

# **Practice Oriented Science: UAE – RUSSIA – INDIA**

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## SPECIFICS OF THE TRANSITION TO PERSONNEL MANAGEMENT BASED ON NEW HR TECHNOLOGY - PERFORMANCE MANAGEMENT

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**Annotation.** *The article notes that digital technologies continue to change work processes, including human resource management practices. Changes in business conditions require HR professionals to constantly review their priorities, set new tasks, and incorporate new roles. The author identifies that employee motivation management has become the second HR function, after personnel administration, which is successfully automated in Russian companies. The article defines the relationship between the automation of personnel management systems and the implementation of a new employee motivation and incentivization system. The article identifies key HR priorities in modern conditions: attracting the necessary resources (external recruitment, employer branding, adaptation); ensuring and measuring effectiveness (performance management and HR analytics, training and development); supporting and developing employees in conditions of change and uncertainty (engagement and retention, training and development, adaptation). The specifics of using personnel management systems considering dynamic external business processes and the implementation of digitization and automation of management are also considered.*

**Keywords:** *management system, personnel management, HR technology, performance management, digitalization, automation, motivation.*

The rapid development of digital technologies contributes to their widespread dissemination and penetration into all spheres of economic and social life, in particular in the processes of managing companies and doing business. At the same time, digital transformations change approaches and methods of management activities, lead to the formation of digital thinking, requiring constant updating of existing HR technologies. The development of information technology, which is characterized by modern society is changing the field of personnel management,



which is on the threshold digital revolution. Digitalization of the field of personnel management has led to the emergence of the concept of digital HR, which combines the use modern technological capabilities (social networks, mobile applications, cloud technologies, augmented reality, etc.) and acts as a new platforms for interaction with both staff and candidates for vacancies. At the same time, digital technology developers ensure the implementation of technical aspects of digital HR, and HR specialists carry out the development and implementation appropriate strategies and programs taking into account new opportunities. It should be noted that digitalization, as a recent trend in management personnel is manifested not only through the implementation of software and automation of personnel management systems, it creates a fundamentally new thinking, new approaches to interaction with employees, as well as to adoption management decisions in the field of personnel management, the basis of which are increasingly numbers and mathematical models become [1, 2].

Let's take a closer look at the technologies and opportunities that digitalization of the HR sector provides [3]:

1. Use of integrated mobile applications and automation of HR processes. Today, most HR processes are automated in a specific system solution, which is integrated with accounting and company management programs. Using digital mobile tools, the following functions of the HR department are performed: time-management, online recruiting and training of personnel, tracking and assessing the quality of employee work, calculating remuneration and compensation, monitoring and managing performance using gamification, measuring and increasing loyalty, providing feedback, synchronization with other departments and others [4].

2. Digital integration with cloud services. Cloud solutions can significantly simplify the process of data transfer and ensure the use of big data and open-source technologies, thanks to which they can be considered the foundation of Industry 4.0 [5, 6].

3. Predictive people analytics (HR analytics). It is used to analyze and visualize large amounts of data on a global scale, combines methods of predictive development scenarios and intelligent analysis, and acts as an effective tool for decision-making and forecasting, allowing to minimize the influence of the human factor. The use of predictive analytics increases the value of data for management and the efficiency of its use, and also reduces personnel costs. The use of HR analytics is typical for large companies that have a large number of employees. The capabilities of HR analytics can be used in such areas as personnel selection, recruiting, personnel training, motivation and adaptation, talent retention, personnel costs, individual employee performance [7, 8, 9].

4. Technologies of virtual (augmented) reality (VR/AR). Using the capabilities of virtual reality makes it easier for companies to attract talent, as well as

expand opportunities for professional training and employee development. Thus, virtualization of the internal space of an organization allows job applicants to very quickly form an opinion about the specifics of their professional activities, the atmosphere within the company and understand whether they share the corporate values and culture of the organization. For newly hired employees, virtual reality significantly facilitates the adaptation process, allowing HR specialists to obtain information about their behavior and personal characteristics. In the field of vocational training, virtual (augmented) reality allows you to get as close as possible to practical experience, facilitating the process of perceiving and remembering information [10].

5. Artificial intelligence (AI) technologies. Artificial intelligence is a technology that enables tasks that only humans can do. Its main difference from software is the ability to self-learn. AI technologies make it possible to create a “person image” that can interact with job candidates, support new employees in the adaptation process, and provide the necessary analytical information to HR specialists and managers. Its capabilities help reduce personnel management costs, as well as improve data accuracy [11].

Performance Management, or performance management, is a holistic approach to planning, managing, controlling and improving organizational results and increasing profits at the strategic, tactical and operational levels. The development of this approach was facilitated by the work of R. Kaplan and D. Norton [12] and P. Drucker [13]. In the Russian Federation, the large-scale implementation of a new remuneration system (NRS) began in 2008. This was preceded by scientific discussions of many Russian scientists - specialists in the field of remuneration. Performance Management, NSOT were the drivers of the process of automating remuneration processes. An audit of the new remuneration system being implemented in the Russian Federation in the context of improving the principles of remuneration revealed significant difficulties and problems and showed that a successful transition to an effective contract is impossible without reducing the subjectivity of managers when determining the incentive part of wages and creating an integrated system for managing quality and performance efficiency organizations based on the Key Performance Indicator - KPI [14]. KPI, in the Russian version, is sometimes used as an abbreviation KPI (key performance indicator) - an indicator of the effectiveness and success of achieving set goals using specific indicators. The KPI of each individual employee determines the effectiveness of the specific work performed by him and is financially reflected in his salary. KPI involves achieving results in a particular activity that can be digitized and measured, which allows you to direct the actions of employees of all departments in a single direction to achieve the business goals of the entire company.

An analysis of the experience of developing and implementing various KPI systems in the domestic market showed that automation of the analyzed function becomes necessary if the number of people covered by the KPI system exceeds 15–20 people, an end-to-end KPI system is used, and not only objective, easily measurable quantitative indicators are taken into account, but also the translation of quality indicators into numbers (Table 1) [15, p. 67]. This is due to the fact that after developing a system of 3-5 indicators for each position, it is important to ensure the collection, analysis and storage of a large amount of data, often stored in various subsystems of the company.

**Table 1**  
*Conditions necessary to automate the management of personnel motivation based on KPIs*

<b>Characteristics of motivation according to KPI</b>	<b>No automation required</b>	<b>Automation is necessary</b>
Number of positions assessed	Top management, managers and performers of main business processes (production and sales)	All positions, including business support and support staff
Number of people covered by the KPI system	Up to 15 people	More than 15-20 people
Frequency of evaluation and bonuses	No more than once a year	Monthly or quarterly
Number of indicators	No more than two	3-5 indicators that provide a comprehensive assessment
Type of indicators used	Clearly measurable quantitative indicators	A combination of quantitative and qualitative indicators, including subjective ones

The author, based on data from the official websites of leading vendors, conducted a comparative analysis of software products for automating the HR function of motivation and remuneration (Table 2).

**Table 2**  
*Review of software for automating staff motivation by KPI*

<b>Name</b>	<b>Type</b>	<b>Peculiarities</b>	<b>Advantages</b>	<b>Flaws</b>
KPI-Dative	Cloud	Developed based on the author's KPI methodology	Allows you to keep track of employees' performance of not only quantitative, but also qualitative indicators.	Cannot be adapted to universal personnel assessment technologies. no mobile version.

			There is a well-developed payment management functionality, for example, a payslip, mandatory payments	There is no available information about the existence of tools for automatic data downloading. Information visualization tools are not provided
1C: Management by goals and KPIs	Boxed and cloud	Written on the 1C platform: Enterprise 8.3	Easily integrates with the 1C: Enterprise 8.3 program, widely used in Russian business. It is possible to independently design various methods for assessing employees (KPIs, standards, objectives), automatically carry out regular assessment procedures in standard business processes, and set up alerts. The system is interactive, since personal accounts can be created for each user, configured according to roles and corresponding access rights	No mobile version
KPI Monitor	Cloud	The system is positioned by the developers as business intelligent (BI)	The system provides the ability to perform multidimensional data analysis and present the results in interactive visualization. The program has a friendly and convenient interface, as well as the presence of options for consolidating many quantitative assessment indicators. There is a mobile application. For the purposes of personnel performance management, it is possible to launch a “reporting company”. Competency-based assessments can be carried out.	The system does not have an option for coordinating joint tasks and projects for employees
Higher	Cloud	Designed to collect data from various sources and databases to evaluate employees	The system offers a simple tool for calculating KPIs and also does not require significant costs for initial setup, and therefore is relevant for small businesses. You can apply scorecards, manage tasks, and use quantitative	It has very limited functionality and a somewhat outdated design. There are no graphical visualization tools at all. No mobile app

			criteria for evaluating staff. It is possible to set reminders. There are options for downloading data from other systems, including 1C, Excel, etc. Affordability	
SAP Success Factors	Cloud	Refers to complex HRM systems	The system allows you to set and cascade goals across company divisions, as well as track the status of their implementation. It has a high degree of interactivity, thanks to user interaction and the use of a mobile application. By calibrating goals, you can identify the best and worst performers. Availability of options for visualizing the dynamics of achieving goals and a large selection of personnel forms and reports. It is possible to adjust the employee's remuneration depending on his personal contribution to achieving common goals	One of the highest cost systems. Access to the software product may be limited in the Russian Federation, since legislation prohibits storing personal data on servers outside the country
Elma KPI	Cloud	An automated system that allows you to build a map of the company's strategic and operational goals, which can later be decomposed for an individual employee	Quantitative and qualitative indicators can be used to present employee performance matrices. There is a designer for setting up business processes. The internal communications function is well developed: you can leave comments and send messages. The system has a constructor for creating a control panel, many filters and options for sorting and presenting data	There are no templates for conducting assessment sessions. There are no opportunities to manage the wage fund at all. Mobile app for iOS only
KPI Suite	Cloud	Positioned by developers as a system that can be used to organize staff collaboration	An important aspect is the interactive collaboration of staff, as well as data visualization using dashboards. It is possible to manage projects and risks. The strategic goals panel is presented in the form of a classic BSC map. There is a mobile application	There is no information about the ability to generate reports. There are no tools to support staff performance management processes and set up alerts

Now it's no secret that Performance Management in the classical sense, when a manager meets with an employee once a year, sets goals for him, and then evaluates his achievements, is already outdated. In the current situation, the annual cycle is too long: during this time, the external business environment may change beyond recognition, so that by the end of the year, the goals that a person worked on may completely lose their relevance. Today, HR managers use different practices. Some call it Continuous Performance Management, others call it Real-Time Feedback. In essence, this is frequent and systematic (for example, once a week) feedback, which is also multilateral in nature, not limited to the direction from the manager to the subordinate. This practice is in keeping with the spirit of the digital age: a person should quickly receive corrective signals about his activities.

To reduce the number of transactions, appropriate IT resources are needed to implement new systems for setting goals and measuring results. Mobile applications are becoming a mandatory element of HR systems, since many employees work in project teams and network structures, often remotely. Over time, the long procedures of agreeing on goal cards at the beginning of the year and summing up the results at the end will disappear. Most likely, the IT system will also adjust the salaries of employees, taking into account the person's qualifications, experience, performance and other parameters. Prompt feedback increases people's involvement and improves the quality of their work (this practice has already been appreciated by companies that have adopted Scrum Agile project management methodologies). However, when giving people an assessment, HR managers should remember that the competency model should correspond to the success profile for a specific position, and the list of competencies should be as short as possible (lists of several sheets, as is customary in some companies, are useless).

Also, changes in Talent Management practices are long overdue [16]. Previously, companies assessed the performance and potential of employees, identified 9 categories of personnel based on this data (the "Nine-box Grid" matrix), and then worked with a group of the best. It was usually called a personnel reserve, talent pool or succession pool. However, today employers are coming to the understanding that they need to engage not only the best, but also everyone else. If an employee has high performance and high potential, he is worth promoting. If there is potential, but there are problems with performance, you need to understand the reasons: perhaps the person is in the wrong place or has the wrong manager. Good performance with low potential is a reason to leave the employee in place. Finally, for employees who are bad in all respects, there is also a correct route - to leave the company. When making career plans, it is important for HR managers to let the employee plan his own future, to take into account his desire - where he himself strives. You can ask questions directly, but the HR-IT system also stores indirect data - "digital traces" (what courses a person enrolls in, what books he orders from

the corporate library). This significantly saves time and increases the efficiency of HR managers.

In recent years, a new view on working with personnel has emerged: you should not invest in established “stars” - it is important to retain them, and it is better to develop those who are “average” in terms of performance. This is much more profitable: some of them have potential and are not so high in ambition; they are not looking for more lucrative work. True, not all companies know how to measure employee potential. This task should definitely not be entrusted to the immediate supervisor: managers are good at assessing the current results of their subordinates, but can say little about the future. The task of identifying potential is better handled by a manager two levels higher than the employee being assessed. You can also use special potential assessment tools - for example, the Potential in Focus (PIF) test [17].

Thus, the key to the success of the HR field in the future lies in the skillful use of digital technologies as effective HR tools that cannot completely replace the skills of a true professional. Robots, performing basic operations, are designed to make everyday work easier, minimize human errors, becoming not a substitute, but an assistant (for example, in mass recruiting, personnel records management, and training). Obviously, one of the main advantages of a living person over his electronic copy is creativity, the ability to find an individual approach to employees and the ability to act in non-standard situations, because HR is an engineer of human souls, capable of feeling the inner world of an applicant, which is beyond the reach of any gadget in the world.

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## THE EFFECTIVENESS OF USING CHANGES IN THE KEY INTEREST RATE OF THE BANK OF RUSSIA TO COMBAT INFLATION

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**Abstract.** *This article examines the effectiveness of the Central Bank of the Russian Federation using changes in the key interest rate to combat inflation in our country. The period of development of the economy of our state after the start of the special interest rate in our country provided rich food for thought on this issue. This is precisely what prompted me to write this article.*

**Keywords:** *Central Bank of the Russian Federation, key interest rate, inflation.*

The Central Bank of the Russian Federation considers the fight against rising inflation in the country's economy to be one of the main directions of its monetary policy, using such an instrument as the key interest rate. At the same time, the Bank of Russia is guided by the following logic. The key rate is the percentage at which the Bank of Russia lends money to commercial banks. They need to return this money. Therefore, when the key rate rises, banks raise interest rates on loans and deposits. People and companies borrow less and keep more money in deposits. Demand for goods decreases, and prices rise more slowly [4, p. 3].

Many Russian economists do not agree with this monetary policy of the Bank of Russia. For example, Academician of the Russian Academy of Sciences Sergei Glazyev in his fundamental work "Leap into the Future. Russia in the New Technological and World Economic Structures" entitled one of the chapters "Sanctions of the USA and the Bank of Russia: a double blow to the national economy" and subjected the policy of the Bank of Russia to scathing criticism. In particular, he writes: "The consistent increase in the key rate by the Bank of Russia further aggravated the situation, putting many enterprises and banks in a pre-default position" [5, p. 221].

The famous Russian economist, and now State Duma deputy Mikhail Delyagin, believes that “high bank interest rates spur inflation. It all depends on whether the money supply is insufficient or insufficient. If the money supply is excessive, and inflation is due to this, then a tough financial policy is necessary, an increase in the cost of credit is necessary in order to neutralize this excess supply and remove it from the market. But our situation is exactly the opposite. Our state has created a terrible financial famine in a completely artificial way. And the lack of money has led to our inflation being contained. A high percentage, on the contrary, promotes inflation. Here I am a trader. To buy something and then sell it, I first need to take out a loan. I take this loan, but if I take it at a high interest rate, then I include this high interest rate in the price. I just have nowhere to go. And thus I am increasing inflation. So the talk of our wonderful Bank of Russia that it is supposedly fighting inflation with high interest rates is a conversation that testifies to the illiteracy of the people who manage this very Bank of Russia. At best, illiteracy. One can assume everyday stupidity, one can assume absolute irresponsibility. We settle on the softest, quietest home option - illiteracy. Because people don’t understand what they are saying” [6, p. 217-218].

We set the task to analyze the monetary policy of the Bank of Russia in 2022 and 2023. As can be seen from Table 1, the Bank of Russia raised the key interest rate twice during this period: on February 28, 2022 from 9.5 to 20% and in July-December 2023 from 8.5 to 16%.

**Table 1**  
*Dynamics of changes in the key interest rate of the Bank of Russia in 2020-2022 [7, p. 44]*

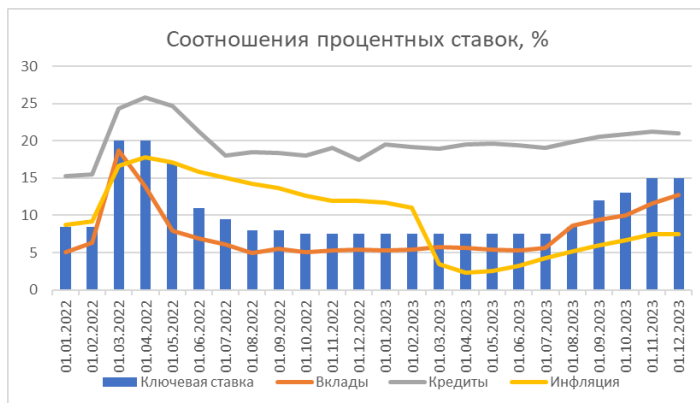
<b>Date</b>	<b>Key rate value</b>
20.12.2021	8,50
14.02.2022	9,50
28.02.2022	20,00
11.04.2022	17,00
04.05.2022	14,00
22.05.2022	11,00
14.06.2022	9,50
25.07.2022	8,00
19.09.2022	7,50
24.07.2023	8,50
15.08.2023	12,00
18.09.2023	13,00
20.10.2023	15,00
18.12.2023	16,00

In the first two days after the start of a special military operation in Ukraine, there was an outflow of household deposits from Russian commercial banks. Starting on February 24, fearing sanctions from Western countries, Russians withdrew 1.8 trillion rubles from their accounts in two days. This is approximately 5% of all citizens' funds in accounts and deposits in Russian commercial banks. As a result, on February 28, the Bank of Russia sharply increased the key interest rate from 9.5% to 20% per annum. As the Chairman of the Bank of Russia E. Nabiullina explained, this was done in order to increase the attractiveness of deposits and stop the outflow of money from banks.

Banks then, literally within two days, raised interest rates on deposits. At the same time, the spread of profitability on deposits in Russian banks is from 15 to 23% [3, p. 6]. It should be recognized that in this case the decision to increase the key rate was taken not so much to reduce inflation, but to save the Russian banking system due to the outflow of deposits. And as practice has shown, this decision was completely justified.

By April 2022, according to the Bank of Russia, risks to financial stability began to decrease: citizens' funds were returned to the banking sector, including time ruble deposits; the dynamics of the ruble exchange rate and the situation in the financial market as a whole have stabilized [9, p. thirty]. From the beginning of April to September, the interest rate was reduced from 20.0 to 7.5% per annum.

If we carefully analyze Figure 1, we can come to the conclusion that the jump in inflation in February occurred precisely as a result of an increase in the key interest rate. And even in April, when, according to the Bank of Russia, the economy stabilized, inflation in April reached a peak of 17.8% and began to decline [9, p. 31]. This decrease surprisingly coincided with the decision of the Bank of Russia to reduce the key interest rate from 20.0 to 17.0% on April 11, 2022, and then the decrease in inflation was accompanied by a decrease in the key interest rate. In the end, on July 25, 2022, the key interest rate of the Bank of Russia was reduced to 8.0%, and even to 7.5% on September 19, 2022. She lasted until July 2023. And this period truly became a period of stability. Interest rates on household deposits were around 5%, inflation was declining and in March 2023 it became below the key rate.



**Figure 1.** Dynamics of changes in interest rates on household deposits, loans and the level of inflation depending on changes in the key interest rate of the Bank of Russia [7, p. 44; 12, p. 72, 79; 13, p. 87, 94; 9]

As for raising the key interest rate in 2023, this decision was made precisely as part of the fight against inflation. Justifying its decision to increase the key rate, the Bank of Russia in its information message dated December 15, 2023 stated that the Bank of Russia decided to increase the key rate by 100 bp, to 16.00% per annum. He notes in particular: “Current inflation pressures remain high. On average, for October–November, seasonally adjusted price growth was 10.0% annualized (compared to 12.2% in the third quarter). Annual inflation, estimated as of December 11, fell to 7.1% after 7.5% in November...” [2, c, 6]. In fact, one cannot but agree with the Bank of Russia: inflation in the country is growing, but in not a single document does it even try to understand the reasons

We believe that these reasons cannot be overlooked.

Firstly, as we have already indicated above, the reason for the sharp increase in the key interest rate of the Bank of Russia on February 28, 2022 to 20% was the start of a special military operation by Russian troops in Ukraine. This is what provoked panic among the population, which almost led to a banking crisis.

Secondly, as a result of the sanctions imposed by Western countries after the start of the North Atlantic Treaty Organization, many foreign firms left the Russian market. In the absence of competition from foreign firms, Russians, primarily trade organizations and manufacturers, were quick to take advantage of this and inflated prices for their goods. By the way, the Bank of Russia itself admits this, using its own cautious formulations: “Persistent inflationary pressure has intensified in recent months. This is explained by the faster growth of domestic demand compared to the possibilities for expanding the production of goods and services...” [2, p. 6].

Thirdly, a significant weakening of the Russian ruble exchange rate led to an increase in prices for the still remaining imported goods. The Bank of Russia comments on this: “High domestic demand was a significant factor in the weakening of the ruble through increased demand for imports. The transfer of the ruble weakening to prices is enhanced by increased inflation expectations...” [1, p. 4].

A serious methodological flaw in regulating the level of inflation using the key interest rate, in our opinion, is the focus on the “inflationary expectations” of the population. We have the impression that marketing services, mainly of trade organizations, fuel these “expectations” by raising prices for their goods and services.

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## GLOBAL APPROACHES TO MANAGING THE COSMONAUT TRAINING SYSTEM IN THE 21<sup>ST</sup> CENTURY

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**Abstract.** *The authors consider the factors that determine the characteristics of the training of astronauts in various fields: from science to space tourism, determine the possible nuances and current priorities of the future generation Z, as a task setter and executor for solving the problem of the scarcity of earthly resources at the current intensity of their exploitation, speak out about the future of space tourism and I catch valuable components in the extraterrestrial economy of comet-asteroid traps of cosmic bodies flying past us.*

**Keywords:** *space, ICT, AI, Big Data, marketplaces, digital transformation, USA, China, Russia, high-tech, Industry 4.0., NATO, drones, ADF, geopolitics, AUCUS, SCO, BRICS.*

Humanity is rushing into space and to the stars, wants to live on asteroids, build Lunar and Martian bases, flee from itself to distant galaxies and not notice the ideals of transhumanism that are killing it and the increasing competition between man and robot. The latter makes us more and more clearly define the contours of the “astronaut of the future”, a universal explorer, an impeccable navigator, an ideal soldier and an insatiable scientist, reflecting the functions of a corsair

ordered by his governments, and hiding behind peaceful intentions to maintain leadership in the extraterrestrial weapons race, putting the very idea of something alive on planet Earth is in great doubt [1]...

The development of Russian manned cosmonautics, in accordance with the “Concept of Russian manned cosmonautics”, approved by the Roscosmos State Corporation, which determined the ongoing transition from the ongoing human exploration of low Earth orbits to research, and to a new quality of exploration and to the use of deep space, which represents current direction of scientific research and depending on a set of the following factors [2]:

- the conditions for a human flight into deep space differ from the conditions of space flights in low Earth orbits, cannot be solved safely and technically in a short time and give a stable and constantly scalable and repeatable result, as was achieved on Yuri Gagarin’s rocket and is still used today by all explorers of the solar system. In this regard, the set of knowledge and methods for training astronauts must create the required provision of the required profile and categorically separated into the relevant specialties, by professionals who have the competencies and master the technologies of targeted and targeted training that will allow them to qualitatively, effectively and safely prepare cosmonauts for such a flight [3]. The solution to this problem will facilitate the astronaut to conduct effective independent scientific, research and economic activities on board new generation spacecraft and at extraplanetary base stations, primary deployment modules deployed on the Moon and on various subjects of the Solar system as their resources are explored, developed and used [4]. The latter depends on the accuracy of the existing operation of probes, telescopes, spacecraft, observatories, satellites and other agents of space logistics and research infrastructure [5].

-improving the national education system of each space state makes one of its priorities the convergence of federal state educational and professional standards to ensure that graduates of educational institutions start working as quickly as possible. Achieving this goal is realized by the transition from a cognitive educational paradigm (knowledge, abilities and skills) in the system of established classical centuries-old education to a competency-based one (knowledge, abilities, skills and competencies), implying lifelong learning (eng. lifelong learning) [6]. This state of affairs determines the requirements for the development of the global space industry, setting priorities for the existing cosmonaut training system: it must correspond to NBICS trends in the development of the education system, acting proactively [7], and not on a catch-up basis, as today, and in continuation of promising educational standards, requirements for updating specialized professional standards, as well as provisions clearly spelled out for Russia in the “Concept of Russian Manned Cosmonautics” [8].

