theoretical and experimental values of microhardness. The distribution of thermoelastic stresses should be displayed on the distribution of microhardness over the surface and deep into the sample. In fig. 1 shows the experimental results for various coatings.

Fig. 1 that the microhardness of the coating varies (within the experimental error) unevenly over the sample, i.e. in some "oscillating manner." This behavior corresponds to our solutions (13) - (14). Thus, we can write:

$$\mu_r = A_r \frac{\partial T}{\partial r} = \frac{2}{z} \frac{A_r T_0}{\sqrt{\pi}} I_1\left(\frac{2r}{R}\right). \quad (15)$$

$$\mu_z = A_z \frac{\partial T}{\partial z} = \frac{R A_z T_0}{\sqrt{\pi} z^2} I_0\left(\frac{2r}{R}\right). \quad (16)$$

In these expressions, the value of A is constant at low thermal stresses. In metal bodies, the effect of the coupling of the deformation field and the temperature field usually has little effect on thermal disturbance and distribution of thermal stresses. In this case, one can use well-known solutions for a circular plate of constant thickness (see, for example, [11, 12]) and write down for stress components:

$$\sigma_r = -2G \frac{1}{r} \frac{\partial T}{\partial r}. \quad (17)$$

$$\sigma_z = -2G \frac{\partial T}{\partial z}. \quad (18)$$

Here, the shear modulus G is determined by the expression:

$$2G = \frac{E}{1+\varepsilon}, \quad (19)$$

where E is Young's modulus, ε is Poisson's ratio.

In the above experiments, the radial component of microhardness was measured; therefore, we will consider only the radial component of thermoelastic stresses. Comparing (15) and (17), we have:

$$\sigma_r = -2G\frac{1}{rA_r}\mu_r. \quad (20)$$

Formula (20) is the basis for calculating thermoelastic stresses from the experimental values of microhardness shown in Fig. 1.

Conclusion

Based on theoretical and experimental studies, the following conclusions can be drawn:

- an analytical solution to the problem of the temperature field of a circular plate with a movable interface under uniform boundary conditions is obtained;
- it is shown that the formation of the coating occurs according to a certain autowave process. This result is confirmed by experimental data on measuring the microhardness over the sample surface;
- a formula is obtained, which is the basis for calculating thermoelastic stresses from the experimental values of microhardness.

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NOTES

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