-the development of digital technologies influences the formation of values and priorities, fears and hopes among new generations of people living in anticipa-

tion of geopolitical uncertainty and the increasing toxicity and volatility of global markets. In accordance with the existing “Requirements for applicants for participation in the competition for the selection of candidates for cosmonauts,” age and educational qualifications have been established, which make it possible to more clearly determine which training specialist with the status of cosmonaut can be specialized in creating and training him to operate in the form of labor resource for deep space exploration [9]. These will be applicants representing generation “Z”, which, according to the theory of generations of N. Hoovor and V. Strauss, is already actively born among humanity until 2025, laying down forecasts for the futurological interaction of the symbiosis of “man-machine” in Industry 4.0. [10] This is a very creative and quickly learning generation of young people using the mobile Internet, distance communication and learning technologies, cloud and end-to-end technologies, generative artificial intelligence and neural networks. Traditional approaches to mass and non-inclusive education and the off-line format, debunked in terms of effectiveness, supplanted by the Covid years, indicate possible low efficiency, giving place to online practices and digital educational platforms, digital ecosystems, digital twins and avatars in metaverses, and the movements of researchers in virtual and augmented reality of the Internet of things and “smart” energy-saving technologies [11]. The growing role of innovation is increasingly shaping the essence of representatives of this generation, clearly indicating in which direction the technologies of their potential learning trajectories need to be developed and how to anticipate their burnout when studying in each of the creative specialties.

- the commercialization of the process of human space exploration is a global trend that has been launched and becomes part of the Doomsday plan or a quantum leap in the transition of our physiological-anatomical state to a more perfect, Darwinian, conscious and consistent with the accelerating evolution of nature against the backdrop of the ongoing general digitalization of all business processes -structures from micro to mega levels. Today, world practice shows that Roscosmos State Corporation is not a monopolist and is not even the main player in the international space market in providing a universal space tourism service [12]. NASA, as part of the Low-Earth Orbit [LEO] economy program, is already implementing the fourth mission of private astronauts to the ISS (Private Astronaut Mission [PAM]). Private companies Axiom Space, SpaceX, Blue Origin have already proven their worth in delivering and returning humans from low-Earth orbit, and have intrigued many rich people to place their bets on the space entertainment industry and the “cocktail of extraterrestrial emotions” of finding extraterrestrial gravity. Accelerating competition in the market for manned and unmanned astronautics has become a reality of our time, revealing its leaders and outsiders, creating alternative platforms and drawing in forces that were previously dormant



in the focus of space projects. In this regard, the training of a non-professional cosmonaut is increasingly acquiring the features of a “commercial service” that has a minimum set of safety and common sense requirements based on a self-sufficient healthy organism. Economic efficiency (the cost of turnkey training for such a conqueror of the “depths of space”) should become one of the most important characteristics of the system for training new generation cosmonauts. Investing in the development of professional competencies (Hard Skills) and the set of flexible competencies (Soft Skills) formed by such a service for cosmonaut training specialists will ensure not only the fulfillment of the state-subsidized function of training professional cosmonauts, but will also determine the cost of the service for training a “private” applicant for space flight, harmonizing the costs of training both, reducing the time and financial costs of their joint training [13].

-unlike educational organizations, cosmonaut training institutions have competitive advantages over them in assessing the effectiveness of using educational technologies, their constant monitoring through AI systems and Big Data of the results obtained. This is due to the fact that the cosmonaut training system is a system of cyclical development, requiring repetition and feedback in its constant correction and self-improvement. An astronaut, in his professional activity, repeatedly goes through the cycle “preparation for flight – flight – post-flight report – preparation for flight.” At the same time, for an astronaut, the system of his training and labor use depends not only on transitions from one cycle to the next, but also affects the creation, accumulation and subsequent development of competencies due to increasing experience in their application in each such cycle. This is how one of the distinctive features of the cosmonaut training system is realized - its emergent, that is, absorbing nature. The presence of constant feedback between the astronaut and the cosmonaut training specialist at almost every stage of the cycle has a positive effect on the quality of assessing the effectiveness of the use of educational technologies. University educational systems do not have this opportunity. And they cannot combine together, as is already being done in the West and East on campuses and in technological nanoclusters, 3 components: science, training and practical application, the results obtained from such astronaut activities [14;23].

The Chinese and Indians are trying to extract elements of contemplation and consolidate the philosophy of other worlds in the consciousness of the developing mind from a position of constant challenge, but growing readiness to technically, emotionally and physiologically overcome all this. Westerners, on the contrary, got into the images of “men in black” and disappeared between worlds, nations and the philosophy of preserving the survival of humanity, regardless of the severity of the pursuit of extraterrestrial resources and the “arms race,” better known as “star wars” [15; 22].

The tasks of Russia in this approach are to find again its unique innovativeness [16] only to us, the inherent academic activity and development of options for applying from market services to extraterrestrial tourism services and consolidating peaceful initiatives in the preparation of those who are responsible for peace in the Universe: in general, and on Earth, in particular [17;21].

Our ability to again try on “Slavophiles” and “Westerners” in this will make it possible to create the foundations of new cosmic forges of galactic labor personnel of joint competencies between AI [18] and knowledge itself, which is losing its peaceful research essence and increasingly reciprocating TNCs of the weapons industries [19] and genetic engineering, robotic technological systems and computer models of future quantum computing and extraterrestrial infrastructure for resource hunting on an asteroid-comet basis [20;26].

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**TRENDS IN THE DEVELOPMENT OF MARKETPLACES  
AND ECOSYSTEMS OF THE ALIBABA HOLDING WITHIN  
E-COMMERCE: THE 2ND CHINESE WAVE IN ICT**

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**Abstract.** *The authors propose to consider the Chinese company Alibaba as a single evolving digital ecosystem of the market of digital services and services capable of developing from fintech to sales vectors of customer service in the B2C, B2B, B2G sectors. The dynamics of the post-Covid recovery of global markets and the ongoing digitalization of world trade through changes in the preferences of buyers and producers in the creative industries of Daniel Kahneman's behavioral economics are also examined.*

**Keywords:** *ecosystem, marketplace, AI, Big Data, fintech, creative industries, behavioral economics, B2C, B2B, B2G, business messenger, China, USA, Russia.*

The ongoing digitalization of all business processes and environments of the world economy reveals its leaders and outsiders who are capable of determining the mainstream of development of entire creative industries in the virtual space and in other geophysical environments. One of the main business miracles and a creative point of growth for the increasingly introduced neural algorithms and distribution systems was the Chinese company Alibaba, which was founded in 1999 in China by Jack Ma and began its activities as a site for the wholesale sale of goods. Since then, Alibaba has significantly expanded its operations and is now one of the world's largest companies in e-commerce, cloud computing, financial services, digital media and other related fields.

As of 2022, Alibaba ranks second in capitalization among Chinese companies with a valuation of 1.86 trillion Hong Kong dollars (\$221 billion) and is second

only to Tencent - 3.26 billion Hong Kong dollars (\$387 billion).<sup>1</sup> In October 2020, Alibaba's capitalization reached 6.65 trillion Hong Kong dollars (\$837 billion).<sup>2</sup> Obviously, the results for 2020 are superior to the current ones due to the coronavirus epidemic that broke out 3 years ago, when the whole world was "locked down" and people were not able to freely enjoy the benefits of offline commerce. Therefore, 2020 is rightfully considered the peak of demand for online platforms and, despite the continuous development of digital platforms, it has not yet been possible to break the capitalization record of 2020 [1].

Alibaba operates the three largest online marketplaces in China - Taobao, Tmall and Aliexpress.com. Each of them offers a wide range of goods and services: electronics, clothing, cosmetics, food, hotels, air tickets and much more. One of the key features of the company is its business model - it supports an ecosystem that brings together suppliers, merchants and consumers. That is, in the case of Alibaba, marketplaces and ecosystems are concepts that do not need to be separated within the framework of this study. Of all the companies offered by the Alibaba group, the most interesting for us for detailed consideration will be, first of all, AliExpress and Tmall, since they are marketplaces in the usual sense for us. And the Alibaba group itself will be considered as a large ecosystem, since it includes projects in a variety of areas, which allows the user to cover most of their needs within one online platform (which is the description of the ecosystem).

So, AliExpress is an online platform for international trade. On AliExpress, sellers can be both Chinese manufacturers and small businesses from all over the world. The platform features millions of products, including clothing, electronics, home goods, auto parts and toys. Aliexpress charges a flat fee for opening a store, as well as commissions for sales and internal services. In Southeast Asia, the company is represented by the Lazada platform, and in Turkey, Bangladesh and Pakistan by Trendyol [2].

Tmall is an online platform that operates on a B2C model. Unlike Taobao, individuals will not be able to sell their goods on this marketplace. Tmall provides access to millions of products from more than 70,000 international and local brands. Tmall is very popular among consumers in China and Southeast Asia, where Chinese products are in high demand. Marketplace revenue is generated through annual fees from sellers and commissions from the sale of goods.

From an ecosystem perspective, Alibaba offers a wide range of opportunities for both businesses and individual consumers. The Alibaba group, as an ecosystem, offers cloud services Alibaba Cloud, which includes computing, data storage, analytics, artificial intelligence and the Internet of things. Alibaba Cloud's revenue grew from \$2.14 billion to \$11.24 billion from 2018 to 2022, a CAGR of about 51.4%. Also connected to Alibaba Cloud is DingTalk, a business messenger

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<sup>1</sup> [https://www.hkex.com.hk/Market-Data/Securities-Prices/Equities?sc\\_lang=en](https://www.hkex.com.hk/Market-Data/Securities-Prices/Equities?sc_lang=en)

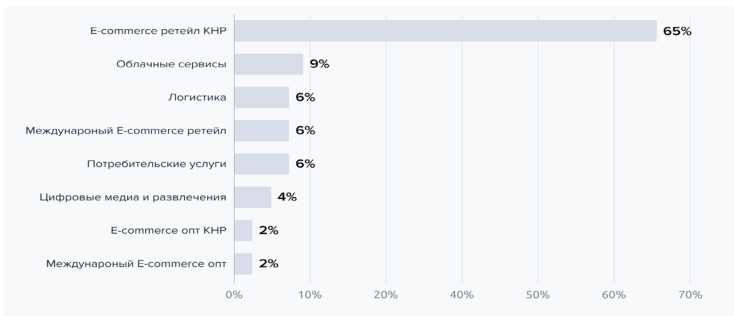
<sup>2</sup> <https://gazprombank.investments/blog/reviews/alibaba/>

that simplifies communications and collaboration between companies. At the end of the first quarter of this year, Alibaba Cloud took 4% of the global cloud services market. The company was second only to Amazon Web Services (32%), Microsoft Azure (23%) and Google Cloud (10%) [3].

Financial and logistics services cannot be ignored. Ant Group is a fintech company, the largest player in the mobile payments market in China. The trend of global ecosystems to create their own payment systems has not bypassed Alibaba. Ant Group provides loans, insurance, asset management and online banking services. The main service of Ant Group is the Alipay payment system, which occupies over 50% of this segment in China.

In 2013, Cainiao was founded - a logistics company that manages deliveries and logistics services of the largest online stores: both its own - AliExpress, Taobao, Tmall, and others. The division generates only 7% of the company's revenue, but is expanding rapidly. Cainiao's revenue in the fourth quarter of 2022 grew by 27% YoY to \$2.4 billion. During this period, the company launched five new international sorting centers and increased their number to fifteen.

For fiscal 2022, which ended March 31, 2023, 75% of Alibaba's revenue comes from e-commerce, with the majority (65%) coming from retail in China. Further in the revenue structure, the cloud segment occupies the largest share - it accounts for 9%. The share of this segment has not changed over the year. The third place in terms of revenue share is occupied by the logistics division - 6%. This segment is the fastest growing at the moment - Cainiao's annual revenue growth rate was 21%. The annual growth rate of Alibaba's clouds is no longer so significant - only 4%. At the same time, the division managed to reduce costs so that adjusted EBITDA grew by 24% and amounted to 1.4 billion yuan - the largest figure among all divisions except online trading in China. All of the above indicators are visually presented in Figure 2.2. [4]



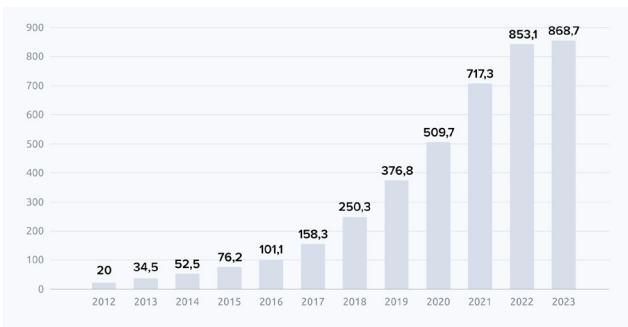
*Figure 2.2. Alibaba revenue structure by segment*

Source: [1]

Earlier, in the presented work, a reservation was already made to the fact that the Alibaba group of companies was chosen as a practical example for studying both marketplaces and ecosystems not by chance, since within the Alibaba ecosystem it is marketplaces that generate the greatest revenue. The fact is that cloud services, digital media, consumer services, etc. used mainly by Chinese businesses and consumers. And the “E-commerce retail China” segment (which is precisely represented by Alibaba’s marketplaces) is widely used in the global market. Access to a larger audience and continued demand for Alibaba’s marketplaces ensures first place for this segment.

At the end of the 2022 financial year, the company’s revenue grew by only 2% - to 868.7 billion yuan (\$126.5 billion). At the same time, adjusted EBITDA increased by 11% to 175.7 billion yuan (\$25.6 billion). Adjusted EBITDA margin also increased from 19 to 20%. Net profit changed by 17% to 72.51 billion yuan (\$10.6 billion). Free cash flow increased by 74% and reached 171.66 billion yuan (\$25 billion). Alibaba has a huge stock of cash and short bonds - \$81.6 billion. That’s more than three times its debt. The ratio of liabilities to assets is less than 0.2. This is a very comfortable level.

Alibaba’s revenue, shown in Figure 2.3, has always grown at a fast pace, but as the business has developed, maintaining high growth rates has become difficult due to increasing competition and increased oversight from the Chinese authorities [5].



*Figure 2.3. Alibaba group revenue, billion yuan*

Source: [1]

The figure clearly demonstrates that from 2012 to 2022 the company’s income grew 43.5 times - the average annual growth rate remained at 41%. This is due to the timely response to the crisis during the covid-19 epidemic and strict adherence to business strategies. However, over the past five years, the growth rate has



decreased slightly - to 23%, which is still quite good, since the average growth rates of competitors are lower: eBay - 17.71%, Amazon - 22%. When comparing revenue results, for example, between Alibaba and eBay, it becomes obvious that the first company is many times superior to its competitor. Since 2015, eBay has seen a decline in revenue of more than \$9 billion, which has significantly affected its performance in all subsequent years. This is due to a decrease in the number of unique visitors<sup>3</sup> to the platform. In 2015, Alibaba launched a new marketplace Taobao, so those same “unique visitors”, having tried the new Chinese platform, decided to stay, without returning to eBay. Moreover, Alibaba shows steady revenue growth, which over the entire specified period has never decreased, nor has it remained at the same level for two (or more) years in a row, but has only continuously increased.

Alibaba has stopped publishing operating and financial forecasts since 2020. However, in 2019, the company predicted the number of users to grow to 2 billion by 2036. Also, by this period, the company set a goal to increase turnover (GMV) at its sites to 10 trillion yuan (\$1.4 trillion). At the end of 2022, Alibaba’s GMV in China alone amounted to 8.32 trillion yuan (\$1.16 trillion). The company can successfully achieve each of its goals because China’s GDP growth rate significantly exceeds that of leading countries in the world. The online trading market has a positive outlook: at the moment, online sales in China account for about 45% of all retail sales.<sup>4</sup> By 2026, online trading is projected to grow from \$2.88 trillion to \$3.98 trillion, with the share of online sales reaching 52.1%. This will bring the company hundreds of billions of dollars in additional revenue. In March 2023, Alibaba announced plans to reorganize and decentralize its business. There will be six independent divisions within the company:

- 1) Cloud division - Cloud Intelligence Group;
- 2) Online commerce division - Taobao Tmall Commerce Group;
- 3) Logistics division - Cainiao Smart Logistics Group;
- 4) Division of local services (food delivery, mapping services) - Local Services Group;
- 5) International e-commerce division - Global Digital Commerce Group;
- 6) The division responsible for entertainment services is Digital Media and Entertainment Group.

Alibaba Group’s public entity will own its main asset, the Taobao Tmall Commerce Group (Taobao and Tmall). It accounts for the main profit of the holding. The remaining five companies will become private and may go public in the future. The separation of the company will allow investors to evaluate each division separately, and business groups will be able to independently raise financing.

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<sup>3</sup> A unique visitor is a non-repeating user who has unique characteristics and has visited the site for a certain period of time.

<sup>4</sup> <https://www.insiderintelligence.com/content/china-ecommerce-forecast-2022>

Since a significant part of Alibaba's revenue comes from online trading, first of all you need to pay attention to this segment. By 2026, the online retail market is expected to increase from the current \$2.88 trillion to \$3.98 trillion. At the same time, according to Statista forecasts, by 2026 the turnover in Alibaba online stores will grow to \$1.375 billion [2;4].

Alibaba is actively developing outside its home market, and the company has room to grow. For example, towards India: the development of the Internet and online trading can make this region one of the most profitable areas for Alibaba. For comparison: the Internet covers only about 50% of the population in India, in China - about 76%.

Alibaba Cloud holds 4% of the global cloud services market. According to forecasts, until 2030 the market volume will grow by an average of 14% per year. If Alibaba can even just maintain its share, then revenue will at least triple within seven years.

As you know, no matter how large and successful a company is, it, in any case, constantly carries certain risks. Alibaba is no exception here. In addition to tense relations with the United States and the risks of delisting from American sites, the risk of conflict between China and Taiwan has recently begun to emerge. In this scenario, the Chinese economy will face a recession, and the multipliers of Chinese companies will be much lower than global ones due to non-residents exiting their shares. In addition, Alibaba competes with other major players in the national market, such as JD.com and Pinduoduo, and in the international market, with Amazon and Ebay. If these plans fail, or if other e-commerce companies are able to offer unique benefits to consumers, intense competition could erode Alibaba's margins and weaken its position in the market. Finally, since the majority of Alibaba's business (67%) is in China, the company is exposed to political and economic changes in the country. We are talking about changes in legislation, tax rates and economic conditions that could negatively affect the company. The negative experience of the covid-19 epidemic, when China became one of the most affected countries, is not so far away. Even though the lockdown had a positive impact on e-commerce, no one can predict where the "new trouble" (crisis) will come from. Therefore, Alibaba should take care to minimize risks so that they do not become a serious reason for the company's decline in the future. A more structural analysis of the company's advantages and disadvantages is presented in Table 2.5. [3;5]

Сильные стороны	Слабые стороны
1. Ценность бренда (входит в топ-15 крупнейших компаний мира)	1. Китайский бренд (стереотипы о китайских вещах всегда низкого качества)
2. Огромная клиентская база (903 млн. человек по всему миру)	2. Ограниченное международное присутствие (не все национальные рынки освоены компанией: Индия, Туркменистан, Иран, Ливия, Африканские страны)
3. Умение расти в кризис (30% расширения бизнеса во время пандемии)	3. Прямая зависимость от государства, давление от регуляторного вмешательства китайских властей
4. Рентабельность собственного капитала (24,2% в 2022 году)	4. Ограниченные потоки доходов (хотя Alibaba предлагает множество сервисов, главным сегментом остается только эдектронная торговля)
5. Диверсификация продуктового портфеля (самый обширный список сервисов среди конкурентов)	
Возможности	Угрозы
1. Освоение новых рынков (рынок Индии)	1. Конкуренция (Внутренняя: JD/com; Pinduoduo; Tencent. Внешняя: Amazon; eBay)
2. Реструктуризация экосистемы (для более эффективного управления каждого подразделения и увеличения доли отдельных сегментов)	2. Торговые барьеры и политическая напряженность (Alibaba сильно зависит от внешнего рынка, введение торговых барьеров со стороны США сильно повлияет на компанию в негативном ключе)
3. Рост пользователей до 2 млрд, человек к 2036 году (благодаря торговой экспансии)	
4. Увеличение онлайн-продаж на 1,1 трлн. дол к 2026 году	

**Figure 2.5.** SWOT analysis of the Alibaba group of companies

Source: compiled by the authors

So, it's hard not to notice that the Alibaba group of companies confidently holds its own on the world stage thanks to its economic strength. In terms of brand value and return on equity, the company is not inferior to its Western competitors, and in terms of the size of its customer base and the wide range of services offered, it is the undisputed leader in global e-commerce. Despite the impressive results already achieved, Alibaba has room to grow: the chain "developing new markets - attracting new users - increasing sales" seems to be a very appropriate and effective strategy for the company, since Alibaba previously acted in exactly the same way, entering the markets of Europe, the USA and Russia. The political component still remains a weakness and threat for the group of companies, due to the impossibility of completely avoiding pressure from Chinese government institutions and the potential introduction of trade barriers in the event of an escalation of the conflict situation between China and the United States. However, the planned restructuring promises to significantly reduce existing risks, making each division of the company more autonomous. The most important of the upcoming changes is the division of assets, which seems to be a rather positive decision, since this

will allow investors to separately evaluate each division based on their own multiples. Also, the division of assets will potentially reduce the risks of regulatory interference from the Chinese authorities. Pressure from Chinese regulators on the IT sector over the past few years has greatly reduced the capitalization of many large technology companies in China. Now individual business groups will not be so large, and the sphere of influence of the parent company will decrease. Coming big changes always bring uncertainty, although the Alibaba group of companies has a fairly promising future thanks to its stable and good present [6].

At the same time, Jack Ma, due to criticism of the Central Bank of China that is unacceptable from this perspective and attempts to promote his unique financial innovations on the economic platforms of Chinese fintechs and unicorns, has already left the country to reduce the degree of criticism against him, going to Japan and South Korea, but emotions have always given way to reason, and his academic position as an emeritus professor and business innovator in the Celestial Empire remains the main achievement of Alibaba's growing digital ecosystem, which is only preparing for new rounds of its evolution and new market expansions [7].

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## THE ROLE OF AESTHETIC INTELLIGENCE IN BUILDING MODERN MARKETING STRATEGIES OF GLOBAL COMPANIES: MODERN VISION AND “THE ROAD TO THE FUTURE”

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**Abstract.** *This paper examines the concept and role of aesthetic intelligence as one of the key factors that must be taken into account when developing company marketing strategies and increasing brand loyalty.*

**Keywords:** *aesthetic intelligence, sensory marketing, brand code, target audience, marketing strategies, advertising campaign, consumer loyalty, level of customer involvement.*

In the modern world, it is not enough to simply produce high quality items. When making their choice, customers want their purchase to bring a different range of emotions. Brands that follow the principles of aesthetics stand out, are memorable and attract attention to their best qualities. They masterfully play on the five senses and derive considerable benefit from it.

The concept of “aesthetic intelligence” was first introduced in the 20th century by the Italian psychotherapist Piero Ferrucci. He developed a theory according to which aesthetic intelligence consists of three components:

- Aesthetic range;
- Depth of perception;
- Degree of impact.

Depending on the individual components of a person’s psychological portrait, each of the presented components has a certain impact on the formation of a person’s aesthetic idea of the world around him [1].

Pauline Brown, the former head of the North American division of Moët Hennessy – Louis Vuitton, a company that includes dozens of luxury brands, includ-

ing Christian Dior, Louis Vuitton, Tiffany & Co., Bulgari, took a fresh look at the meaning of the term in the 21st century. Loewe et al. She defines aesthetic intelligence as “the ability to understand, interpret, and express the feelings that arise in connection with an object or experience.” In her opinion, a developed aesthetic IQ reflects the presence of taste.<sup>1</sup>

The modern consumer no longer strives to accumulate material wealth. Now he is looking for the depth and significance of his experiences, so the most sustainable brands are those whose products or services have an ideological meaning and excite the imagination. Pauline Brown argues that modern business strives to engage all the senses and to do this, create products or services that are pleasant to buy and use in the future. According to research by marketers, 85% of purchasing decisions are made based on how a potential consumer feels about a product or service, and only 15% of cases are made on the basis of a conscious and rational assessment of the quality and practical functionality of the product. Thus, what is now valued is not so much utility as the sensory pleasure that a certain product or service provides.

Aesthetic intelligence is gradually being introduced into the construction of brand marketing strategies and is becoming more and more deeply rooted in the business models of the world’s leading companies. Aesthetic advantage allows companies to stand out from the crowd of other competitors in the market and make their product or service unique and inimitable. There are several principles of aesthetic intelligence in the context of the development of marketing strategies of companies:

1. Creation of new forms of creative expression;
2. Constant monitoring of changes in the preferences of the target audience;
3. Development and formation of aesthetic principles in business

Based on this, one might assume that the constant introduction of innovations, modifications and creative ideas will help companies become aesthetically unique, but this is far from the case. Marketers argue that there is no need to radically re-draw brand codes and completely modify the composition of a product or service in order to increase demand [2].

A code is clear and recognizable distinctive features, brand markers that encapsulate its philosophy. Companies must carefully and precisely define the unique concepts that can later become the core of their value proposition and that will be difficult for competitors to copy. Certain brand codes can be bright slogans that evoke an emotional response (the famous Nokia ringtone and the roar of a lion from the screensavers of MGM films) - all of them are capable of awakening associations. Strong visual codes can arise when brands use or “own” certain colors

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<sup>1</sup> Aesthetic intelligence. How to develop and use it in business and life / Pauline Brown; lane from English N. Bragina. – Moscow: Mann, Ivanov and Ferber, 2023. – 320 p.

(Tiffany & Co.'s aquamarine brand, Coca-Cola's red bottle labels). In addition, symbols (the hare from an advertisement for the Energizer battery brand), the texture of a material (a Chanel tweed jacket), and even the recognizable shape of a product (tall cylindrical containers with Pringles chips) can become brand codes.

According to Pauline Brown, codes are a company's most valuable asset because they form strong and lasting emotional connections between customers. They serve as the basis for a product's attractiveness, what economists call demand. The richer the history of a brand, the stronger and more stable its codes. Accordingly, innovation and the introduction of creative concepts should not go against the codes and DNA of the brand; only in this way will it be possible to achieve a balance between the company's historical heritage and its readiness for renewal [3].

In addition to brand codes, modern specialists quite often use sensory marketing (neuromarketing) - sensory influence on customers before, during and after direct interaction at the point of sale. Traditional marketing techniques cease to have an effect on the consumer, since the market is oversaturated with various types of goods and services. People are so accustomed to advertising on TV, handouts, media, banners and billboards that they do not pay attention to them at all and are increasingly beginning to perceive them as information noise. Therefore, companies are looking for new ways to engage customers with a product or service. For example, Rolls-Royce found that fragrance can be directly related to profit. After car manufacturers replaced wood trim with plastic, they noticed that the company's sales began to decline sharply due to the unpleasant smell of plastic, which customers could not associate with the smell of "luxury and high quality" of cars. After extensive research, Rolls-Royce's marketing team brought in a fragrance expert to create a special scent that imitates the scent of wood found in previous models. After this, the aroma was sprayed inside the interiors of new cars with plastic coating. Thus, sensory marketing is part of the concept of aesthetic intelligence and directly shapes the brand image, making it unique compared to other competitors in the market [4].

Analysis of the target audience is also one of the key factors when building a company's marketing strategy. According to Clayton Christensen, a professor of business administration at Harvard Business School, the more pleasant a consumer's experience after purchasing a product, the more loyal he becomes to the brand. What comes to the fore is not just observation and tracking of customer behavior, but also a sense of empathy, involvement, the ability to understand and see consumers not as people who just want to consume, but as individuals with their own interests and experiences. At the present stage, empathy is a key element of work for continuous business improvement. Companies that are able to offer a product that touches the senses and emotions have a chance to outperform many competitors.

The most striking example confirming the importance of empathy for customers for business development and product promotion is social advertising videos as part of the global marketing campaign “Thank you, mom” (translated from English as “Thank you, mom”) from the American multinational company Procter & Gamble. The campaign has been running since 2010, and has subsequently become one of the most prominent global marketing initiatives for the Olympic Games, specifically designed to honor the mothers of athletes. The campaign’s overarching goal was to create a deep emotional connection between P&G, its diverse portfolio of brands and consumers, thereby uniting P&G’s 34 brands within a single narrative of champion mothers who, like their children, did everything possible to become the best in their business. . The campaign was widely praised for its emotional resonance and authenticity, resonating with audiences around the world. With over 74 million video views, the campaign achieved unprecedented levels of awareness and engagement. Moreover, P&G reported a significant increase in sales, generating an additional \$500 million in revenue due to the success of the campaign. The campaign’s lasting impact prompted P&G to extend its “Thank You, Mom” initiative to subsequent Olympic Games, cementing its position as one of the most iconic and effective marketing campaigns in corporate history. Thus, by celebrating the universal connection between mothers and their children, P&G created a meaningful connection with its target audience, resulting in unprecedented levels of engagement and brand loyalty [5].

At the present stage, the introduction of aesthetic intelligence into a company’s business strategy opens up promising opportunities for development and increasing involvement in the brand of a product or service. When companies engage with customers on an aesthetic level, they win. Many non-luxury sectors that have traditionally focused on scale, efficiency, and innovation have had their personal economic and customer value undermined through neglect, misunderstanding, or underinvestment in aesthetics. The automation of modern society means that some jobs will now be performed even more by computers: analytics, sorting and interpreting parts, and even scheduling physical tasks and jobs. However, people are still able to use their talents and abilities in creative activities that modern technology has not yet been able to surpass, including the ability to create works of art, come up with innovative creative solutions and establish deep human connections.

Aesthetics in business starts from the very top - from the company’s management’s own level of aesthetic intelligence. Keeping up with the times, marketers need to adapt to the ever-changing tastes of their customers and skillfully adapt to them over time, while maintaining their unique characteristics and brand code. While aesthetic intelligence begins with developing one’s own aesthetic sensitivity, it also requires a deep knowledge and respect for the feelings of others, since empathy is an important component in developing a company’s loyal customer base [6].



Therefore, the development of aesthetic standards and associated marketing strategies is essential to maintaining the economic and social sustainability of people and businesses in general.

Moreover, modern creative industries are rewiring the brains of the consumer, laying in them unconscious trends in the development of the capabilities of the manufacturer, who has moved away from the standards of “innovative leaps” for the sake of the struggle between originals and substitutes, who is not ready, in an era of resource scarcity, to follow the standards of Abraham Maslow’s pyramid and not accept the apparent availability of behavioral economics by Daniel Kahneman and Richard Thaler [7].

Far from it, such a creative always pushes the world towards the patterns of his madness, to the deviant leaps of his aberrations and swaddles every inexperienced mind with his concepts of virtuality and time, quality and diversity, which will always be at the junction of the classical psychology of Sigmund Freud and the neocons of unrestrained shopping and the education of “civilized” consumers” of the dense forest of seeming solutions to freedom between virtual worlds and digital ecosystems, binding a person in the world of hints and dreams, imposed desires and nausea of Jean-Paul Sartre in the eternal rivalry with Albert Camus for aestheticism and against total loneliness [8].

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## ANDRAGOGICAL FACILITATION AS A LEADING APPROACH IN ORGANIZING COLLABORATIVE TEACHER TRAINING AT SCHOOL

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**Annotation.** *The article discusses the concept of facilitation and the possibility of its use in the system of additional professional pedagogical education, in an educational organization, in the workplace, and in a school for adult education. The role of andragogical facilitation for intra-school collaborative learning of teachers is revealed.*

**Keywords:** *teachers, andragogy, facilitation, collaborative learning.*

In-school teacher training and on-the-job training are becoming increasingly popular these days. There are several reasons for this. One of the most significant is the exorbitant amount of professional workload that falls on the “shoulders” of teachers (these are reports, work programs, lesson plans, work checks, personal participation in projects and competitions, preparation for certification, and participation in conferences, and management of student project activities, and much, much more). Therefore, on-the-job training, without traveling, and even on personally significant problems, becomes an effective means of professional growth and development of teachers. Another reason is related to the insufficient readiness of the advanced training system to “go” to the workplace and school. It is easier for teachers working in the advanced training system to conduct classes in a stable workplace, with well-functioning equipment, free classrooms, the ability to quickly exchange information between study groups, etc, etc. But at the same time, the specific request of teachers is not implemented. Therefore, it seems important to us to consider teacher training in school using group work and implementing andragogical facilitation as a leading approach.

Facilitation is considered in a number of scientific and methodological works: L.A. Zubova studies the conceptual apparatus of the phenomenon, highlighting

the features and differences between facilitation and mentoring, mentoring, coaching [3]; S.Ya. Romashina considers the essence and ways of implementing pedagogical facilitation in education [8]; L.V. Adonina explores the possibilities of facilitation in group work [1]; M.O. Goncharov considers the role of facilitation in the development of the pedagogical culture of subjects of the educational process at a university [2]; G.P. Novikova, E.A. Sidenko study the features of basic facilitation [7]; A.M. Ryabkov considers facilitation in vocational education [9]; E.A. Sidenko explores the instrumentality of the concept of facilitation and the possibility of its use in the system of additional professional pedagogical education, in an educational organization, in the workplace, at school [10, 12, 19]; A.B. Yuriev considers the use of facilitation in institutions of continuous education [15]; E.V. Shirinkina studies the possibilities of facilitation for effective organization of work [14]; L.E. Khaludorova uses facilitation to organize interaction between teachers [13]. Andragogical facilitation stands out in particular, as it combines the possibilities of adult learning - andragogy and the possibilities of facilitation as a pedagogical tool. Andragogical facilitation is a pedagogical approach aimed at adult learners [5, 6, 7, 11, 16, 17, 18, 20]. It can serve as an effective method for promoting collaborative learning among teachers. Collaborative learning in school and the workplace is becoming increasingly important as it promotes teacher professional development and improves student learning outcomes.

Andragogical facilitation is based on the principles that adults:

- Self-motivated and have clear learning goals.
- Have a wealth of life and professional experience.
- Prefer hands-on and reflective learning.
- Need a respectful and supportive environment.

Collaborative learning (i.e., collaborative learning) is a pedagogical approach in which group work is carried out to solve a problem, complete a task, or create a product [4, 7, 19]. Collaborative learning in the workplace and at school includes:

- Teachers working together to solve problems.
- Exchange of knowledge and experience.
- Collaborative lesson planning and development.
- Providing mutual support and feedback.

Andragogical facilitation can support collaborative learning for teachers in the workplace by providing:

- Respectful and supportive environment: Facilitators create a trusting environment where teachers feel comfortable sharing ideas and learning from each other.
- Personalized approach: Facilitators recognize the unique needs and experiences of each teacher and tailor teaching methods accordingly.
- Practical and reflective experiences: Facilitators engage teachers in hands-on learning and reflection, allowing them to apply new knowledge and skills to real-life situations.

- Opportunities for collaborative problem solving: Facilitators facilitate collaborative sessions where teachers can collaborate on complex problems and find creative solutions.

- Ongoing Support: Facilitators provide ongoing support to teachers to help them overcome challenges and achieve their teaching goals.

We can highlight the advantages of collaborative in-school teacher training using andragogical facilitation, such as:

- Increased professional development and self-development.
- Improved student learning outcomes.
- Creating a more positive and supportive school culture.
- Increasing teachers' satisfaction with their teaching work.

We can highlight the advantages of collaborative in-school teacher training using andragogical facilitation, such as:

- Increased professional development and self-development.
- Improved student learning outcomes.
- Creating a more positive and supportive school culture.
- Increasing teachers' satisfaction with their teaching work.

Conclusion. Andragogical facilitation is a powerful tool for promoting collaborative learning among teachers in the workplace and at school. It creates a supportive environment in which teachers can learn from each other, solve problems together and improve their teaching skills and competencies.

By incorporating andragogical facilitation into collaborative learning programs, schools can create a more professional and effective work environment for their teachers.

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## METHODOLOGY OF GYMNASTICS TRAINING FOR CHILDREN WITH LEARNING IMPAIRMENTS

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**Abstract.** *The article describes the specifics of gymnastics classes for children with learning impairment. Developing such activities for children with special needs is relevant at the present time. The author provides the content of exercises included in the training, and the approximate content of classes. The study discloses the methods applied as well as approaches to children's physical development.*

**Keywords:** *individuals with learning impairment; gymnastics; adaptive sports; training methods; means of physical training.*

### Introduction

According to RBC.ru, there are approximately 15 million persons with some kind of disability in the Russian Federation [1, 2]. This amounts to 10% of the country's entire population. The increase in the number of individuals with special needs poses a challenge to their integration in the society. Sports and physical education act as a special guide in the educational environment [3, 4].

Physical education is a basic element of the training system, and the development, treatment and education of children with intellectual disabilities [5]. Children with learning impairment have problems with motor deficiencies, poorly developed coordination (which is difficult to improve) poor spatial orientation and low power capabilities of the body.

These specific features of children with learning impairment affect not only physical development, but also the child's overall health. For example, the body becomes more vulnerable to viruses and infectious diseases.

Therefore, coordination and motor skills are the basis for the physical development of children with intellectual disabilities.



### **Methodical specifics**

All mental-cognitive processes are directly related to the development of the speech apparatus. Children with learning impairment face significant difficulties in communication and thought. They have difficulties in formulating and reciting their thoughts and constructing coherent information.

The main objectives when teaching children with intellectual disabilities are:

- to control movement (different types of walking, running, jumping, stepping, etc.)
- to learn basic drill commands (directions of movement, etc.)
- to achieve spatial orientation, to use the space around him/her for activity in it;
- to develop coordination of hands, arms, fingers, legs movements with the use of visual control;
- to develop rhythmical movements, to perform alternations, repetitions of exercises and ligatures;
- to strengthen and correct the posture, to prevent various diseases of the spine;

Gymnastics is a complex coordination sport. It includes a large number of exercises to develop flexibility, speed capabilities of the body and strength.

When compared to other sports, a great variety of resources allows you to select and dose the load, so that they are commensurate with the qualifications of the athlete, their physical development and other characteristics of the participant's organism.

The interval type of training prevails in gymnastics. It is performed in a relatively short period of time and alternates with pauses to rest. This allows both professional athletes and children with disabilities to quickly recover after loads and maximize their performance.

Another positive aspect of gymnastics is the wide variety of exercises and their practically endless combination.

Various combinations of exercises help increase the productivity of training and physical development of children with intellectual disabilities. Motor abilities are directly proportional to the number of gymnastic elements achieved by a child. A much faster way of achieving coordination, strength and flexibility is to combine elements.

Another important methodical feature achieved when teaching gymnastic is the universal solution of different teaching problems.

The competent use of the means and methods of gymnastics helps the trainer improve the health of children, develop basic physical qualities, improve motor actions and skills, and tackle the challenges associated with gymnastics.

Training in gymnastics is based on the division of physical activity, according to the objectives of the class, the problems to be solved and the exercises to be used for this purpose.

Gymnastic equipment helps to expand the range of tools used.

The equipment can be of different heights, width and other additional characteristics and properties. This changes the difficulty of performing gymnastic exercises.

Children with learning impairment cannot perform the exercises and combinations performed by able-bodied athletes.

Therefore, coaches need to develop alternative regimes. The exercises need to be adapted for each child. They may be simplified to general physical exercises or be a special physical training exercise.

The following must be used in classes for individuals with intellectual disabilities:

- exercises with elements of artistic gymnastics, with the use of equipment (ropes, ribbons, balls);
- simplified exercises using sports equipment;
- games involving gymnastics and general movement;
- exercises with elements of choreography, e.g., learning dance steps, basic rhythm;
- fitness and sports aerobics exercises: steps, jumps, coordination of hands and feet to music.

The most beneficial environment is training together with parents or other family members.

The training process in complex coordination sports is based on mastering complex and precise movement technique. Therefore, a separate constructive method and a method of holistic performance of exercises is preferable. Each element is divided into parts for ease of learning, memorization and repetition.

### **Conclusions**

Gymnastics is a huge resource of means and methods of development for persons with learning impairment. Gymnastics focuses mostly on methods of teaching motor actions, allowing children with learning impairment to develop successfully, not only physically, but also intellectually. A variety of gymnastics exercises make the training process bright and varied, and take into account the individual characteristics of each child.

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## PSYCHOLINGUISTIC FEATURES OF THE LINGUISTIC OF THE CHARACTERS' WORLD PICTURE IN THE MOVIE “WHO’S AFRAID OF VIRGINIA WOOLF?”

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**Abstract.** *This article is devoted to the study of psycholinguistic features of the linguistic picture of the world of characters in the movie “Who’s Afraid of Virginia Woolf?” 1966 movie directed by Mike Nichols. In the film industry, language plays a key role in the formation of images and the transmission of emotions, and psycholinguistic research allows us to better understand the mechanisms of speech perception in movies. Both the content of an utterance (semantics) and individual lexical units, lexical and grammatical features are valuable.*

**Keywords:** *psycholinguistics, cinema, linguistic picture of the world, character, manipulation, language.*

### **Introduction**

Language is a key element of communication, and the analysis of language and the linguistic artistic picture of the world of this or that character allows us to understand the nuances of thinking of the characters of literature/theater/film, their motives and desires, as well as how their actions and words affect the development of the plot.

The relevance of the topic that have been chosen to study is due to the fact that the linguistic picture of the world plays an important role in creating the characters’ images and understanding their inner world. It creates a special universe in which the characters exist [6]. In addition, analyzing the language that the characters use can help to determine the peculiarities of their personality, as well as to identify which psycholinguistic aspects were used by screenwriters and directors to create the most full possible characters’ images.

The purpose of this paper is to study the psycholinguistic features of the linguistic picture of the world of the characters, as well as to analyze its influence on the perception of the characters' images and the general development of the plot.

### **Methods**

The following methods were used in the course of the work: comparative method, method of contextual analysis, semantic-stylistic method, as well as the method of psycholinguistic observation and the method of solid sampling. The results of the study can be used in the future not only to study the peculiarities of the formation of the linguistic picture of the world of characters in other films and literary works, but also to develop classifications of psycholinguistic techniques of verbal violence.

### **Literature review**

The methodological basis of the study is formed by the works of V. L. Belyanin, A. A. Brudny, V. I. Vaisfeld, Y. M. Lotman, J. Field and others.

The term “linguistic picture of the world” was introduced into scientific use by German educator and researcher L. Weisgerber: “The vocabulary of a particular language includes as a whole, together with the totality of linguistic signs, also the totality of conceptual thinking means that the language community has; and as each native speaker learns this vocabulary, all members of the language community master these thinking means; in this sense, we can say that the possibility of the native language consists in what it contains in its concepts defined by the language community [9].

Researcher P. B. Parshin emphasizes in his works that, on the one hand, almost any manifestation of language structure can be used for speech influence, and on the other hand, there is only one instrument of speech influence in a certain sense - the use of a meaningful change in language structures, in which the differences between them are ignored by the addressee, and as a result one of several possible subjective interpretations of the surrounding reality is imposed on a person [8, p. 248].

According to P. B. Parshin there is the following classification of levels of linguistic manifestations of manipulation: lexical, grammatical, phonetic, graphic.

J. Mity notes that the internal form of a movie is usually more flexible than many other works of art. And if the internal form of a film resonates with the perceptions and experiences of the viewer, the film has the right to be called a work of art as it evokes a corresponding emotional response. It is often the case that when creating a film, it is not the internal that is the most important part, but the external form, the play with color, the structure of the frame, the intonations, tones of voice. What becomes most significant is not the internal content and meaning, but the set of artistic images that dominate the minds of both creators and viewers. [7, p. 79] A film is a product of collective work, so when analyzing it, as most film

theorists emphasize, it is necessary to pay attention to the difference between the positions of the cameraman and the director of the film, which is of fundamental importance also in the psycholinguistic analysis of works of this kind of art.

### **Results and Discussion**

While watching the movie, one cannot help but notice that it is inside, in the dwelling of George and Martha, that the director's skill allows him to achieve the foreboding and anxiety that the author of the play, Edward Albee, has so thoroughly and thoughtfully incorporated into the plot. It is not so much a house as a labyrinth, the gray squalor of which reminds Martha of her husband's failures. Wexler's (cameraman's) camera follows George and Martha relentlessly through this playhouse.

In the course of our research, we identified the purpose of the characters' language in "Who's Afraid of Virginia Woolf?". We concluded that language is a verbal weapon for its characters and, moreover, they masterfully use it as a mean of manipulating each other. Even comic elements and seemingly harmless compliments and affectionate addresses in this movie serve as a pretext for the use of verbal violence. Both spouses are "playing" the "big game" of manipulation and are unlikely to be able to stop.

Let's look at a few examples of characters using language as a weapon to inflict psychological and emotional harm:

George's jokes are barbed and even insulting:

**- *Martha is a remarkable woman. I imagine she weighs around 110.***

Martha, unable to cope with her disappointment in her husband and her subsequent anger, compares him to a swamp. She doesn't stop at one comparison, she uses gradation, and raises her voice with each subsequent word uttered:

**- *George is bogged down in the History Department. He's an old bog in the History Department. That's what George is... A bog, a fen, a G. D. Swamp. Hey, swamp! Hey, swampy!***

The dialogues of the characters seem artificial and fake, this is how the screenwriters managed to "remove" all the "masks" from the characters and expose their true nature. We should also mention that the play "Who's Afraid of Virginia Woolf", which formed the basis for the script of the movie of the same name, is an excellent example of an absurdist play. The characters of the work are alienated from the outside world, they are totally lonely. George and Martha resemble clowns who laugh and suffer for the amusement of the audience.

An excellent example of their "artificial" dialog:

**- *I'll hold your hand when it's dark and you're afraid of the bogeyman.***

**- *And I'll tote your gin bottles out after midnight so no one sees.***

The presented "exchange of barbs" also seems like an awkward attempt by the characters to show concern for each other.

The choice of the word “daddy” at times when Martha is talking about her father should be noted:

- *George hates Daddy. Not for anything Daddy’s done to him, but for his own...*

- *But Daddy took a look at Georgie’s novel.*

The word “daddy” is slang, often used by children when referring to their father/father figure, although sometimes this particular form of the word has sexualized connotations. In this case, we can assume that Martha speaks of her father in this form in order to annoy her husband, emphasizing her particularly tender and reverent (childlike) attitude towards her parent.

Martha insults George using profanity:

- *All right, you son of a bitch!*

It should be noted that the use of profanity is directly related to Martha’s level of self-control: while staying calm, although sarcastic, she communicates politely and even respectfully, but as soon as she becomes nervous, profanity dominates in her speech.

George’s speech has fewer emotional “outbursts” compared to Martha’s, he uses much more direct threats: *“Shut up, Martha!”*, *“I’ll kill you”*, *“You’re a spoiled, self-indulgent, dirty-minded, liquor-riddled...”*, *“My God, you’re a wicked woman!”* (“wicked” - morally “broken”). It is the “broken” that George considers his wife to be.

It is noteworthy that he calls his wife affectionate nicknames (*“baby”*, *“sweet-heart”*, *“honey”*), saying exactly what she wants to hear, which is another method of manipulation.

The linguistic picture of the world is what characterizes the character’s origin, peculiarities of his thinking and hidden motives in relation to other characters. Lexical and grammatical characteristics of the characters’ statements can characterize the character’s past, his relations with society and close environment. [1] We were able to assume that perhaps the characters of the movie under study had love relations, but mutual offenses turned once sincere compliments and affectionate addresses into scathing jeers and ironic mockery.

### **Conclusion**

In the movie industry, verbal and non-verbal elements play an important role in creating a complete image of a particular character. Directors often use figures of speech (metaphors, allusions, comparisons) to create the most complete linguistic image of the character’s world.

It is impossible not to note the conclusion that in the film each character has a certain linguistic style characteristic of people who grew up in the same conditions and experienced the same events as the hero of the film.

We also determined that psycholinguistics is used in the film industry to analyze a character's thought process and adjust how a particular image will affect the viewer and how the character's speech will change in different life situations.

Dialogues and monologues are some of the main verbal tools for creating a complete picture of a character. They reveal the character's true motives, the intricacies of his relationships with friends and family, and even his past.

Moreover, the context and situation influence the choice of certain vocabulary and syntax that prevail in the hero's speech. Action movies are characterized by rough, short phrases filled with slang and profanity, and drama – extended sentences with metaphors and epithets. Also, the style of speech of characters is influenced by specific situations and even the atmosphere of a particular movie.

Verbal violence is not uncommon in movies – a complex and not fully explored topic in cognitive linguistics, which is a science that studies the methods of manifestation of linguistic manipulation as a subspecies of verbal violence. To date, there is no single and clear classification of the ways of linguistic manipulation. However, some scholars claim that manipulation can be achieved at all levels of language structure. It is worth noting that manipulation is considered successful only if the addressee of the message perceives the information as something objective without additional meanings and subtexts.

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## RUSSIAN FOOD CULTURE AS A FORM OF HEALTH CONSERVATION

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**Summary.** *The article is devoted to the nutrition culture genesis in Russia and to its socio-cultural conditioning, while the authors show the Russians' attitude change to a nutrition culture, systematize the available empirical data of the given problem and present their own author sociological studies conclusions, postulating the following thesis that food culture is one of the most important factors of the optimal health maintaining, that expressed the life expectancy (longevity), a reproductive health, and also a quality of life without an intervention any medicine.*

**Abstract.** *The historically developed food culture in Russia is associated with a number of socio-cultural factors that ensure the human health, as evidenced in this article. In the structure of the theoretical and methodological systematization this work introduces the certain additions, enriching and concretizing the factor interdependence of the nutrition and health culture. The considered biosocial model presupposes the priority of social attributes with the active of person participation in social activities. A chronological description of the food culture features in Russia, focused on the justified conservatism of tastes and preferences, ethno-stereotypes associated with human adaptation in different climatic conditions and established traditions is given. The modern market relations differentiated the nutrition culture, commercialized the public life, offering a wide variety of the food market, which, in turn, led to the integration of tastes and preferences of consumers. In this regard, the following thesis is asserted: in modern Russia the nutrition culture is still at the stage of its formation, and the process of its formation depends on the socio-cultural and behavioral features of the towards health attitude. The latter fact is proved in the given author's empirical sociological studies. From the analysis of experimental data it is revealed that their formation of a food culture is formed not only from upbringing and propaganda, but also involves the stability of a whole set of motives: individual, family, group interests and needs, as well as adaptation, goal-setting, self-organization and self-regulation. Influence on*

*them also has the social role and personality functions, statuses, prestige, which determine the general behavioral orientation of individuals. In this connection, the authors consider the culture of nutrition as a system of human life-actions, determined by the harmonious unity of physical, mental, cultural, social functions, ensuring full-fledged health.*

**Keywords:** *nutrition culture, health, traditions of Russian cuisine, food.*

Human health is a complex, multilevel phenomenon. Its preservation is determined by the impact of the whole range factors: economical, socio-psychological, climatic, spiritual and cultural conditions, and also largely determined by the individual attitude to his health.

Recently there have been significant changes in the impact ratio of these factors. One of the objective factors of any nation health is the established centuries-old nutrition culture, which is directly connected with mentality, religion, traditions and norms, climate and seasonal changes in the human biorhythms, which means that it corresponds to the way of the certain ethnic community life. Thus, we can argue that the a nutrition culture is mediated not only by established technologies, but also by socio-cultural factors, the most important of which are the provision of optimal health for the person living in a particular territory, and also expressed in the expectancy life (longevity), the ability to have children, to maintain a full life without the intervention of any medicine (drugs, dietary supplements, medical advice etc).

At present among the Russian authors, who study the problems of the social and cultural factors influence on health, it is possible to point such researchers as Tishkov V.A., Dmitrieva T.B., Posozhny B.S., Nilov V.M., Chernova N.A., Kazaryan E.A., Kaplunov O.A., Vyalykh N.A., Shlyapnikova M.N., Vinogradova S.V., Klokov K.B., Krasovskaya T.M., Yamskov A.N. [1]. Among the western researchers, who paid attention to the relationship between the nutrition culture and health, we can name, first of all, Marmot M.G. and Wilkinson R.G.

Some researchers identify the health risk factors such as socioeconomic conditions, including stress, early childhood, work, unemployment, a social support, a chemical dependence, nutrition, transportation and social estrangement [2]. According to most scientists, the influence of social factors to health has a dominant character that determines the effect of another factors, the scientific community has not yet developed the general theoretical and methodological basis for their analysis, which complicates the process of comparing the results obtained by different researchers.

The health of modern man is considered in various aspects: medical, psycho-physiological, medical-biological, economical, socio-political, cultural, moral and aesthetic, etc. There is a mutual connection and interdependence between

the sciences that study health, relations of interdependence and cooperation. Moreover, they simultaneously use not only different definitions, but also different approaches to their formulation. In the work by P.I. Kalju presented about 80 definitions of the “health”, proposed by representatives of various scientific schools and directions [3]. The negative health essence and interdisciplinary status of this category, as a subject of scientific research, allow talking about health in the context of Medicine, Biology and Biotechnology, Philosophy, Anthropology, Sociology, Psychology, Economics, etc.

The authors adhere to the biosocial model methodologically, where the biological and social factors are included in the notion of “health”, which are considered in unity, but social factors are given priority, and “health” is defined as normal, optimal functioning of the organism, providing the person with the ability to the basic social functions and his participation in social activities.

As to the “nutrition culture” we mean the certain set of products using for cooking, the process of cooking in accordance with real standards adopted in this socio-cultural space, as well as the eating traditions and customs (time, space, clothing, the number of meals per day, the amount of food, etc.).

The nutrition culture in Russia has evolved and is closely connected to the country history and has its own characteristics. Let’s name some of them:

1. Traditions of Russian cuisine were formed by ancient Slavs, today the descendants of which are Russians, Macedonians, Serbs, Ukrainians, Byelorussians, Czechs, Poles, Croats and Bulgarians. Slavs mainly worked outdoors, so they ate once a day, this factor determined the necessity of the presence the high-calorie food in their ration, which saturated them until the end of the work day. In addition to this factor, the calorific value of Russian cuisine is also determined by the harsh climate, a long cold period during which the human body must have a resources supply (fats, proteins) for the life support. In this regard the main products list in Russia includes bread, potatoes, eggs, milk, meat, butter and fish. In Russia they can grow only vegetables that are able to withstand the wind; they are grown in summer and harvested for the future using (potatoes, onions, cabbage, carrots, beets, turnips).

2. The eating traditions in Russia during the Christianity period are tied:

- to Orthodox holidays (Easter, Radunitsa, Christmas, Baptism, Annunciation, Shrovetide, etc.);
- to the nutrition culture and traditions of the different social human structures;
- to the geography aria and Russia regions according their culinary colours.

3. It is necessary to point that the daily nutrition culture in Russia is the following [4]:

a) it has three main meals, folding during many centuries: breakfast, lunch and dinner. Breakfast is a morning meal, before leaving for work, it’s about 7-8 am in

the morning; lunch begins in Russia from 12 pm to 1 pm till 2 pm; dinner usually is at 19-20 pm;

b) it considerably includes bread at each meal: for breakfast, traditionally eat white wheat bread (biscuits, loaves, bagels), at lunch - rye (“black”) bread, for dinner - at one’s choice. It’s no secret that everyone in Russia knows the proverb “Bread is the head to all”, but here we must also remember another one: “The man doesn’t live only by bread”. That means the binary of Russian nature, the ambivalence of the mentality, but at the other side – the emphasizes spirituality (to the counterweight to utilitarianism) as the most important component of Russian national consciousness and everyday life;

c) it suggests the conservatism, particularly, in the Russian tradition - to prepare some meals at home, occasionally allowing yourself to go with friends to a cafe or a restaurant to celebrate some occasions that represents Russia closer to the Eastern culture. In Russia, just like in the East, they like big feasts, and are able to receive guests and “go to visit”, which always involves the common meal at a large table and joint purchases for a common table (it is not customary to come to one’s place empty-handed even “for tea”);

d) in the daytime ration there is a liquid hot food’s dish, it’s often some soup. Of course this fact is related to the climatic conditions in Russia, where the temperatures are often low, and hot liquid food warms quickly. The traditional Russian soup is “borsch”, one of the main ingredients of which is beet, that gives a special red color to the soup. Borsch is cooked with meat, it can be either beef or pork, it is always served hot with sour cream, contains a lot of calories and sates one’s body for the whole day. The aboriginal Russian dishes are also: beef stroganoff, pancakes, caviar and different pies.

4. In Soviet Russia the nutrition culture was the result of a purposeful activity of the government, which left the distribution of food and formed the strategic food policy. At times even life itself depended on food, but even in the 20-s and 30-s of the twentieth century the mass hunger of the population could not affect the change in the country political course, while the main factor was the issue of the food security of the population [5, 6], especially it was in the post-revolutionary and war years (1941-1945). Of course there is a little to tell about the aesthetic of the food intake component, etiquette, and in general the socio-cultural norms in the revolution conditions, and also the mass starvation or war.

5. In 50-s till 60-s of the XX century the nutrition culture in Russia was determined by the thesis that urban women workers and the social toilers value their time and do not want to spend it staying at a stove for many hours, and therefore was represented, mainly, the ready-made factory food products and balanced food at the public catering establishments - canteens, teahouses, snack bars, buffets. The Soviet woman was oriented to use her time not only for keeping her house-

hold, but mainly in production, cultural work, and the children upbringing. At the same time the producers of food products were given a clear goal of ensuring its high quality, the health strengthening of the Soviet man. Among those tasks were such as increased consumption of the ocean fish, fresh and canned fruits and vegetables, with the maximum possible elimination of the seasonal downturns, increased use of legumes, changing vodka (as a hard drink) to the grape wine, the production expansion and consumption of fruit and berry juices.

6. The modern Russia emphasis the nation health, therefore: chooses the quality Russian food from the national factories and farms; refuses food imports; tries to eat without doubtful imported semi-finished products; do not keep some food styles of American fast-food and street-food. Today, even in the Russian megacities' streets, every tourist can buy the traditional dishes - pancakes, pies, potatoes, "chebureks", etc.

It should be noted, that in recent years the Russian economic consciousness has also changed: the trend to have a bakery/restaurant as an important business where the customers are offered some Russian bread/dishes of national cuisine has become fashionable. So, the businessman Alexander Goncharov opened two restaurants with Russian cuisine according to the recipes of the 19-th century, where only the products of the Moscow region peasant farms were used. He told the German journalist in his interview: "The market of bio-products in Russia was still in its infancy, but gastronomy in Russia was booming. That year their turnover was three times more than in" [7].

As the modern foreign media point out and in, earnest and seriously, in the new Russian food culture we are not talking about some patriotism, but about the fact that many local Russian products are better more and more [7]. At the same time the President of Russia, Vladimir Putin, supports the growing interest in domestic natural food and Russian cuisine – at first, for economic reasons, but this interest is also determined by the belief, that much can mean the understanding their ethno identity going through their native, a centuries-old nutrition culture. Therefore there are many patriots and supporters among many new food producers of such V. Putin's ideas in Russia.

Thus, the modern food culture in Russia consists of a clear government policy to preserve the population health [8], the formulation of domestic scientific concepts about the appropriateness of preserving the nation health and the formation the special food culture; popularization of the healthy lifestyles (in the media, schools, universities), the purposeful formation, among the population, the country mass views about the Russian health culture.

However, it should be noted that the nutrition culture in the new Russia of the 21-st century is still in its infancy, as there are a number of problems to be solved:

- a long way from a producer to a consumer;
- a low quality of raw materials and products;

- a presence of the frozen substandard semi-finished products;
- using the preservatives and some chemical additives.

There is also a whole range of issues that weigh down the objective “leveling”, of the state situation with food.

So, the sociological studies in Russia show that the conscious health saving problem in Russia is associated, first of all, with mentality. If 150 years ago in the causes mortality structure, which can be considered as an extreme form of ill health manifestation, exogenous factors predominated (most people died from circumstances related to external conditions of life - hunger, epidemics, infectious diseases), but now the endogenous factors are manifested more – as non-infectious chronic diseases, often due to a lifestyle and a human behavior. This is confirmed by the World Health Organization’s data, according to which human health is only 10% dependent on the health care institutions work, 20% depend on heredity, 20% on environmental quality, and 50% on lifestyle. That’s why the study of the socio-cultural and behavioral features of attitudes toward health is becoming increasingly urgent [9].

In 2009, the All-Russian Center of Public Opinion Study (WCIOM) [10] published some results about the assessment of their health by Russians. Recent years the proportion of the Russians assessing their health as “good” or “very good” has changed insignificantly: from 2006 to April 2009 it ranged from 27% to 31%; in April 2009 24% - considered their health to be good, 3% - is very good. 49% reported a satisfactory state of health, 23% of the Russians complained of poor health (19% - weak, 4% - very weak). Since 2006 the shares of these respondents have also changed insignificantly. And the higher the self-esteem of the material situation of the Russians, the more often they are satisfied with health of their relatives: 75% of respondents are with high self-esteem of their material situation of the Russians against 43% with their low self-esteem.

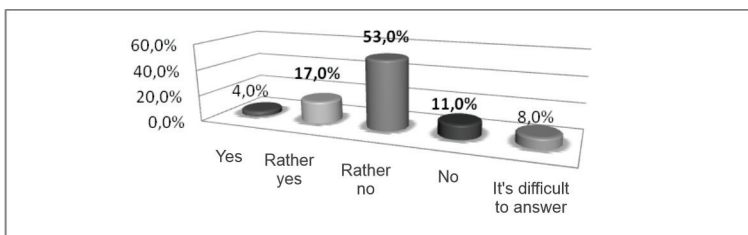
A similar survey about the assessment of the Russians own health was conducted by the Sociological “Levada-Center” [11] on January 21-24, 2011. So, 1600 people were interviewed. 72% of men surveyed are satisfied with their state of health. Among women only 58% were satisfied with their health. 40% of women and 27% of men are not satisfied with their health.

A study in Volgograd conducted by Danilchenko S.S. [12] showed that the low-income population in the bulk weighs state of their health as satisfactory. The majority of respondents believe that heredity and the quality of medical care affect health more. It is noteworthy that almost all respondents to the question “If you find out that your work adversely affects your health, how will you do?” They answered that they will continue to work as long as their health allows.

The empirical base will also be supplemented by the conclusions of author’s sociological studies: “The problems of the men’s health studying in modern Rus-

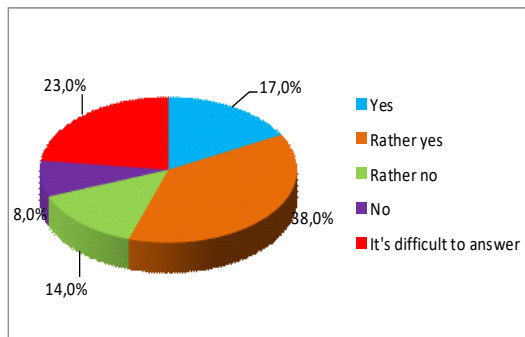
sia” (February 2014, Tambov), as well as studies to identify the population’s living standard in Tambov region, conducted under the Laboratory of Social Analysis of the Michurinsk State Agrarian University (November 2016, Michurinsk).

As Tambov’s respondents 200 men from the age from 18, with various professions and educational levels were selected, a total-quota survey was conducted. The study involved men who are mostly married, with an average material situation (when ”enough for food, but buying expensive things causes difficulty”). After analyzing the answers to the questionnaire, related to the nutrition of the respondents, we found that 52% of the respondents (men) do not care about their health, and 64% do not comply with the diet, while 8% of the respondents did not even think about it because they found it difficult to give answer (picture 1.)



**Picture 1.** Distribution of respondents’ opinions on diet, N = 200

Thus, 53% of respondents (17% + 38%) who participated in the survey noted that they are affected by unfavorable environmental factors affecting the technologies of growing fruits, vegetables and grains; 23% were at a loss to answer. Perhaps these respondents do not attach importance to the impact of ecology on the quality of food (Picture 2).



**Picture 2.** Distribution of respondents’ opinions on the impact of unfavorable environmental factors, N = 200



Analyzing the self-esteem of Tambov men's health, it can be noted that, despite all the problems and the bad habits, psychological difficulties, 44% men who participated in the survey, assess their health as good. 32% indicated a satisfactory health and only 10% recognized the presence of health problems (picture 3).



**Picture 3.** Distribution of respondents' opinions on their health,  $N = 200$

As the author's empirical study showed, the majority of the male respondents do not consider their health as a social problem, and the notion of "health culture", "food culture" does not say much about them. The majority of respondents do not care about their health.

The sociological study of the Laboratory of Social Analysis "The Social Well-being of Tambov Region Residents" showed the motivation factors for the respondents' nutrition, the composition of them was determined by the method of random-mechanical selection, representing a proportional sample. It turned out that their formation is formed not only from upbringing and propaganda, but also implies the stability of the whole motives: individual, family, group interests and needs, as well as adaptation, goal-setting, self-organization and self-regulation. Also the social roles have Influence on them and personality functions, statuses, prestige, which determine the general behavioral orientation of individuals. For example, the respondents indicated the possibility of eating as follows (table 1).

**Table 1**  
Distribution of respondents' answers to the question about the possibility to eat according to the individual wishes,  $N = 381$  (100%)

variants of answers	number of respondents, people	%
I almost do not deny myself anything	151	39,6
I eat normally	140	36,7
It is necessary to refuse in many respects	60	15,7
Money is not enough even for the most necessary	30	8

It can be seen from the table that the quantity and quality of nutrition, in fact, is expressed in the respondents' material well-being. In the findings of correlation, however, the fact that every 6-th person practically does not eat up (15.7% + 7.8%), within a general picture of the satisfaction of nutrition (39.6% + 36.7%).

On the basis of the studied set of nutrition motives, it is necessary to assume that the *food culture* is a multisyllabic behavioral phenomenon that influences and determines the forms, images and life styles of people. In addition, the understanding of this phenomenon - *the culture of nutrition* - we define as *a system of human life-actions, determined by the harmonious unity of physical, mental, cultural, social functions, which provides the full health*.

The Association of Honored Doctors of Russia in this regard proposes a project in which the directions and ways of solving the most important tasks for achieving meaningful results are outlined (the Project Team for Healthy Eating -2016). So, it is necessary:

- 1) in Russia the production, sale and processing of high-quality raw materials and drinking water become the norm;
- 2) to achieve economically and legally that production and processing of low-quality products would become an unprofitable business;
- 3) in the family, children are encouraged to cultivate a culture of adherence to the norms of healthy nutrition;
- 4) to include in the popularization of healthy nutrition all methods of public propaganda, the media, to organize schools for healthy nutrition in the entire social field of activity;
- 5) organize the formation of health eating in all spheres of social activity.

With the combined efforts, the Association of Honored Physicians of Russia predicts 20% decrease in morbidity and mortality in the population by 2025.

The unconditional urgency of the problem of the influence of social factors on the health of the population, as well as the diversity and multidirectional nature of scientific research on this topic require the development of serious scientific approaches and structuring of existing concepts to the analysis of the influence of social factors on public health. It is necessary to further highlight the key ideas, theoretical and empirical strategies that a scientist can follow when studying the social determinism of health, as well as identifying the problem areas and contradictions in this area of the scientific research, one of which, undoubtedly, is the problem of the food culture formation as a health saving attribute.

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## THE PSYCHOLOGY OF SURVIVAL OF DENTAL PREVENTIVE KNOWLEDGE IN THE ADULT POPULATION

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**Abstract.** *To date, the leading task of primary prevention is to increase motivation in conducting individual oral hygiene in the adult population. The preservation of dental hygiene knowledge determines the level of dental health in the adult population. The low level of oral hygiene comes to the fore, which forms of hygienic and dental statuses, leading to an increase in the prevalence of dental caries and inflammatory periodontal diseases in the population. The leading feature of the prevention of major dental diseases among various groups is the constant repeated “Hygiene lessons” in the adult population, taking into account their psychological status, which supports a higher level of survival of preventive knowledge and motivation to take necessary actions.*

**Keywords:** *survival of preventive knowledge, psychoemotional tension, prevention of dental diseases.*

A component of a person’s individual health is their dental status, which is part of the person’s overall health [7]. In order to improve and maintain dental health among the population, today the leading task of primary prevention is to increase motivation in individual oral hygiene. A low level of oral hygiene comes to the fore, which shapes the hygienic and dental status, leading to an increase

in the prevalence of dental caries and inflammatory periodontal diseases in the population [12].

The problem of developing functional adaptive behavior and life skills during dental preventive measures is considered as a cognitive-behavioral process [4, 10]. The participatory model of prevention of major dental diseases is determined not only by the level of knowledge about oral hygiene products and items, but also by the level of retention of this knowledge, which ensures the acquisition of oral care skills [1, 8, 15]. The survival of preventive knowledge makes it possible to determine how much the information provided during the “Hygiene Lesson” is retained in the patient’s memory, as well as to monitor changes in the survival of acquired knowledge in the process of carrying out hygienic training and education among the population [6, 9, 13-14].

The fundamental role of dental education in preventing the development of major dental diseases is to motivate the population to practice individual oral hygiene, good nutrition and regular visits to the dentist to maintain dental health. One of the factors reducing the level of oral health is the adaptive abilities to a neurotic reaction and the lack of awareness of the adult population about the influence of the level of individual oral hygiene on the effectiveness of the results of therapeutic, orthopedic, orthodontic and surgical procedures [3, 11]. Dental education must be viewed as a continuous process, which should be carried out consistently at each stage of dental care [2].

For our country, this task is quite acute, since it allows us to determine a plan of preventive measures in the provision of dental care, the level of retention of knowledge about which is quite low among the population, which creates very high rates of prevalence and intensity of major dental diseases [5].

The basis of hygienic training and education is information and motivation of patients in carrying out preventive measures. A special role is determined in the psychological readiness of the adult population to assimilate information and form a preventive approach to dental pathology [7-9]. The relevance of the problem of preventive care in the adult population and the significance of the survival psychology of preventive knowledge in the prevention of major dental diseases is determined by the development of measures to strengthen dental health and plays a leading role in improving the quality of life of the population.

The purpose of the study is to study the survival of dental preventive knowledge taking into account the dynamics of situational and personal anxiety in the adult population.

A study was conducted at the Department of Preventive Dentistry of the I.P. Pavlov First Saint Petersburg State Medical University of the Ministry of Health of the Russian Federation to assess the survival of dental preventive knowledge taking into account the hygienic status and evaluation of adaptive abilities to neurotic reactions in the adult population. The study involved 86 people not burdened

with general somatic pathology, of which 4 groups were formed: the 1st group included pregnant women aged 30–39 years who were in the first trimester of pregnancy (19 people), the 2nd group included persons after periodontal surgery aged 35–44 years (22 people), the 3rd group consisted of persons working in the oil industry, aged 35–44 years (22 people), the 4th group included persons with true pathological oral halitosis in the presence of fixed orthopedic structures, aged 35–44 years (23 people).

To objectively assess the hygienic status of various population groups, the Green-Vermillion Hygiene Index Simplified (OHI-S) was used. To objectively assess adaptive abilities, the Spielberger-Khanin scale of reactive and personal anxiety was used. To characterize the observed groups during the entire study period, a survey was conducted using a validated questionnaire to determine the survival index of preventive knowledge by S.B. Ulitovsky (SPK Ulitovsky, 2020). The study of the indicators was carried out for one month, at intervals of one week; based on their study, the effectiveness of knowledge survival was calculated according to the Ulitovsky SPK index.

The work was carried out using subjective (psychological and pedagogical) and objective (clinical) examination methods. The reliability of the research results was justified by the representativeness of the sample, the use of a set of techniques and adequate statistical analysis.

To study the psychology of survival of dental preventive knowledge and the level of dental health in various groups of the adult population, changes were determined indicators situational and personal anxiety.

Table 1 shows the change in level situational and personal anxiety in the adult population during the study period.

**Table 1**  
*Level of anxiety in the adult population during the study period*

Distribution by groups	Indicators on the Spielberger-Khanin reactive and personal anxiety scale (%)	
	At the start of the study	
	Situational anxiety (%)	Personal anxiety (%)
group 1	59.82±4.79	33.62± 3.03
group 2	61.25±5.51	55.19±4.42
group 3	28.61±2.58	46.10±3.69
group 4	47.39±3.79	37.26±3.35

P<0.01

As a result of the study, it was found that the data were distributed as follows: in group 1, situational anxiety amounted to 59.82 ± 4.79%, in contrast to personal anxiety -33.62± 3.03%, in the 2nd group - 61.25 ± 5.51% and 55.19 ± 4.42%,

respectively, in the 3rd group, the indicators of situational and personal anxiety at the beginning of the study reached  $28.61 \pm 2.58\%$  and  $46.10 \pm 3.69\%$ , respectively, in the 4th group the indicators of situational anxiety were  $47.39 \pm 3.79\%$  and personal anxiety -  $37.26 \pm 3.35\%$ , which reflects a high level of indicators in Spielberger–Hanin scale of reactive and personal anxiety in different groups (Table 1).

Table 1 summarizes the results of changes in the Greene–Vermillion index (OHI-S) in all study groups.

**Table 2**  
*Changes in the Green–Vermillion index*

Distribution by groups	Indicators of the Green–Vermillion simplified index (conventional units)				
	Examination period (weeks)				
	Start	1	2	3	4
group 1	$3.07 \pm 0.27$	$2.67 \pm 0.15$	$2.23 \pm 0.25$	$1.93 \pm 0.22$	$1.87 \pm 0.16$
group 2	$3.17 \pm 0.21$	$2.63 \pm 0.24$	$2.37 \pm 0.30$	$2.03 \pm 0.10$	$1.83 \pm 0.10$
group 3	$2.97 \pm 0.11$	$2.37 \pm 0.10$	$2.00 \pm 0.12$	$1.77 \pm 0.29$	$1.63 \pm 0.13$
group 4	$3.03 \pm 0.19$	$2.53 \pm 0.28$	$2.17 \pm 0.27$	$1.93 \pm 0.16$	$1.77 \pm 0.19$

P<0.01

As a result of the study, a decrease in indicators was found OHI-S index in group 1 with  $3.07 \pm 0.27$ conventional units up to  $1.87 \pm 0.16$ conventional units, in the 2nd group - with  $3.17 \pm 0.21$  conventional units up to  $1.83 \pm 0.10$  conventional units, in group 3 the indicator at the beginning of the study was  $2.97 \pm 0.11$ conventional units, and by the end it decreased to  $1.63 \pm 0.13$ conventional units, in group 4 the indicator reached  $1.77 \pm 0.19$ conventional units, which reflects an increase in the cleaning effect in different groups (Table 2).

Table 3 shows the change in the survival index of S.B.’s preventive knowledge. Ulitovsky during the study period.

**Table 3**  
*Dynamics of changes in the survival index of preventive knowledge S.B. Ulitovsky*

Distribution by groups	Ulitovsky SPK index (points)				
	Examination period (weeks)				
	Start	1	2	3	4
group 1	$33.34 \pm 4.33$	$73.34 \pm 4.33$	$70.19 \pm 3.82$	$65.27 \pm 3.58$	$59.69 \pm 2.97$
group 2	$31.22 \pm 3.96$	$71.22 \pm 3.96$	$68.72 \pm 3.20$	$63.26 \pm 3.64$	$61.35 \pm 3.43$
group 3	$31.60 \pm 4.05$	$71.60 \pm 4.05$	$65.31 \pm 3.57$	$62.77 \pm 4.05$	$59.27 \pm 3.60$
group 4	$31.57 \pm 4.21$	$71.57 \pm 4.21$	$69.18 \pm 3.49$	$64.05 \pm 3.16$	$60.12 \pm 2.71$

P<0.01



After 2 weeks of the study, the indicators of the Ulitovsky hygienic knowledge index were in the 1st group  $65.27 \pm 3.58$  conventional units., in the 2nd group  $-63.26 \pm 3.64$  conventional units., in the 3rd group  $-62.77 \pm 4.05$  conventional units., in the 4th group  $-64.05 \pm 3.16$ . By the end of the study, the maximum reduction in information stored in the patients' memory about the rules of oral hygiene measures was determined to be only 20%, which corresponds to the high survival efficiency of knowledge among the population (Table 3).

Table 4 presents the impact of survival rate of preventive knowledge on dental health in the adult population.

**Table 4**  
*Correlation of survival level of preventive knowledge and adaptive abilities in the adult population*

Level of dental hygienic knowledge according to the Ulitovsky SPK index	Index assessment of dental status		
	OHI-S (conventional units)	Situational anxiety (%)	Personal anxiety (%)
Very good knowledge	$1.78 \pm 0.15$	$26.58 \pm 2.39$	$63.42 \pm 5.07$
Good knowledge	$2.19 \pm 0.27$	$31.40 \pm 2.51$	$39.71 \pm 3.57$
Satisfactory knowledge	$3.06 \pm 0.33$	$54.22 \pm 4.88$	$25.33 \pm 2.02$

$P < 0.01$

The survival of dental hygienic knowledge according to the Ulitovsky SPK index established a positive dynamics of indicators according to the simplified Green-Vermillion indices with low situational and high personal anxiety, as well as with regular "Hygiene Lessons" among various groups of the adult population (Table 4).

The ongoing monitoring of the level of anxiety in the adult population made it possible to adjust the preventive focus of health education work, which increased the survival rate of dental preventive knowledge. To improve and maintain dental health in the adult population, it is necessary to take into account the peculiarities of the psychology of survival of preventive knowledge, as a factor in increasing the level of quality of life for the purpose of sustainable development of a healthy society.

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## **FACTOR STRUCTURE OF COGNITIVE ABILITIES OF DENTAL HYGIENISTS STUDENTS. PSYCHOLOGICAL ANALYSIS**

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**Annotation.** *The article presents the results of a study of cognitive abilities in medical college students. An attempt has been made to identify the leading factors of cognitive activity in students. Two leading factors in the structure of cognitive abilities have been identified: abstract thinking and focus on applied cognition. The relationships of cognitive ability factors with the level of dental knowledge of students are analyzed.*

**Keywords:** *cognitive abilities, cognitive activity, metacognition, metacognitive knowledge, self-regulation, psychology.*

The formation of a future professional specialist requires the teacher to take into account the individual characteristics of students. Research notes that the learning process, as a rule, gives knowledge the clearest form that is inherent in

a particular teaching or person [1,3,7]. This process, from a pedagogical point of view, is called activation. In essence, this is a constant, uninterrupted process aimed at encouraging dental hygienist students to overcome stereotypical passive activities, to targeted learning, and to intensively acquire knowledge. The main goal of activation is to create a certain activity aimed at increasing the effectiveness of the educational process and the overall quality of education [4,5,9].

As part of this research work, it is also worth paying attention to such an important category of the cognitive process as metacognition. At the moment, it is quite relevant in the modern educational process. This is a special integrated approach with which it is possible to develop cognitive abilities among students of dental hygienists and to form the competencies necessary for their future profession [6,8].

Undoubtedly, it is important in this matter to take into account and subsequently rely on cognitive abilities. However, it is necessary to understand the structure of the cognitive abilities of modern students of secondary vocational education, as well as their connection with the acquisition of professional knowledge and categories [2,10].

Taking into account all of the above, an attempt was made to identify the structure of cognitive abilities. The study involved 50 dental hygienist students aged 18 to 20 years (of which 18 were boys and 32 girls). To study cognitive abilities, the following methods were used: “Number series” (to determine the ability for inductive mathematical thinking, the ability to find general patterns in the material), “Complex analogies” (to identify the ability to understand various types of logical connections), as well as the “Ideal computer” to determine metacognitive abilities (cognitive position, openness to knowledge, ability to pose various types of questions) [11]. To establish the level of hygienic knowledge, the Ulitovsky hygienic knowledge index (1993) was used.

An exploratory factor analysis was performed (maximum likelihood method using varimax rotation with Kaiser normalization). The results of the factor analysis are presented in Table 1.

**Table 1.**  
*Results of factor analysis of cognitive abilities*

	<b>Abstract thinking factor</b>	<b>Applied knowledge factor</b>
Number series	0,78	
Complex analogies		0,57
Number of questions		0,92
Subjective questions	-0,81	
Objectified questions	0,88	

Factual questions		0,95
Categorical questions	0,80	
Eigenvalue	2,83	2,63
Proportion of explanatory variance	0,40	0,38

It can be seen that the first factor included indicators of inductive thinking, an orientation towards objectified (that is, not related to personal problems) issues that require developed decentration, as well as an orientation toward categorical cognition. This factor was called “Abstract Thinking” because it includes indicators of orientation towards understanding the general patterns of the answered categories.

The second factor consisted of: the success of the “Complex Analogies” technique, the total number of questions asked (according to the “Ideal Computer” technique), as well as questions of factual type. The factor was designated “Applied Knowledge”, since its indicators characterize the focus on understanding and discovering the facts of reality, as well as establishing connections between various phenomena.

At the next stage of the study, factor coefficients were calculated to identify relationships with indicators of dental knowledge. Next, a correlation analysis was carried out (Spearman’s rank correlation coefficient was used).

It was found that the integral indicator of dental knowledge correlates positively with the factor of abstract thinking ( $r = 0.37$ ,  $p \leq 0.01$ ), that is, the higher the students’ ability to understand abstract categories and identify patterns, the higher the level of dental knowledge. This connection is quite logical, since students need to comprehend a fairly large number of scientific categories. In addition, the factor of abstract thinking is associated with understanding the importance of various oral hygiene products, and I also understand the connection between dental diseases and the entire body.

The applied knowledge factor is positively correlated with the use of whitening products ( $r = 0.41$ ,  $p \leq 0.01$ ), as well as with the use of therapeutic and prophylactic pastes to solve bleeding problems ( $r = 0.39$ ,  $p \leq 0.01$ ). The applied orientation of knowledge gives an understanding of the significance of medical recommendations, their implementation and application both in oneself and in future patients.

A small study conducted made it possible to identify the structure of the cognitive abilities of dental hygienist students. This is how the factor of abstract thinking was obtained, as well as the factor of focus on applied knowledge. Both factors are significant in the training of future specialists and provide a broader picture of the world and professional activities. Significant connections between the identified factors and indicators of dental knowledge (both general and individual) were obtained. However, the results obtained should be considered preliminary, and they require further verification and clarification.

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## AGE-RELATED FEATURES OF THE CIRCADIAN RHYTHM OF DIASTOLIC BLOOD PRESSURE IN ACUTE RENAL FAILURE IN CHILDREN

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**Abstract.** *According to the results of hemodynamic monitoring of 33 children admitted to the national medical children's center, it was revealed that only on day 1 there was an increase in the mesor of the circadian rhythm of DBP in children of group 3 by 28 mm Hg; in the subsequent 2 and 3 days, age-related differences in DBP levels disappeared, increasing again on day 4 (by 20 mm Hg) between groups 1 and 3. Over the course of 5 and 14 days, the mesor level of the circadian rhythm DBP fluctuated between 70-75 mm Hg, regardless of age. Only in the dark, at 21 and 24 hours, was there an increase in DBP in group 3 relative to the data of infancy by 16 mm Hg. Increased differences in DBP levels were a manifestation of the instability of the achieved positive effect of treatment due to the immaturity of the central and peripheral regulatory systems, which required longer conservative corrective and supportive intensive therapy in children of group 1. The direct correlation between the duration of hemodialysis and the level of DBP in group 2 (0.7) and in group 3 (0.39) appears to be due to the stress response of the cardiovascular system to an increase in the duration of the session.*

**Keywords:** *circadian rhythm, diastolic pressure, acute renal failure in children.*

**Relevance.** The most common cause of childhood hypertension is non-compliance with the daily routine, lack of regular physical activity, poor diet and even frequent stressful situations. High blood pressure in a child can also be caused by



diseases such as diabetes or obesity. In children aged 7 to 8 years, normal blood pressure is considered to be from 110/60 to 122/78 mm Hg. Art. In this case, the heart rate should be 79-80 beats per minute. Experts say that blood pressure at this age undergoes changes due to a decrease in physical activity. The beginning of schooling and a change in social circle also contribute to the changes occurring in the body. High blood pressure can be primary or secondary, caused by another medical condition. In children aged 6 years and older, primary high blood pressure is most common. Secondary high blood pressure is more common in children under 3 years of age. Although the cause is unknown, primary hypertension is more common in children with the following risk factors: overweight or obesity; family history; low level of physical activity; excessive amounts of salt and calories in the diet; low birth weight or premature birth. The authors also highlight social risk factors, such as child abuse, neglect, violence among family members, and lack of food or housing. Smoking, the use of any nicotine-containing products, and second-hand smoke can increase blood pressure. Secondary hypertension has an identifiable cause, after elimination of which the blood pressure returns to normal: kidney disease - glomerulonephritis, pyelonephritis, urinary tract obstruction, polycystic kidney disease. Nervous system disorders – meningitis, encephalitis, traumatic brain injury. Vascular pathologies - aortoarteritis, pathological development of vascular structures of the kidneys or lungs. Hormonal disorders - over-active thyroid gland (hyperthyroidism). Other causes of secondary hypertension include: sleep apnea; increased intracranial pressure; taking corticosteroids, anabolic steroids; stress or pain. According to researchers, the average level of DBP in healthy children aged 2 months to 3 years is  $66 \pm 2.6$  mm Hg; in the age group 3.1-7 years  $DBP = 70 \pm 3$  mm Hg; in the school age group of 7.1-18 years, the DBP level corresponds to  $87 \pm 13$  mm Hg. However, in the literature there is insufficient information on the characteristics of changes in diastolic blood pressure in acute renal failure at different age periods in children [1-4].

**Goal of the work.** To study and give a comparative assessment of changes in the circadian rhythm of diastolic blood pressure in acute renal failure depending on age.

**Material and research methods.** We studied the data of hourly monitoring of body temperature in 33 children with acute renal failure who were admitted to the ICU of the NMDC with oligo-anuria at the age of 6 months to 18 years. All patients underwent hemodialysis under the control of hemodynamics, acid-base balance, respiratory system, supportive, antibacterial, anti-inflammatory, syndromic corrective intensive therapy. The results of the studies were studied in the following age groups: 12 patients aged from 6 months to 3 years (group 1) were in the ICU for up to 30 days. Group 2 combined the results of a study of monitoring data from 14 children from 3.1 to 7 years (in the ICU - 14 days), in group 3 - 7 children

aged 7.1-18 years (in the ICU 14 days), subsequently all children were transferred to the Department of Pediatric Nephrology. As presented in Table 1, tubulointerstitial nephritis was diagnosed mainly before the age of 7 years, amounting to 27% in group 1 and 30% in group 2. In the majority of older patients, the severity of the condition was due to MODS (38% of children). Acute cerebral insufficiency aggravated pathological deviations of homeostasis in 28% of children. In 13% of patients over 7.1 years of age, a chronic disorder of the functional activity of the kidneys was discovered for the first time. The research data were processed by the method of variation statistics using the Excel program by calculating arithmetic means (M) and errors of means (m). To assess the significance of differences between two values, the parametric Student's test (t) was used. The relationship between the dynamics of the studied indicators was determined by the method of paired correlations. The critical significance level was taken equal to 0.05.

**Results and its discussion.** Hemodialysis in group 1 was carried out for 18 days, 12 days in group 2, 14 days in group 3, causing restoration of renal function and improvement of clinical and biochemical parameters of patients. Age-related characteristics were manifested in the limitation of the average duration of a hemodialysis session to the greatest extent in infants to 3 hours. While in the older groups the duration of each procedure increased to 5 hours in group 2 on days 7 and 12, in group 3 - on days 1 and 14. It should be assumed that the duration of each session of the extracorporeal detoxification method was determined not only by the degree of blood purification and anti-edematous effect, but the limitation of detoxification time was also determined by the state of compensatory resources, which at an early age are characterized by a greater tendency to generalize protective reactions, rapid depletion, and a high risk of complications. (AHF, ARF, hemorrhagic syndrome, etc.), that is, anatomical and functional features of an early age.

**Table 1.**

*Average values of parameters of the phase structure of the circadian rhythm DBP in acute renal failure in children in mm Hg.*

Groups	Mesor	In acrophase	Bathyphase	amplitude	Daily fluctuation
1	74±3	90±4	57±7	17±4	33±8
2	79±1	92±3	67±3	13±4	25±5
3	82±5	98±7	63±5	16±3	35±7

As presented in Table 1, no significantly significant age-related differences were found in the average parameters of the phase structure of the circadian rhythm of DBP. However, DBP in group 1 was increased by 8 mmHg, in group 2 by 9 mmHg, and in group 3 it did not differ from the norm. The difference from the physiological norm on day 1 in all groups was insignificant.

**Table 2.**  
*Dynamics of mesor DBP, mm Hg.*

<b>Days</b>	<b>1 group</b>	<b>2 group</b>	<b>3 group</b>
1	69±6	80±5	97±5*
2	77±6	78±5	83±7
3	74±3	77±4	83±9
4	72±3	79±4	92±8*
5	70±4	78±6	82±8
6	73±5	79±4	88±9
7	81±6	81±3	81±16
8	75±6	81±4	75±7
9	81±9	79±6	76±9
10	78±7	79±5	83±8
11	73±7	79±5	81±6
12	72±8	79±4	81±9
13	73±11	76±6	66±6
14	70±10	75±5	85±12
15	67±7		
16	71±9		
17	74±8		
18	74±10		
19	73±6		
20	75±10		
21	71±9		
22	68±6		
23	71±6		
24	70±6		
25	71±8		
26	77±9		
27	73±10		
28	87±7		
29	68±6		
30	79±8		

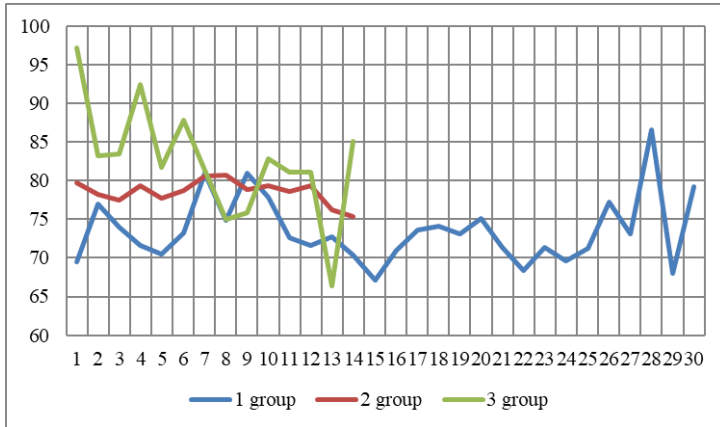
**Table 3.**  
*Average circadian rhythm of DBP*

<b>Hours</b>	<b>1 group</b>	<b>2 group</b>	<b>3 group</b>
8	74±8	79± 3	80±10
9	74±12	79±9	77±12
10	74±8	79±4	81±13
11	77±12	81±6	81±8
12	72±7	80±6	82±7

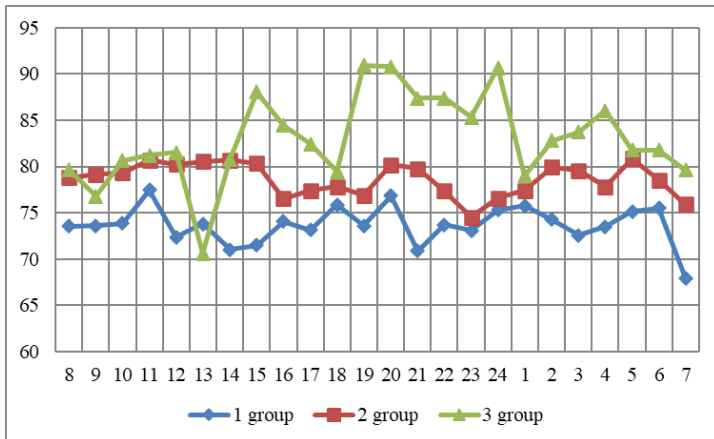
13	74±5	81±3	71±5
14	71±9	81±6	81±12
15	71±8	80±7	88±11
16	74±7	77±4	84±7
17	73±8	77±4	82±9
18	76±6	78±4	79±11
19	74±7	77±3	91±10
20	77±8	80±2	91±8
21	71±6	80±4	87±8*
22	74±8	77±4	87±14
23	73±9	74±6	85±8
24	75±6	77±4	91±4*
1	76±5	77±5	79±14
2	74±7	80±4	83±10
3	73±6	80±6	84±9
4	74±8	78±4	86±8
5	75±11	81±4	82±9
6	75±5	79±5	82±8
7	68±7	76±3	80±11

\*- significant relative to the indicator in group 1

Only on day 1, an increase in the mesor of the circadian rhythm of DBP was detected in children of group 3 by 28 mm Hg; in the subsequent 2 and 3 days, age-related differences in DBP levels disappeared, increasing again on day 4 (by 20 mm Hg) between groups 1 and 3. Over the course of 5 and 14 days, the level of meso-circadian rhythm DBP fluctuated between 70-75 mm Hg. regardless of age (Fig. 1). Only in the dark, at 21 and 24 hours, was there an increase in DBP in group 3 relative to the data of infancy by 16 mm Hg. (Table 3).

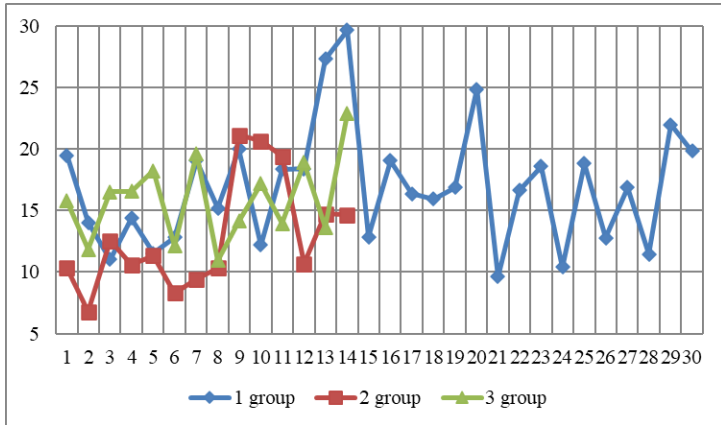


**Figure 1.** Dynamics of the mesor of the circadian rhythm DBP depending on age, mm Hg.



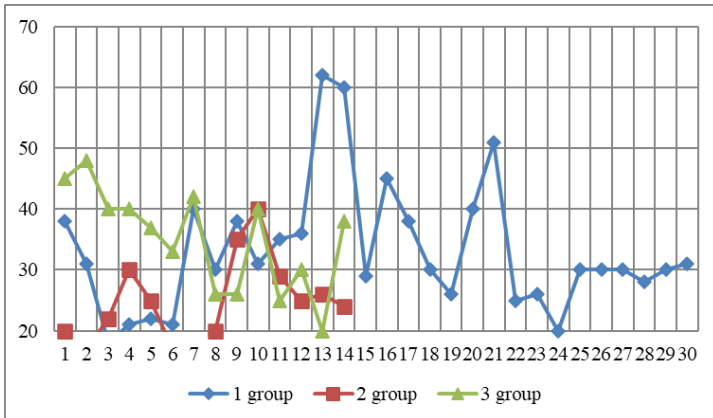
**Figure 2.** Dependence of the average circadian rhythm of DBP on age, mm Hg.

Only in the daytime and evening hours (at 15, 19-24 hours) a tendency to increase the DBP level by 10 mm Hg was found. (Fig. 2) in group 3.



**Figure 3.** Effect of age on the amplitude of the circadian rhythm DBP, mm Hg.

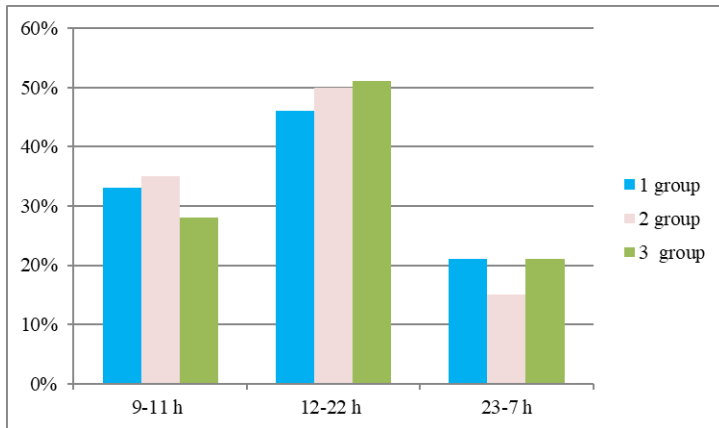
There was a tendency to increase the amplitude of the circadian rhythm of DBP in infants on days 13, 14, 20 to 28, 30, 25 mm Hg (Fig. 3).



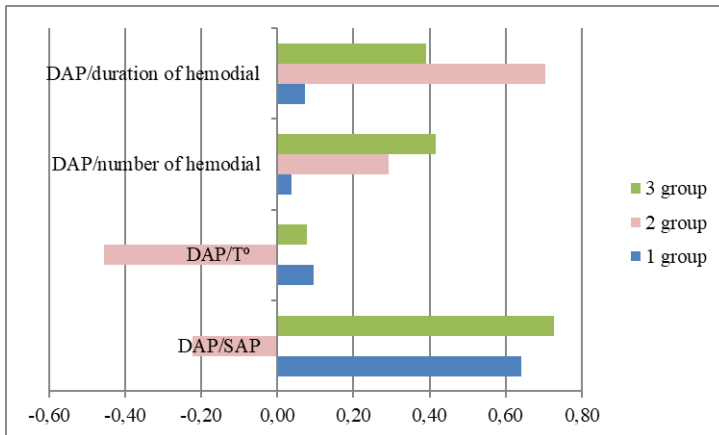
**Figure 4.** Changes in daily fluctuations in DBP depending on age, mm Hg.

In the first 5 days, daily fluctuations were least pronounced in group 1. However, the increase in differences in DBP levels on days 13, 14, 20, apparently, was a manifestation of the instability of the achieved positive effect of treatment, dependence on the instability of compensatory reactions due to the immaturity of the central and peripheral regulatory systems (Fig. 4), which required longer conservative corrective and supportive intensive care for children of group 1. The du-

ration of inversion of the circadian rhythm of DBP in group 1 was 21%, in group 2 - 15%, in group 3 - 21% of the duration of intensive therapy (Fig. 5).



*Figure 5. Duration of inversion depending on age*



*Figure 6. Correlations of DBP dynamics.*

The direct correlation between the duration of hemodialysis and the level of DBP in group 2 (0.7) and in group 3 (0.39) appears to be due to the vasopressor effect of increasing the duration of the session (Fig. 6).

**Conclusion.** Only on day 1, an increase in the mesor of the circadian rhythm of DBP was detected in children of group 3 by 28 mm Hg; in the subsequent 2 and 3 days, age-related differences in DBP levels disappeared, increasing again on day

4 (by 20 mm Hg) between groups 1 and 3. Over the course of 5 and 14 days, the mesor level of the circadian rhythm DBP fluctuated between 70-75 mm Hg. regardless of age. Only in the dark, at 21 and 24 hours, was there an increase in DBP in group 3 relative to the data of infancy by 16 mm Hg. Increased differences in DBP levels were a manifestation of the instability of the achieved positive effect of treatment due to the immaturity of the central and peripheral regulatory systems, which required longer conservative corrective and supportive intensive therapy in children of group 1. The direct correlation between the duration of hemodialysis and the level of DBP in group 2 (0.7) and in group 3 (0.39) appears to be due to the stress response of the cardiovascular system to an increase in the duration of the session.

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## PHYSIOLOGICAL MECHANISMS OF SUGGESTION FROM THE POSITION OF DOMINANT BY A.A. UKHTOMSKY

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**Abstract.** *For many decades, great importance has been attached to the issues of suggestion in various spheres of human life. At the same time, based on the physiological doctrine of the dominant of Academician A.A. Ukhtomsky, the issues of clinical application of suggestion in the theory and practice of higher education pedagogy have been practically not studied. The authors examine the key issues of using suggestion (hypnotic suggestion) in pedagogy from a physiological perspective.*

**Keywords:** *suggestion, physiological mechanisms of use, Ukhtomsky dominant.*

The relevance of research. In 1904, K.D. Ukhtomsky made the first observation, which formed the basis of the concept of dominance, when observing the activities of animals [Ukhtomsky A.A., 2002]. Ukhtomsky believed that all branches of human activity, including science, are influenced by dominants, with the help

of which impressions, images and beliefs are selected [Ukhtomsky A.A., 2000]. Ukhtomsky's dominant is a stable focus of increased excitability of nerve centers [Batuev A.S., Kruglikov R.I., 1990; Ukhtomsky A.A., 2000, 2002].

And to this day, the physiological mechanisms of suggestion in teaching university students have not been sufficiently studied, because there is no clear theory of hypnotic states, as a result of which the existence of hypnosis is generally denied [Pavlov I.P., 1951]. In our opinion, this is partly due to the fact that from a physiological point of view it is not clear why the human body needs hypnotic states. In this regard, we present for discussion and present a hypothesis according to which hypnosis (suggestion, suggestion) is an extremely strong dominant, which, on the one hand, suppresses all dominants in the brain and, on the other hand, is realized in the form of controlled hallucinations of suggestion, similar to night sleep, but with active activity of the muscular system. Considering that no one before us had conducted research on the physiological mechanisms of hypnosis from the point of view of A.A. Ukhtomsky's theory of dominance. Ukhtomsky, for the first time, when conducting practical classes with students from a number of humanitarian universities, we began to actively study and analyze this scientific problem.

**Purpose of the study:** to scientifically substantiate the physiological mechanisms of suggestion in pedagogical practice from the point of view of the doctrine of the dominant of academician A.A. Ukhtomsky.

**Material and methods.** The study was carried out on 29 boys and 32 girls, 18.7±1.7 years old, who were first and second year students at universities in the Russian Federation. We have studied the influence of suggestion as a dominant of A.A. Ukhtomsky on the resistance of the youthful organism to hypoxia through valid functional tests of Stange and Gench.

When conducting the study, the principles of voluntariness, individual rights and freedoms guaranteed by Articles 21 and 22 of the Constitution of the Russian Federation, as well as Order of the Ministry of Health and Social Development of Russia No. 774n of August 31, 2010 "On the Ethics Council" were observed. The study was conducted in accordance with the ethical standards set out in the Declaration of Helsinki and the European Community Directives (8/609EC) and the informed oral consent of the students.

**Results and discussion.** We believe that the dominant is formed from impulses from all receptors of the human body, information from memory, the activity of unconditioned reflexes, the activity of the hormonal ensemble, from the ascending impulse of neurons, that is, from the periphery to the focus of the dominant in the brain. The dominant, in our opinion, exists until it is satisfied, after which it disappears or significantly reduces its power of influence, making room for a new dominant. Let us illustrate our idea with an example. If a dog, for example, has a food

dominant, then all its activities are aimed at achieving the goal of getting enough food. The dog will actively run, search and remember where it previously obtained or found food. After satiation, the food dominant weakens or even disappears for a while, and the dog develops another dominant.

As for the dominant in humans, we allow ourselves to make the assumption that the suggestion we use, in other words, intelligently structured speech, is based, firstly, on the proximity of the auditory and articulatory zones of the cerebral cortex. We perceive suggestion as a type of speech influence, widely and universally used in pedagogical practice. Secondly, such proximity, which has direct connections in the deep structures of the cerebral cortex between receptor, i.e. auditory and motor articulatory neurons according to the principle of proximity, creates the dominant that A.A. Ukhtomsky spoke about and which we consider and use in this work. In addition, we have made the assumption that the process of updating neural connections in the brain will be more effective if it is stimulated with the help of breathing, in particular by arbitrarily holding inhalation and exhalation under musical accompaniment and verbal hypnotic suggestion by creating the dominant A.A. Ukhtomsky.

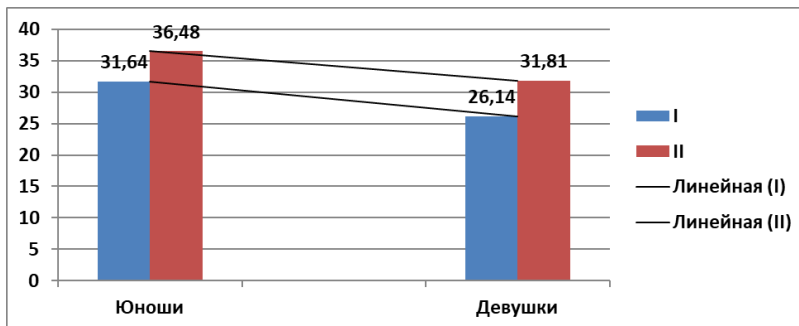
An unresolved issue in such a situation is the identification of individual age-related functional characteristics of students' physiological adaptation to educational activities by studying functional tests, for example, with holding the breath during inhalation and exhalation when using a positive verbal hypnotic suggestion against the background of musical accompaniment. For 10 minutes, we calmly instilled in the students, accompanied by musical accompaniment (most often the music of W.A. Mozart "Rondo Alla Turca" - "Turkish Rondo"), firstly, that they without much effort and, secondly, without visible physical tension will be able to hold your breath longer than usual. We made the assumption that, albeit short in time, but precisely the positive nature of suggestion against the background of musical accompaniment, can be that irritant for the brain, which, in accordance with the teachings of Academician A.A. Ukhtomsky about the dominant, programs it for more pronounced and time-stable preservation of the function of the respiratory system (Table 1). It is quite natural that the more functionally an athlete is prepared for competition, the better the sports result.

**Table 1**  
*Values of Stange and Gentsch tests in boys and girls before (I) and after (II) suggestion ( $M \pm m$ )*

Sex	Группа	Stange (first phase)	Stange	Gencha
Boys	(I)	31,64±1,83	57,87±2,19	29,06±1,58
	(II)	36,48±1,95	62,39±2,23	35,56±1,93

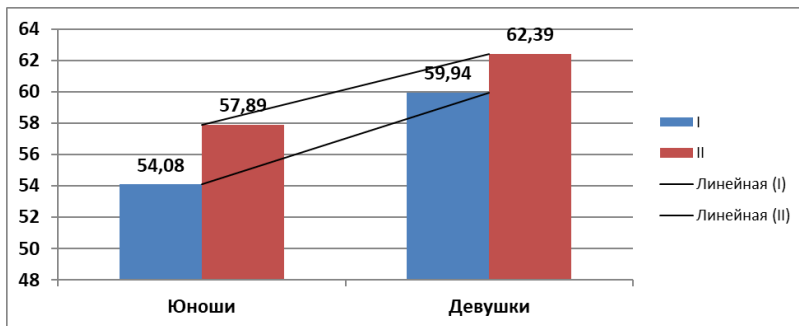
Girls	(I)	26,14±1,69	54,08±2,14	25,23±1,74
	(II)	31,81±1,77	59,94±1,98	30,48±1,86

In boys, the duration (Fig. 1) of the first phase of voluntary breath-holding during inhalation after suggestion in absolute values became longer by 4.84 seconds, and in girls by 5.67 seconds, which is statistically significant ( $p < 0.05$ ).



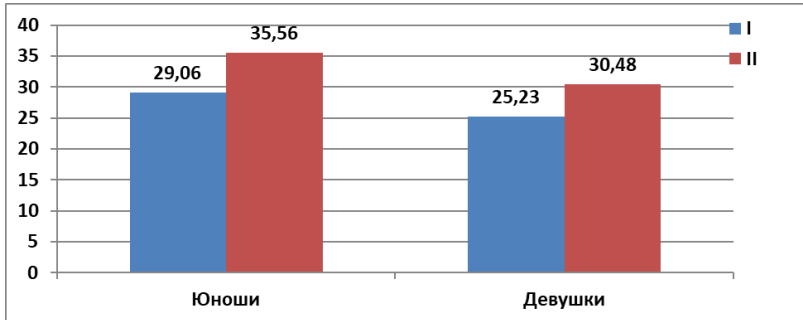
**Figure 1.** Duration of the first phase of voluntary breath holding in boys and girls during the Stange test before and after suggestion.

We note a significant ( $p < 0.05$ ) increase in resistance to hypoxia (Fig. 2) using the Stange test in both boys (by 4.57 seconds) and girls (by 5.86 seconds).



**Figure 2.** Duration of voluntary breath holding in boys and girls during the Stange test before and after suggestion.

After the suggestion, we note a significant ( $p < 0.05$ ) increase in resistance to hypoxia according to the Gench test in boys by 6.50 seconds, in girls by 5.25 seconds (Fig. 3).



*Figure 3. Duration of voluntary breath holding in boys and girls during the Gench test before and after suggestion.*

It can be stated that the use of suggestion allowed all students studying at humanitarian universities to significantly ( $p < 0.05$ ) increase their resistance to hypoxia. So, for boys, the time of holding the breath on exhalation increased by 6.50 seconds, and for girls - by 5.25 seconds.

We believe that the hypnosis model for studying the dominant is a fairly reliable scientific method with reliable clarity [Bull P.I., 1967; Bekhterev V.M., 1994].

It should be borne in mind that in humans the formation, satisfaction and change of dominants is more complex than in animals. As noted by Academician I.P. Pavlov [Pavlov I.P., 1951], humans have a goal reflex, which animals do not have. In animals, only three unconditioned reflexes have been proven: the unconditioned food reflex, the unconditioned sexual reflex and the unconditioned self-preservation reflex. On the basis of these unconditioned reflexes (food, sexual, self-preservation), animals form conditioned reflexes, but only up to the fourth order. A person has a fourth unconditioned reflex - a goal reflex. Target reflex according to I.P. Pavlov, this is all human creative activity, which is developed ad infinitum (Pavlov I.P., 1951). In our studies, for the formation (100%) of a situational dominant in the human brain, we used deep medical hypnosis (Anokhin P.K., 1968; Bekhterev V.M., 1994). In deep hypnosis, various situations were suggested to the university students, such as changing age, the possibility of increasing the muscle strength of the hand, increasing physical performance, and overcoming exam stress.

We were the first to develop a scientific method for studying the physiological teachings of Academician A.A. Ukhtomsky about the dominant, using the formation of dominants in humans using the method of deep suggestion using an absolutely safe method. The main property of the dominant, in our opinion, is the possession of efferent systems, the main of which is the muscular system, which is

a new property of the dominant (this property of the dominant is not in the teachings of A.A. Ukhtomsky), therefore the dominant can be identified by the activity of the muscular system. It is clear that without possessing the muscular system it is impossible to achieve the goal, to satisfy the desire (dominant).

It is necessary to introduce a number of axioms into the doctrine of the dominant, which, in our opinion, will make it possible to more logically explain the doctrine of the dominant. Firstly, it should be borne in mind that there are many dominants (or desires, various goals) in the human brain. A.A. Ukhtomsky called all these desires dominants, then it is not clear how they distribute priority among themselves? We propose to call the dominant (desire, goal) the main or first one, which has the majority of motor pathways. It is this first dominant that can be satisfied faster, because it has motor pathways (muscles).

In our opinion, for the analysis of dominants they can be numbered, for example, the first dominant has executive motor pathways (muscles) and will be satisfied first. The second dominant cannot be realized at the moment (there is no possession of the muscular system), but in terms of the strength of circulation in the neurons of the brain it may be stronger than the first dominant, but it will be satisfied only when it captures the motor pathways of the first dominant. The third dominant will receive motor pathways (figuratively, the steering wheel of a car) after satisfying the first two, and so on. A person's consciousness, his Self and the information of his memory, can choose one from a variety of dominants (desires) and give it the powers of the first dominant, which will possess the muscles and the entire efferent system and, therefore, can be realized.

### **Conclusions.**

As a result of our research into the dominant in suggestion, we obtained completely new physiological properties of the dominant, which had not been studied by any of the researchers before us. We called this new physiological state of the brain the dominant of hypnosis. The dominant of hypnosis differs from the dominant described by academician A.A. Ukhtomsky in that the dominant of hypnosis is introduced and formed in the brain by the hypnotist immediately and for a long time, without struggle it suppresses (or destroys) all other dominants in the brain and exists only on the orders of the hypnotist. The dominant of hypnosis is a new concept in the physiology of higher nervous activity, which reveals the mechanisms of the human central nervous system.

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## QUANTITATIVE ASSESSMENT OF PERITUMOROUS CD8+ T - LYMPHOCYTES AS A PROGNOSTIC FACTOR IN RENAL CELL CARCINOMA: CLINICAL AND PATHOLOGICAL COMPARISONS

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**Abstract.** *The aim of the study was to evaluate the prognostic value of quantitative CD8+ T-lymphocyte counts in the peritumoral zone of renal cell carcinoma. Materials and methods. The material of 74 patients after surgical treatment for renal cell carcinoma with a complete 5-year follow-up was retrospectively analyzed. Of the 74 patients, 56 were alive at 5-year follow-up, and 18 died of cancer. After immunohistochemical staining, the distribution density of CD8+ T-lymphocytes in the peritumorous zone of carcinomas was determined in 3 representative fields of view at a magnification of x 400 and comparisons were made with the clinicopathological characteristics of tumors and the overall 5-year survival of patients. Results. A high level of infiltration of the peritumorous zone of carcinomas with CD8+ T-lymphocytes was observed in stages III-IV of the disease ( $p = 0.0000001$ ), in tumors  $>7$  cm ( $p = 0.0000001$ ), in grades III-IV anaplasia according to Fuhrman ( $p = 0.001$ ), in the presence of metastases ( $p = 0.0000001$ ) and with shorter overall patient survival ( $p = 0.0003$ ). A high content of CD8+ T-lymphocytes was also noted in men ( $p = 0.001$ ) and in cases of unclassified cancer. Conclusion. In light of the need to search for new prognostic criteria for kidney cancer, we conclude that a high level of infiltration of the peritumoral zone with CD8+ T lymphocytes is an unfavorable prognostic factor. Assessment of infiltration of the peritumoral zone of kidney cancer with CD8+ T lymphocytes can serve as an additional prognostic factor that can predict the course of the disease at the preoperative level.*



**Keywords:** *kidney cancer, peritumoral zone, CD8+ T-lymphocytes, prognostic factors, overall survival analysis.*

Cells of the inflammatory infiltrate of the peritumoral zone (PZ) of malignant neoplasms are increasingly attracting the attention of researchers [1, 2, 3]. According to modern concepts, the inflammatory infiltrate in the morphologically unchanged tissue adjacent to the tumor is involved in the process of malignancy [4], since tumor cells have the ability to spread much further than the invasive edge of the tumor. In the PZ, malignant cells are able to remodel the stroma by interacting with mast cells, macrophages, fibroblasts and lymphocytes. The main pathway of activation of CD8+ lymphocytes in the PZ is the presentation of tumor antigens by dendritic cells through the binding of the T-cell receptor (TCR) to the domains of the major histocompatibility complex (MHC-II) molecules of the dendritic cell, with the formation of immunocompetent clones [5]. The path of activation of CD8+ T lymphocytes through CD4+ T lymphocytes is also known: it is the activated CD4+ T helper cells PZ that stimulate the migration and activity of CD8+ T lymphocytes by secreting effector cytokines [6]. Also, there is evidence that CD4+ and CD+ T lymphocytes of the PZ can participate in the process of epithelial-mesenchymal transition, in the processes of invasion and metastasis of carcinomas by activating matrix metalloproteinases [7, 8].

Cytotoxic CD8+ T lymphocytes are integral participants in the peritumoral inflammatory infiltrate. At the same time, the prognostic value of counting CD8+ T lymphocytes in the PZ of carcinomas is not clear.

Danilova N.V. et al. (2021) showed that in gastric cancer, a high density of CD8+ T lymphocytes in the prostate was associated with a greater depth of invasion, a more advanced stage of the disease, the presence of tumor emboli in the vessels and a short overall 5-year survival [6]. For breast cancer, according to Sofopoulos M. et al. (2019) patients with high levels of peritumoral CD8+ T lymphocytes showed poor postoperative survival [9].

However, data from Hu W.H. et al. (2015) showed that in anal squamous cell carcinoma there were strong positive correlations between high levels of peritumoral CD8+ T lymphocytes, good tumor differentiation, early pathological stage and better prognosis [10]. Similar data were obtained for liver cancer [11]. No relationship was found between the content of peritumoral CD8+ T lymphocytes and the clinical and morphological parameters of carcinomas and the prognosis of pancreatic cancer [12].

There are some studies in the scientific literature showing that stromal infiltration of tumor cells by CD8+ T lymphocytes was an unfavorable prognosis factor in renal cell carcinoma (RCC). Thus, Nakano O. et al. (2001) showed that a high number of stromal CD8+ T lymphocytes was associated with shorter postoper-

ative patient survival. At the same time, these authors conclude that it is not the fact of an increase in the number of CD8+ T lymphocytes that is important, but it is necessary to take into account the level of proliferation of immune cells; with a poor prognosis, the lymphocyte proliferation index was low [13]. Research data on the importance of CD8+ T lymphocytes in the PZ of RCC are scarce and ambiguous.

**The purpose of the study** was to study the expression and determine the prognostic significance of the distribution density of CD8+ T-lymphocytes in the PZ of RCC.

#### **Materials and methods of research.**

The surgical material of 74 patients after surgical treatment for RCC with a complete 5-year follow-up was retrospectively analyzed. Of the 74 patients, 56 were alive at 5-year follow-up, and 18 died of cancer. Baseline clinicopathological characteristics of the patients are presented in Table 1.

**Table 1.**  
*Clinicopathological characteristics of patients*

<b>Clinico-pathological parameter</b>	<b>Number of patients</b>	<b>%</b>
Gender: male	37	50
female	37	50
Age, years:	57,05±1,1; 34-74	
30 – 39	3	4,05
40 – 49	10	13,5
50 – 59	20	27
60 – 69	36	48,65
70 – 79	5	6,8
Histological variant of the tumor:		
clear cell	48	64,9
papillary	10	13,5
chromophobic	9	12,2
unclassifiable	7	9,4
TNM stage: I-II	52	70,3
III-IV	22	29,7
Gradation according to Fuhrman: G I-II	47	63,5
G III-IV	27	36,5
Carcinoma size cm: < 7	41	55,4
≥ 7	33	44,6
Localized carcinomas (N0):	59	79,7
Locally distributed (N+):	15	20,3

**Immunohistochemistry and counting methods.** Resected samples of tumor tissue were fixed in neutral formalin for 24 hours and placed in paraffin for subsequent preparation of histological preparations. CD8+ T lymphocytes were

stained by immunohistochemistry using the VENTANA UltraView Universal DAB detection system). Mouse monoclonal anti-human CD8 (clone SP57, VENTANA, USA; dilution 1:50) was used as primary antibodies. The preparations were examined using a Leica DM 750 microscope (Germany) and photographed with a Leica EC3 digital video camera (Germany) at a magnification of x 400. The average number of CD8+ T-lymphocytes in 3 fields of view of carcinomas was calculated by random sampling using the computer morphometric program Image Tool 3.0. The tissue immediately adjacent to the neoplasm and the tissue upstream of the conditionally unchanged kidney were taken as the PZ.

**Statistical analysis.** All statistical analyzes were performed using Statistica 10.0 for Windows. Data were presented as mean  $\pm$  standard error. Student's t test was used for statistical analyses. Correlations between the number of CD8+ T lymphocytes in the PZ and clinicopathological parameters were analyzed using the Spearman test. The association of variables with prognosis was assessed using the Kaplan-Meier method. A p value  $< 0.05$  was considered statistically significant.

#### **Research results and discussion.**

When calculating the distribution density of CD8+ T-lymphocytes in the PZ of RCC (without taking into account clinicopathological features), it was revealed that the number of CD8+ T-lymphocytes in 3 fields of view at a magnification of x 400 averaged  $74.1 \pm 5.6$ .

In a correlation analysis, the clinical stage of the disease, the size of carcinomas, the Fuhrman grade of anaplasia, the presence of local and distant metastases, and the overall postoperative survival of patients were correlated with the distribution density of CD8+ T lymphocytes in the prostate cancer. The gender, age of patients and histological type of tumors were not associated with the distribution density of CD8+ T-lymphocytes in the prostate cancer (Table 1).

**Table 1**

*Correlations between the distribution density of CD8+ T-lymphocytes in the prostate cancer and the clinicopathological features of carcinomas*

<b>Clinical and pathological parameters</b>	<b>Correlation coefficient (r)</b>	<b>p</b>
Gender of patients	0,21	0,08
Age of patients	0,03	0,80
Histological variant of carcinomas	0,06	0,60
TNM stage	0,54	0,0001
Tumor size	0,54	0,0001
Fuhrman grade of malignancy	0,80	0,0001
Presence of metastases (N+)	0,56	0,0001
Overall postoperative survival	0,50	0,0001

We calculated the distribution density of CD8+ T-lymphocytes depending on the clinicopathological parameters of RCC. The results are presented in Table 2.

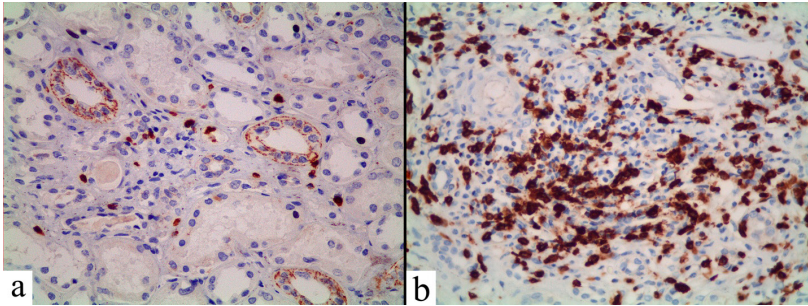
**Table 2**  
*Distribution density of CD8+ T-lymphocytes in peritumoral tissue depending on the clinicopathological features of carcinomas*

Clinico-pathological parameter	Distribution density of CD8+ T-lymphocytes in the peritumoral zone	P
Gender: male female	90±9,6 56,1±11,2	P = 0,001
Age, years: 30 – 39 (1) 40 – 49 (2) 50 – 59 (3) 60 – 69 (4) 70 – 79 (5)	8,3±1,2 121,1±24,3 82,8±98 58,1±6,3 75,2±15,4	P <sub>2-4</sub> = 0,0004
Histological variant of carcinomas: papillary (1) chromophobic (2) clear cell (3) unclassifiable (4)	19,±2,6 59,2±15,7 78,8±6,7 158,2±15,7	P <sub>1-4</sub> = 0,007 P <sub>2-4</sub> = 0,0000001 P <sub>3-4</sub> = 0,0000001
TNM stage: I-II III-IV	43,2±4,8 138,5±10,7	P = 0,0000001
Fuhrman grading of malignancy: G I-II G III-IV	24,4±1,7 160,6±9,3	P = 0,001
Carcinoma size, cm: < 7 ≥ 7	43,6±5,2 111,9±9,5	P = 0,0000001
Localized carcinomas (N0): Locally distributed (N+):	53,5±4,9 162,2±14,4	P = 0,0000001

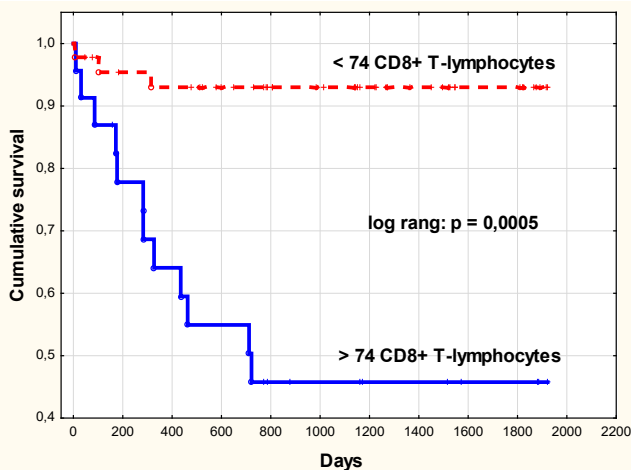
As can be seen from Table 2, in men the average number of CD8+ T-lymphocytes in the PZ was significantly higher than in women. In the age group from 40 to 49 years old, the highest content of CD8+ T-lymphocytes in the PZ was noted, and in the group from 30 to 39 years old, the lowest. In unclassified cancer, the number of CD8+ T lymphocytes in the prostate was the highest, and the lowest was in papillary carcinoma. In patients with clinical stage III-IV of the disease, the number of CD8+ T-lymphocytes in the prostate was increased by 3.2 times compared with stages I-II. With the degree of anaplasia of carcinomas GIII-GIV, the content of CD8+ T-lymphocytes increased 6.6 times compared with GI-GII degrees (Fig. 1. a, b). In tumors ≥ 7.0 cm in size, the number of CD8+ T lymphocytes in the PZ increased by 2.6 times. In patients with localized tumors, compared with

locally advanced ones, the number of CD8+ T-lymphocytes in the PZ significantly increased by 3 times.

An analysis of the overall 5-year postoperative survival of patients revealed an unfavorable prognosis for a high density of CD8+ T-lymphocytes in the PZ of RCC. The differences between the survival curves were significant (log rank:  $p = 0.0005$ ) (Fig. 1).



**Figure 1.** The distribution density of CD8+ T-lymphocytes in the PZ depending on the degree of atypia according to Fuhrman: a – with stage I anaplasia, a small number of CD8+ T-lymphocytes is noted, an increase of  $\times 400$ ; b – significant number of CD8+ T-lymphocytes in stage IV, magnification  $\times 400$ . Immunohistochemical staining for CD8.



**Figure 2.** Survival curves depending on the distribution density of CD8+ T-lymphocytes in the PZ of RCC.

### **Conclusion.**

In the vast majority of studies that studied the lymphoid infiltrate of tumors of various locations, infiltration with cytotoxic CD8+ T lymphocytes was associated with a good clinical outcome. However, in recent years, studies have emerged that cast doubt on the concept of a clear link between CD8+ T-lymphocyte infiltration and good clinical outcome. For example, in diffuse large B-cell lymphoma and Hodgkin lymphoma, tumor infiltration by these cells was associated with a poor prognosis. According to Giraldo N.A. (2015) kidney cancer, and clear cell carcinoma in particular, is a mystery in terms of studying the tumor microenvironment, since, according to the literature, unlike most malignancies, a high density of CD8+ T lymphocytes in carcinoma correlates with poor clinical outcome [14]. Also, in the publication of Remark R. et al. (2013) showed that infiltration of lung metastases from clear cell kidney cancer with CD8+ T lymphocytes was associated with short overall survival of patients, while in metastatic lung lesions from colorectal carcinoma, CD8+ T lymphocytes were a factor of good prognosis, which confirms the relevance of the study immune microenvironment in kidney cancer [15].

Kidney cancer in most cases is a group of solid carcinomas in which the intratumoral stromal component is poorly developed, but this disease has a very well defined PZ, which is usually called the capsule. It is this zone that is the arena where the most important immune events and rearrangements occur. It is interesting to note that in our previous studies, the high content of CD117+ mast cells, CD68+ macrophages and CD97 $\alpha$ + B-lymphocytes in the PZ, as well as the number of CD8+ T-lymphocytes in this work, significantly increased with advanced stages of the disease, high degree of anaplasia, large tumor size node, the presence of metastases and with a shorter overall 5-year postoperative survival of patients. At the same time, activation of angiogenesis was noted in the renal tubule epithelium; high expression of Ki-67, AgNORs, p53, bcl-2 was found in the epithelium of the renal tubules; the area and polyploidy of the nucleus increased there, which indicates manifestations of intraepithelial renal neoplasia. Apparently, in the PZ of kidney cancer, immune cells of the inflammatory infiltrate interact with each other and exert their immune effects in a single complex. However, it is unclear whether the infiltration of immune cells in the PZ in RCC is a sign of an active immune response or whether it is their passive redistribution in response to the release of cytokines by tumor cells.

Our results coincide with the data of those authors who indicate a poor prognosis for kidney cancer with abundant infiltration of the prostate cancer with CD8+ T lymphocytes. A high content of CD8+ T lymphocytes in the PZ of RCC has prognostic significance. In light of the need to search for new prognostic criteria for RCC, we conclude that a high level of infiltration of the RCC with CD8+ T lymphocytes may serve as a prognostic factor in renal cancer.

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## COMPARATIVE ANALYSIS OF BIOCHEMICAL PARAMETERS OF BLOOD SERUM AND ORAL FLUID IN HEALTHY INDIVIDUALS AND INDIVIDUALS WITH METABOLIC SYNDROME

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**Relevance.** *Metabolic syndrome (MS) is a serious medical and social problem throughout the world and is characterized by the presence in patients of: tissue insulin resistance, hyperinsulinemia, impaired glucose tolerance, primary arterial hypertension, dyslipidemia and hyperlipidemia against the background of abdominal obesity. The components of the concept of MS include diseases such as type II diabetes mellitus, arterial hypertension and lipid metabolism disorders. It is known that with general somatic diseases, changes occur in the oral cavity, which can manifest as morphofunctional disorders [1]. Reducing the frequency of complications of MS depends on the possibility of high-quality control over its course, early diagnosis of complications and implementation of preventive measures [7, 8].*

*Biological fluids play an important role in the life of the body, performing informational, managerial and executive functions, being a mirror of the metabolic processes occurring in the body [2]. Oral fluid attracts the attention of researchers due to its availability under physiological conditions [3]. The composition of the oral fluid includes the total secretion of the salivary glands, desquamated epithelium and waste products of the oral microbiota. The composition of saliva includes proteins, enzymes, hormones, lipids, carbohydrates and mineral components from the salivary glands, blood serum and oral tissues. This makes it possible to study metabolic parameters in oral fluid during screening studies [4].*

*Researchers in recent years have identified parallelism in changes in metabolic parameters in the blood and oral fluid in a number of diseases [5].*

*The biochemical composition and properties of oral fluid in persons with MS differ significantly from those in somatically healthy persons according to some indicators [6].*

*The relevance of this study lies in identifying differences in biochemical composition in order to use them for clinical and laboratory diagnostics, contributing to the development of preventive, predictive, personalized medicine.*

**Keywords:** *metabolic syndrome, obesity, oral fluid.*

**Purpose of the study**– study and compare the main biochemical parameters in blood serum and oral fluid in normal conditions and in persons with metabolic syndrome.

**Materials and methods.** To study and compare the main biochemical parameters in blood serum and oral fluid in normal conditions and in persons with Metabolic Syndrome, 33 patients (18 women and 15 men) aged from 35 to 59 years with MS were examined on the basis of the Public Healthcare Institution GKSP No. 1. All patients were examined by a therapist (at the Department of Polyclinic Therapy and Internal Diseases of Omsk State Medical University). The general health status was assessed, including an anthropometric study with the calculation of body mass index (BMI), the presence of abdominal obesity, the ratio of waist circumference to hip circumference (WC/HC) and the components of metabolic syndrome according to the National recommendations of 2013 (VNOK, 2013), which are based on the criteria, including the presence of type 2 diabetes mellitus, arterial hypertension, hyperinsulinemia, impaired glucose tolerance, dyslipidemia and hyperlipidemia against the background of abdominal obesity.

The comparison group included 25 patients (15 women and 10 men) aged 30 to 55 years without MS.

Exclusion criteria for both groups were severe somatic diseases - type 1 diabetes mellitus, chronic renal failure, severe anemia, respiratory failure, and cancer.

Samples of venous blood and oral fluid from patients with a confirmed complex diagnosis were analyzed. The determination of total protein, cholesterol, uric acid, alkaline phosphatase, triglycerides and glucose was carried out using a set of reagents for clinical biochemistry according to the methods of Vector-Best AO.

The dental examination was carried out according to the traditional scheme, including a clinical examination of patients (examination, physical examination methods).

Statistical analysis was carried out using Microsoft Excel and Statistica 6.0. differences between the mean values of individual indicators were assessed using standard deviation. Results were considered reliable at  $p \leq 0.05$ .

Results. Of the blood lipid disorders, hypercholesterolemia was the most common in both groups with MS. The level of total cholesterol (TC) in the blood in patients with MS was significantly higher than in patients in the control group (p

<0.05). The level of high-density lipoprotein (HDL) cholesterol was higher than normal, and low-density lipoprotein (LDL) cholesterol was decreased. The integral indicator of blood lipid composition - atherogenic index (AI) - was on average  $4.9 \pm 0.04$  mmol/l in the group with MS, which is significantly higher than normal and significantly higher than in patients in the control group ( $p < 0.05$ ). When comparing the indicators in people with MS, significant differences were also determined which can largely determine the clinical and morphofunctional state of the tissues. The detected changes in the lipid composition of the blood in patients with MS indicated disturbances in cholesterol metabolism towards increased atherogenicity and indicated a high risk of developing atherosclerosis and coronary heart disease. The studied blood parameters in all subjects of the main group, with a few exceptions, tended to increase (Table 1).

**Table 1***Comparative assessment of biochemical parameters of blood serum*

Group of examined people	Glucose, mmol/l	HS, mmol/l	HDL cholesterol, mmol/l	LDL cholesterol, mmol/l	TG, mmol/l	HbA1c %
Persons with MS*	$6.8 \pm 0.6$	$6.4 \pm 0.9$	$1.11 \pm 0.135$	$3.65 \pm 0.46$	$2.53 \pm 0.63$	$6.4 \pm 0.71$
Test	6.1	5.2	1.09	3.37	1.7	4-5.5

\* - differences with the control group are significant ( $p < 0.05$ )

In the oral fluid there is an increase in glucose levels by 2.5 times, the content of total cholesterol in persons with MS exceeds the levels by 3 times. The level of TG in people with MS was 5 times higher than in the oral fluid (Table 2).

**Table 2**

Group examined	Glucose, $\mu$ mol/l	HS, $\mu$ mol/l	TG $\mu$ mol/l
Persons with MS*	$3.15 \pm 1.48$	$7.8 \pm 0.17$	$3.4 \pm 0.9$
Test	1.56	$2.8 \pm 0.18$	$0.7 \pm 0.2$

\* - differences with the control group are significant ( $p < 0.05$ )

A comparison of the indicators of groups with metabolic syndrome with the indicators of individuals without metabolic disorders showed that in patients with MS, changes in microcirculation in the periodontium during the inflammatory-destructive process are more pronounced.

**Conclusion.** In individuals with Metabolic Syndrome, biochemical parameters were significantly higher than in healthy individuals. Levels of glucose, triglycer-

ides, and total cholesterol in venous blood are significantly increased. In oral fluid, the comparison results are significantly higher than in blood.

Consequently, the study of oral fluid adequately reflects the biochemical status and physiological state of a healthy and healthy person. This has important practical significance for the use of non-invasive research methods in dentistry.

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## METHOD OF TREATMENT OF OROANTRAL COMMUNICATION OF THE MAXILLARY SINUS

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**Abstract.** *In this scientific study, an assessment of different methods of closing the perforation and the oroantral junction of the maxillary sinus was carried out. To close the perforation and oroantral junction of the maxillary sinus, the following were used as a barrier: bioPlateMembraneMatrix collagen membrane manufactured by Cardioplant LLC, Penza, Russia and non-resorbable polytetrafluoroethylene (PTFE) membrane with titanium reinforcement produced by Mediopac, Greece and non-resorbable polytetrafluoroethylene (PTFE) membrane with titanium reinforcement produced by Bio-MAM, Republic of Korea.*

**Keywords:** *perforation, oroantral junction, maxillary sinus, membrane.*

**Introduction.** The complications arising from tooth extraction surgery are described in sufficient detail in the literature. Common complications include pushing a tooth into the maxillary sinus to form an oroantral message or extraction of a tooth to form a perforation of the bottom of the maxillary sinus [1,2,3,7].

Perforation of the bottom of the maxillary sinus occurs both through the fault of a doctor (with traumatic or incorrect tooth extraction with a chisel, forceps or elevator, careless examination of the hole with a curettage spoon or removal of granulations from its bottom), and as a result of individual features of the structure of the upper jaw (pneumatic type of the maxillary sinus with a low location of its bottom or previous pathological processes in the area the tops of the tooth root).

Diagnosis of maxillary sinus perforation is based on the following signs: blood with air bubbles (bloody foam) is released from the hole of the extracted tooth; when probing (with a blunt probe, curettage spoon), the instrument freely enters the cavity of the maxillary sinus; positive nasal test - the patient closes both nostrils with his fingers and tries to exhale air through the nose, and the air comes

out of the hole with a whistle (with noise and bubbles or blood); when rinsing the mouth, liquid enters the nose.

An oroantral fistula is a junction between the oral cavity and the maxillary sinus, formed approximately 10-14 days after tooth extraction. In a clinical study: the edges of the fistula are edematous, the fistula is closed by granulations. The oroantral message is an epithelized anastomosis that forms approximately 10-14 days after tooth extraction. A clinical study determines the free passage into the maxillary sinus, which, as a rule, is localized at the top of the alveolar ridge in the area of the removed first or second molar.

If the perforation of the bottom of the maxillary sinus (without the presence of a tooth root) is complicated by acute purulent sinusitis, then, to relieve inflammatory phenomena and form an oroantral fistula or oroantral message, the maxillary sinus cavity should be rinsed with an antiseptic solution through the hole for several days.

To close the oroantral anastomosis, plastic types are used based on wide cutting and moving of flaps from the palate or from the vestibule of the oral cavity. The disadvantages of these techniques include: high degree of invasion of the intervention [4,5,6,8].

**The aim of our study** was to clinically evaluate the methods of closing the perforation and oroantral junction of the maxillary sinus based on the use of insulating membranes.

**Materials and methods of research.** The present study is based on the results of treatment of patients with perforation of the bottom of the maxillary sinus and oroantral anastomosis who applied to the dental clinic “North Caucasian Medical Educational and Methodological Center” in Stavropol from 2018 to 2023. Treatment for perforation of the bottom of the maxillary sinus was performed in 5 patients, for closure of the oroantral anastomosis in 6 patients. To complete the tasks, clinical, laboratory and retgenological studies were carried out. The patients’ complaints, causes and timing of tooth extraction were studied in the anamnesis, and the nature of the treatment carried out after this was analyzed.

To close the perforation and oroantral junction of the maxillary sinus, the following were used as a barrier: bioPlateMembraneMatrix collagen membrane manufactured by Cardioplant LLC, Penza, Russia and non-resorbable polytetrafluoroethylene (PTFE) membrane with titanium reinforcement produced by Mediopac, Greece and non-resorbable polytetrafluoroethylene (PTFE) membrane with titanium reinforcement produced by Bio-MAM, Republic of Korea.

Due to the small number of patients, no statistical data processing was performed.

**The results of the study.** To close the perforation of the maxillary sinus, we propose the following method. After tooth extraction, with clinical signs of perforation of the bottom of the maxillary sinus, the muco-periosteal flaps are detached in the perforation area, the flaps are immobilized, with the flaps freely overlapping the perforation

zone, the latter is closed by a collagen membrane, the muco-periosteal flaps are sutured above the membrane. The stitches are removed after 10-14 days.

If it is not possible to close the perforation with muco-periosteal flaps, the perforation is closed with a PTFE membrane with titanium reinforcement, the edges of the flaps are sutured to maximum convergence, but without tension. The sutures are removed after 10-14 days, the membrane is removed after a month.

To close the oroantral junction, we propose the following method: at the edges of the oroantral junction, we make a fringing incision of the mucosa, muco-periosteal flaps peel off, we perform an audit of the maxillary sinus, we close the oroantral message with a non-resorbable membrane with titanium reinforcement, the edges of which are tucked under the periosteum, the wound along the edges of the defect is sutured with non-resorbable material. The membrane is removed after 1 month, after waiting for the restoration of the mucous membrane of the maxillary sinus. After removal of the membrane, the restoration of the oral mucosa takes place spontaneously within 5-7 days. This method has proven itself on the positive side and when closing oroantral messages of significant size.

**Description of the clinical case:** patient T., 46 years old, went to the clinic with complaints about food getting from the mouth into the nasal cavity while eating. These complaints appeared about two years ago after tooth extraction in the upper jaw area on the right. Clinical examination revealed a communication of the oral cavity with the maxillary sinus up to 8 mm in diameter (Fig.1). The X-ray shows a defect in the alveolar wall of the maxillary sinus in the projection of the missing tooth up to 12 mm in diameter, the mucous membrane of the maxillary sinus in the communication zone is thickened to 8 mm (Fig. 2). Diagnosis: oroantral message of the maxillary sinus on the right. Treatment plan: closure of the oroantral communication using a polytetrafluoroethylene membrane with titanium reinforcement. To close the oroantral message, we used the method we described.

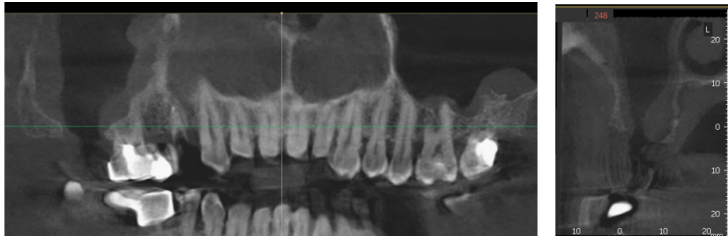
Under local anesthesia, a fringing mucosal incision was made along the edges of the oroantral anastomosis, muco-periosteal flaps were detached, the maxillary sinus was revised, granulations were removed from its walls. The oroantral message was closed with an unresorbable membrane with titanium reinforcement (Fig.3), the edges of which were tucked under the periosteum, the wound along the edges of the defect was sutured with an unresorbable material (Fig.4). The membrane was removed after 1 month (Fig.5), the absence of an oroantral message was noted, the bottom of the wound after removal of the membrane was the mucous membrane of the maxillary sinuses (fig. 6).

After removal of the membrane, the oral mucosa recovered spontaneously in accordance with the physiological processes of wound healing in the oral cavity. 4 months after the operation, clinically and radiologically, a complete closure of the oroantral message was observed, it should be noted that the thickness of the mucosa decreased to 2 mm, that is, to the physiological norm. (Fig. 7,8).

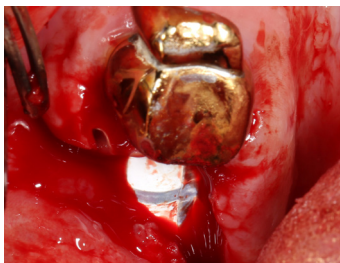




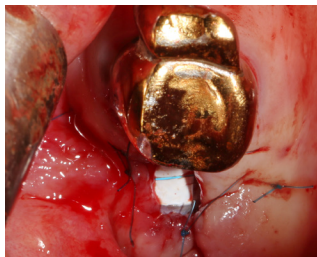
*Figure 1. Type of oroantral message in patient T.*



*Figure 2. Computed tomography, panoramic reconstruction. In the area of the removed tooth, the alveolar wall of the maxillary sinus is missing, the sinus mucosa is thickened.*



*Figure 3. Closing the message with a titanium reinforced membrane.*

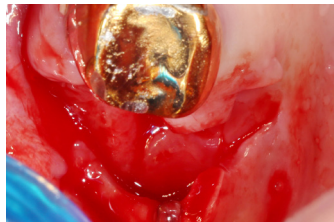


*Figure 4. View of the wound after suturing.*

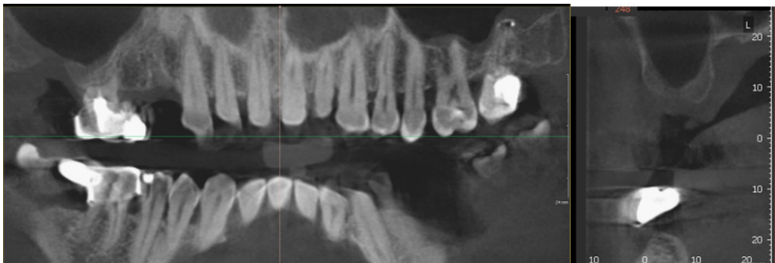




**Figure 5.** View of the wound 1 month after the membrane was installed.



**Figure 6.** View of the wound after removal of the membrane.



**Figure 7.** Computed tomography, panoramic reconstruction. In the area of the removed tooth, the alveolar wall of the maxillary sinus is restored by a bone bridge, the sinus mucosa is not radiologically determined.



**Figure 8.** The condition of the alveolar ridge four months after surgery.

### **Conclusions and recommendations.**

1. To close the perforation of the bottom of the maxillary sinus, in the presence of purulent inflammation, open wound management is recommended. In the case of the formation of an oroantral anastomosis, its closure is planned, no earlier than 4-6 weeks after the relief of acute inflammation.

2. To close the perforation of the maxillary sinus that occurred during tooth extraction, in the absence of purulent inflammation, immediate closure of the hole is recommended. In the presence of soft tissues that allow the perforation to be closed, the use of an insulating collagen membrane is recommended. In case of soft tissue deficiency, the use of an insulating polytetrafluoroethylene membrane with titanium reinforcement is recommended.

3. For the treatment of oroantral anastomosis, plastic surgery of the anastomosis using an insulating polytetrafluoroethylene membrane with titanium reinforcement is recommended.

### **Conclusion.**

The use of methods for the treatment of maxillary sinus perforation and closure of the oroantral anastomosis, based on the use of insulating membranes, significantly reduce the invasiveness of traditional methods of treating this pathology and shorten the recovery time of the maxillary sinus mucosa and oral mucosa. These methods are recommended for use both in the hospital and in outpatient practice.

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## EARLY-STAGE DETECTION AND IDENTIFICATION OF RISK FACTORS FOR GALLSTONE DISEASE USING MACHINE LEARNING ALGORITHMS

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**Abstract.** *Cholelithiasis, also known as gallstone disease, is a multifactorial and multistage condition characterized by disruptions in the metabolism of cholesterol and/or bilirubin, resulting in the formation of gallstones within the gallbladder and/or bile ducts.*

*Gallstones typically arise from the components present in bile, such as cholesterol, calcium, bilirubin, and other pigments. Imbalances in these substances can contribute to the formation of stones. However, the precise causes of cholelithiasis are not entirely understood, and its development is thought to involve a combination of different factors.*

*The prevalence of gallstones varies in different countries, with an average frequency of 10-15% among the adult population. Based on the opinions of several authors, it can be stated that in Russia, this condition is detected in 5.3-40% of the population. In India, it is considered to be approximately 4%. Furthermore, the proportion of gallstone disease within the overall structure of digestive organ disorders is consistently increasing, and it is a significant gastroenterological issue.*

*The absence of clinical symptoms in the early stages of gallstone disease leads to its late diagnosis and, consequently, delayed initiation of treatment. The significant increase in the number of gallbladder surgeries in recent years is largely attributed to the latent progression of the disease and the diagnosis of gallstone disease at advanced stages, where conservative treatment methods are less effective. Unfortunately, it is noteworthy that cholecystectomy, regardless of the surgical approach, does not compensate for the complex pathophysiological disturbances associated with gallstone disease.*

*In light of the above, there is a need for early diagnosis of gallstone disease, identification of prognostic criteria for gallstone formation, as well as the timely application of preventive measures, especially for high-risk individuals.*

**Keywords:** *Early-stage detection, Risk factors, Gallstone disease, Machine learning algorithms, Cholelithiasis, Prevention, Predictive modeling, Decision tree.*

**The objective of this research is** to develop machine learning models that can effectively predict the probability of gallstone disease at an early stage and assist in identifying individuals at a higher risk of developing the condition. The proposed predictors encompass presumed risk factors that are readily accessible, can be collected remotely, and can serve to predict the need for conducting ultrasound examinations of the gallbladder. Furthermore, it is proposed to develop an algorithm for analyzing a large dataset of patients undergoing general medical examination in order to identify those at risk of developing gallstone disease and refer them to a gastroenterologist.

**Basic provisions:**

The data collection for patients and control group was conducted at the Department of Internal Medicine Propaedeutics of the Izhevsk State Medical Academy, Ministry of Health of Russia, based on the Clinical Diagnostic Center of the Udmurt Republic Clinical Hospital No. 8, Ministry of Health of the Udmurt Republic, and City Polyclinic No. 1 in Izhevsk from 2016 to 2020. The examination of patients was carried out based on informed voluntary consent in accordance with Order No. 390n of the Ministry of Health and Social Development of the Russian Federation dated April 23, 2012 (registered by the Ministry of Justice of the Russian Federation on May 5, 2012, registration number 24082). The study was approved by the Biomedical Ethics Committee of the Izhevsk State Medical Academy, Ministry of Health of Russia (session protocol 529, January 24, 2017). The study group consisted of 209 patients, including 122 females and 87 males. The average age was  $45.64 \pm 15.84$ . The control group consisted of 50 individuals, comprising 30 females and 20 males, with a mean age of  $41.04 \pm 11.57$ .

The statistical indicators of liver disease incidence from 2008 to 2018, both nationwide and in two regions of Russia - the Udmurt Republic and Tatarstan, are publicly available on the website of the Federal State Statistics Service (Rosstat) under the category “Disease Incidence of the Total Population of Russia,” Ministry of Health of the Russian Federation. The data were analyzed using various programming language libraries such as “Python” for statistical analysis, including sklearn, xgboost, and others.

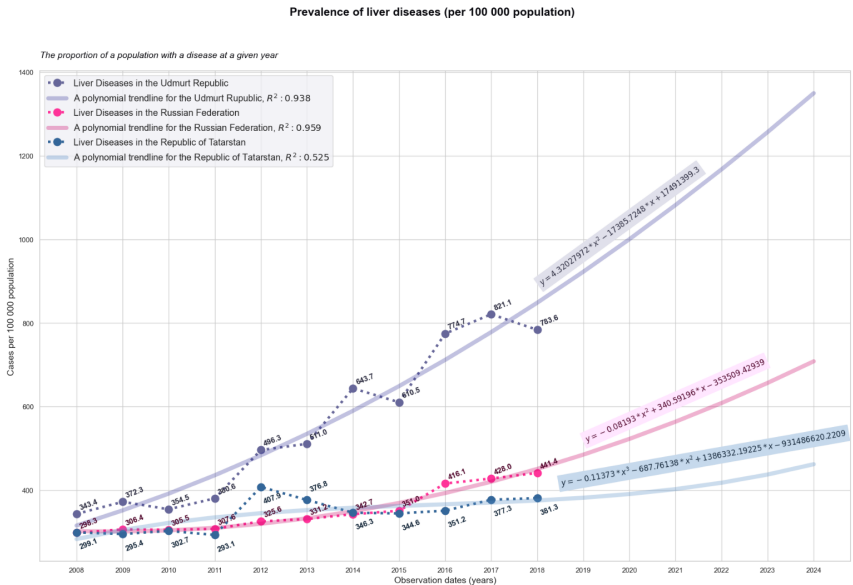
**To begin with,** it is important to highlight the significance of this research. This can be done by examining the rates of liver pathology over a 10-year period (from 2008 to 2018) in the Russian Federation, Udmurt Republic, and the Republic of Tatarstan. The selection of regions for the study was based on data availability. Additionally, considering that data on the control group and the experimental

group were collected within the territory of the Udmurt Republic, choosing these locations for the data analysis seems appropriate.

**Table 1.**  
*The prevalence per 100,000 population for liver diseases in 2008-2018*

Location	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
The Russian Federation		343.4	372.3	354.5	380.6	496.3	511.0	643.7	610.5	774.7	821.1	783.6
Udmurt Republic		299.1	295.4	302.7	293.1	407.9	376.8	346.3	344.6	351.2	377.3	381.3
The Republic of Tatarstan		298.3	306.4	305.5	307.6	325.6	331.2	342.7	351.0	416.1	428.0	441.4

By employing the polynomial regression method, a predictive model for the general prevalence of liver diseases in the three selected locations can be constructed.



Now, utilizing the constructed model, the overall disease prevalence until the year 2025, inclusive, can be forecasted. It should be noted that the model’s accuracy is sufficiently high to trust the predicted increase in overall disease prevalence in the investigated regions.

**Table 2.**

*The predicted dynamics of prevalence per 100,000 population for liver diseases until 2025*

Location	Year	2019	2020	2021	2022	2023	2024	2025
The Russian Federation		485.18	522.83	563.98	608.62	656.77	708.42	763.57
Udmurt Republic		922.72	1000.57	1082.2	1167.6	1256.77	1349.72	1446.44
The Republic of Tatarstan		382.1	390.9	402.64	417.98	437.62	462.22	492.49

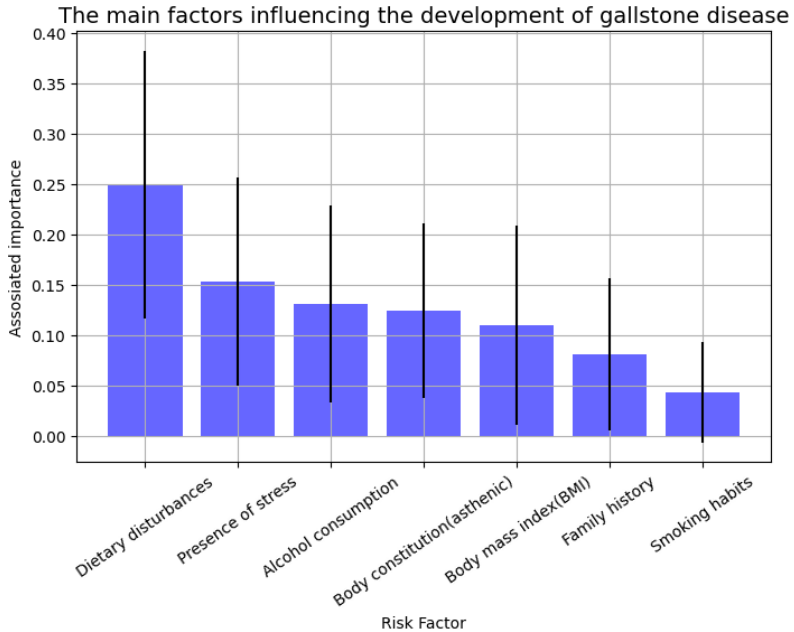
As it can clearly be seen from the table, the occurrence of liver diseases is predicted to have a high growth rate in both Udmurt Republic and Tatarstan, as well as in Russia as a whole. It is important to note a few points. Firstly, despite the data being specific to Russia in this case, the increasing prevalence of liver diseases is a global trend. Therefore, regardless of the chosen location, an increase can be expected. Additionally, the provided data represents liver diseases as a whole. However, according to many authors, cholelithiasis is considered the second most significant problem in gastroenterology, following only peptic ulcer disease (PUD). Therefore, the overall increase in liver disease occurrence undoubtedly indicates a rise in the prevalence of gallstone disease in particular.

Given the undisputed significance of this research study, let us now proceed to ascertain the primary risk factors associated with the prevalence of gallstone disease, as well as the mechanisms involved in its timely diagnosis.

Having analyzed the data and their impact on the presence or absence of gallstone disease, the following 7 significant risk factors that are part of the medical history and do not require any specific tests (such as a complete blood count) have been identified. The comprehensive list of analyzed predictors includes the following:

- Personality anxiety (determined based on questionnaire responses).
- Alcohol consumption.
- Smoking habits.
- Age.
- Body mass index (BMI).
- Dietary disturbances.
- Family history.
- Presence of stress.
- Gender (and the number of pregnancies)
- Body constitution (asthenic, hypersthenic, normosthenic).

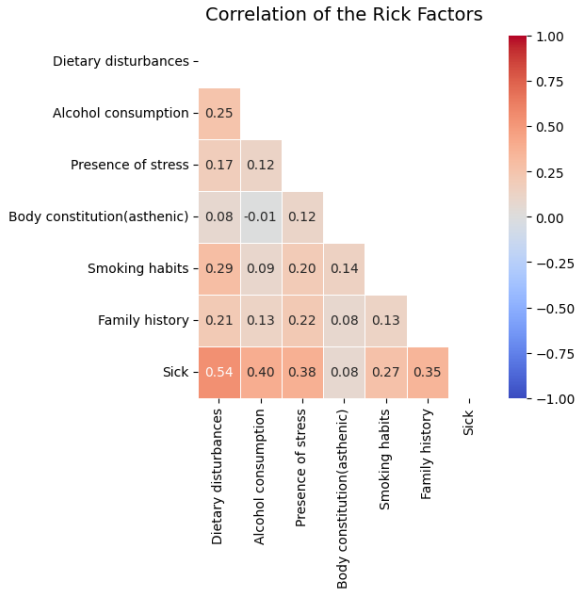
These factors have been assessed for their association with the occurrence of gallstone disease, considering their influence on the overall risk profile of the individuals under study.



Thus, the main risk factors influencing the development of gallstone disease (cholelithiasis) have been successfully identified. This allows healthcare professionals to pay special attention to patients who exhibit most of these risk criteria. Furthermore, it enables the formulation of a list of recommendations to prevent the development of gallstone disease. These recommendations may include strategies to maintain a healthy weight, modify diet and lifestyle, manage stress levels, quit smoking, and limit alcohol consumption. The effective implementation of such recommendations can help reduce the risk of developing gallstone disease in susceptible individuals.

On the next stage, based on the selected data, we will attempt to build a simple model that can accurately identify individuals at high risk of developing gallstone disease.

First of all, it is crucial to ensure that the identified risk factors do not correlate, which is vital to know, thus building a non-biased model.



The given rick factors are clearly independent, which allows to precede with analysis. The built decision tree based on the selected risk factors allows to determine whether a person is sick or not. Since the model is dealing with the categorical data represented as 0 and 1, a threshold value of 0.5 to make a decision about the presence or absence of a particular symptom has to be used.

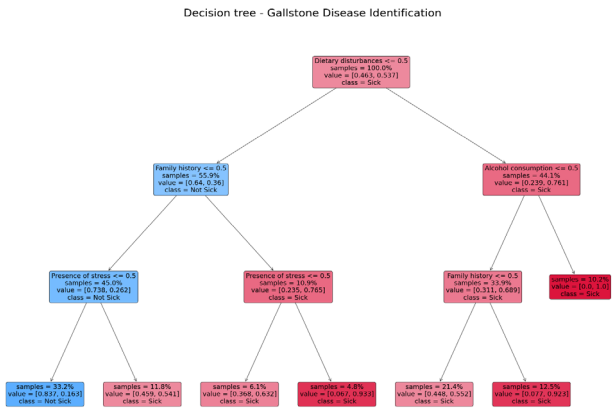


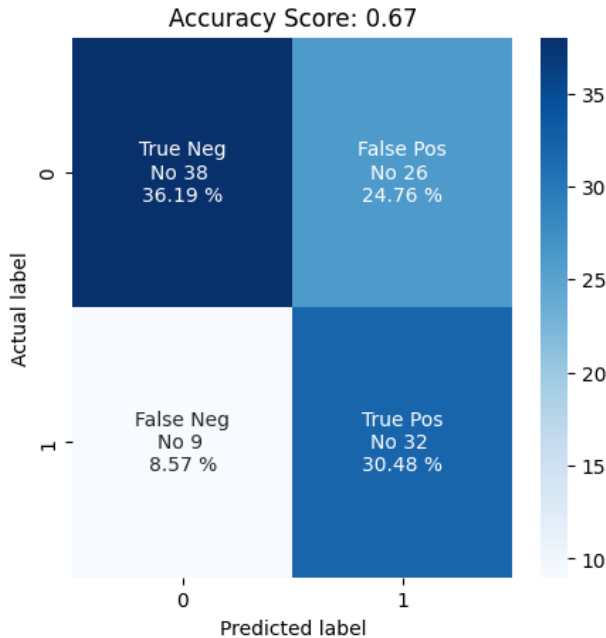
Figure 4. Decision tree for the identification of the gallstone disease



Note that this model is a significant simplification and cannot be used as the sole indicator for diagnosing a condition. However, it can effectively identify individuals who fall into a high-risk group for developing cholelithiasis and, for example, serve as a questionnaire to determine whether a person should seek consultation with a gastroenterologist.

The model can help identify individuals with specific risk factors, such as family history and dietary disturbances, which may indicate the possible presence of a disease. It can be a useful tool for preliminary health assessment and decision-making regarding further consultation with a medical specialist.

However, it should be noted that the model's accuracy is not high enough for precise diagnosis. Nevertheless, considering that the majority of false predictions belong to the category of false positives, the application of this model will still lead to a higher level of gallstone disease detection.

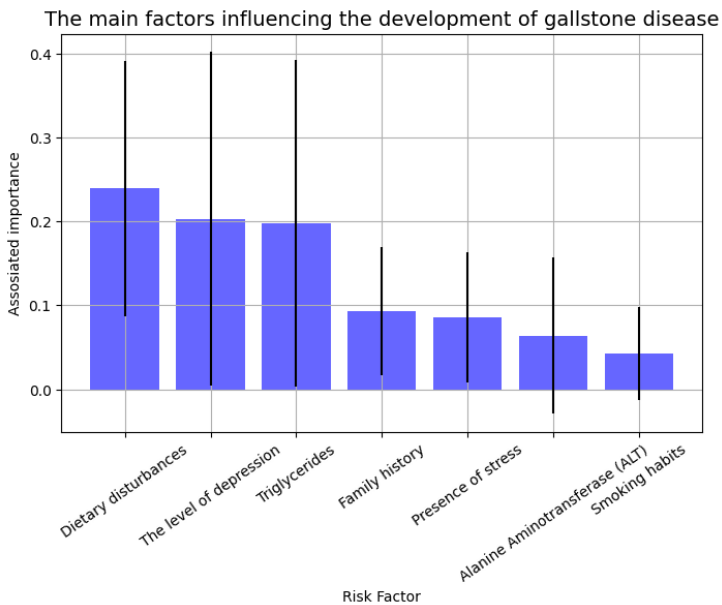


*Figure 5. Confusion Matrix for the decision tree*

More complex algorithms should also be applied. This method can be useful for processing the medical history of a large number of patients who have undergone, for example, a general examination - after which there is a question of

referring some of them to a gastroenterologist consultation. Suppose the patient has previously undergone a biochemical blood analysis. It is an important part of a comprehensive patient examination and provides information about the function of various organs and systems of the body, as well as helps detect or monitor various diseases. During a general examination, biochemical blood analysis can be a useful tool for assessing the condition of the liver, kidneys, heart, pancreas, and other organs.

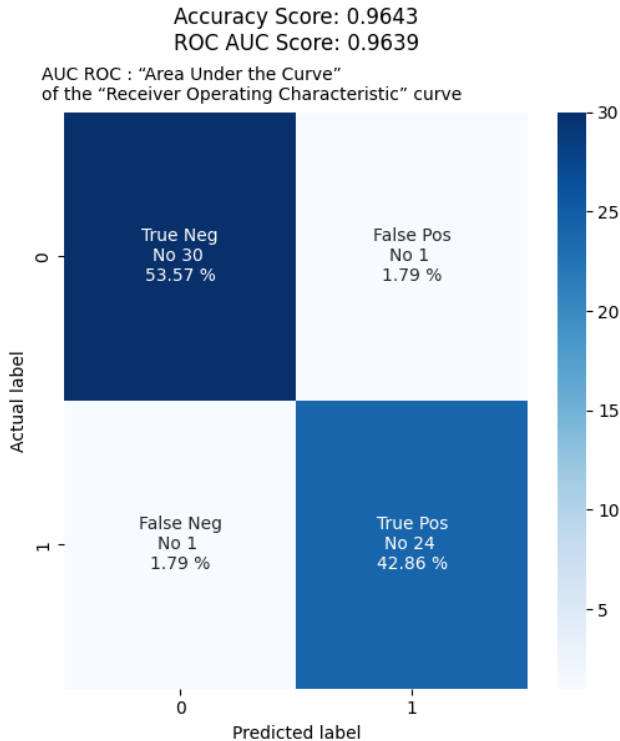
Let us begin by identifying the primary predictors for diagnosing early-stage gallstone disease. This time, the predictors included in the biochemical blood analysis (such as ALT, AST, ALP, etc.) will be incorporated.



**Figure 6.** Identified risk factors, influencing the development of gallstone disease (Including the parameters from the biochemical blood analysis)

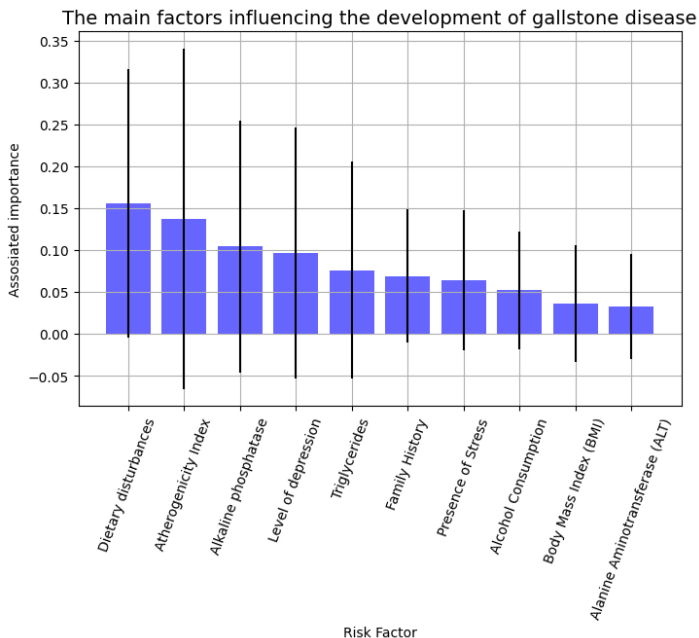
In this instance, Random Forest and Extreme Gradient Boosting (XGBoost), which are renowned machine learning algorithms employed for classification purposes, to forecast the likelihood of a disease occurrence, are to be utilized. Random Forest amalgamates multiple decision trees to generate predictions, while XGBoost operates as a gradient boosting algorithm that constructs an ensemble of weak prediction models sequentially.

After hyperparameter tuning, the XGBoost classifier achieved an accuracy of 0.96. The ability to achieve such high accuracy with relatively basic predictors opens up a wide range of possibilities in the field of detecting gallstone disease at an early or preclinical stage.



*Figure 5. Confusion Matrix for the XGBoost Classifier*

The model's potential is constrained due to the limited amount of data currently available. Nevertheless, even with these limitations, it is still feasible to identify several robust predictors. Future plans involve enhancing the model's accuracy and reliability by acquiring additional data pertaining to these predictors. By collecting data from a larger pool of patients and broadening the control group, it is possible to develop more precise models. These models can vary in complexity, ranging from simple ones that utilize predictors solely from medical history to more intricate models that incorporate parameters derived from a complete blood count.



**Figure 5.** Identified risk factors, influencing the development of gallstone disease (that are to be implemented in the future)

Based on the research conducted, the following conclusions can be drawn

1. From 2008 to 2018, there has been a clear and consistent upward trend in the prevalence of liver disease in The Russian Federation, including specific regions such as the Udmurt Republic and The Republic of Tatarstan. This trend was predicted and is expected to continue in the coming years. Additionally, despite the data being specific to Russia, it has been demonstrated that this is a global trend.

2. Studying the trend of liver disease prevalence enables us to forecast the continuation of the increasing incidence of bile duct diseases, primarily in the early (preclinical) stage.

3. An important goal is to continue research aimed at gaining a deeper understanding of the risk factors associated with gallstone disease and identifying appropriate algorithms for early diagnosis. By further investigating the risk factors, such as genetic predisposition, lifestyle factors, and metabolic disorders, effective strategies for early detection and prevention of gallstone disease can be detected. The development of accurate and reliable diagnostic algorithms will contribute to timely intervention and improved patient outcomes.

4. Currently, predictive models incorporating biochemical blood markers are still under development. However, there is no doubt about the need to continue data collection and analysis. This will enable future analysis of large patient datasets and facilitate the referral of patients to gastroenterologists only when necessary. Additionally, it will help alleviate the burden on hospitals and expand the abilities of telemedicine.

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## NEUROSURGICAL TACTICS OF LABOR MANAGEMENT IN A PATIENT WITH A RUPTURED ICA ANEURYSM: LITERATURE REVIEW AND CLINICAL OBSERVATION

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**Annotation.** Currently, extragenital diseases occupy a leading place in the structure of maternal mortality, which explains the relevance of a broad study of this topic. This article presents a clinical case of successful termination of pregnancy in a woman diagnosed with: III premature operative delivery at 36 weeks. Aneurysmal disease of the cerebral vessels. Aneurysm of the internal carotid artery on the right with rupture, unexpressed intraventricular hemorrhage (from 05/20/2021). 2 scars on the uterus. Burdened obstetric and gynecological history (OAG). Gestational arterial hypertension. Chronic pyelonephritis, remission. Mild myopia. Compensated placental abnormalities. Intrauterine infection (IUI). Laparotomy according to Pfannenstiel. Caesarean section by Derfler. Sterilization of the fallopian tubes. Angiography of brachiocephalic arteries (BCA), main arteries of the head (MAG). Embolization of the supraclinoid aneurysm of the right internal carotid artery (ICA) by a microspiral.

An emergency surgical delivery was performed by cesarean section in the conditions of the X-ray operating room of the cardiac surgery center, followed by emergency angiography of the MAG, which further confirmed the presence of a saccular aneurysm of the supraclinoid section of the right internal carotid artery, it was decided to embolize it with a microspiral. The patient was observed in the intensive care unit with subsequent transfer to the Department of neurosurgery to continue conservative therapy, from where, after the end of treatment, she was discharged in a satisfactory condition without complaints.

**Keywords:** aneurysm rupture, subarachnoid hemorrhage, pregnancy, treatment.

### **Introduction**

A special place among extragenital diseases that complicate the course of pregnancy, childbirth, and the postpartum period is occupied by acute cerebrovascular accident (ONMC) as the most threatening and dangerous condition.

Subarachnoid hemorrhage (SAH) is one of the forms of hemorrhagic stroke characterized by the spread of blood from the bloodstream into the subarachnoid space (between the soft and spider membranes) of the brain [1]. Subarachnoid hemorrhages (SAH) occupy a significant place in terms of prevalence among non—maternal causes of maternal mortality.

The frequency of hemorrhagic strokes (GI) in pregnant women varies according to various sources, ranges from 2-5 to 30 cases per 100,000 pregnancies [2-4], mortality reaches 30-40%, in the structure of maternal mortality - 5-12%. The frequency of GI in obstetric practice is 0.04% of the total number of births, or 42.9 per 100,000 pregnant women [4].

Acute disorders of cerebral circulation at various stages of pregnancy, childbirth and the postpartum period remain the most important interdisciplinary problem for obstetricians, gynecologists, neurologists, neurosurgeons, vascular surgeons, anesthesiologists, intensive care specialists and doctors of other specialties, since each clinical case is individual.

Risk factors for cancer during pregnancy and in the postpartum period include [5]: arterial hypertension, aneurysms, malformations, vascular abnormalities in connective tissue dysplasia, arterial hypotension, collapse. Also, obstetric risk factors themselves: eclampsia, in vitro fertilization, multiple pregnancies (the risk of it is increased with in vitro fertilization), amniotic fluid embolism, cesarean section, cardiomyopathy, choreocarcinoma. Administration of medicines (high doses of female sex hormones, L-asparaginase, immunoglobulin, interferon, hormonal contraceptives).

An arterial aneurysm (AA) is a small local bulge with a thinning of the vessel wall. Aneurysms should be considered as a polyethological disease in which, under the influence of a large number of different factors (genetically determined defects in the structure of the arterial wall, atherosclerosis, hemodynamic features, hypertension, exogenous effects, etc.), local damage to the vascular wall occurs, followed by the formation of an aneurysmal sac. There are a number of diseases that lead to vascular wall disorders and increase the risk of formation of cerebral vascular aneurysms (Marfan syndrome, Ehlers-Danlo syndrome, systemic lupus erythematosus, vascular elasticity disorder) [6].

The clinical picture of subarachnoid hemorrhage includes sudden sharp headache that cannot be treated with analgesics, repeated vomiting, the development of

meningeal symptoms (stiffness of the occipital muscles, Kernig's symptom) and depression of consciousness (from mild stunning to coma). Focal neurological symptoms occur in the form of impaired motor function, sensitivity, and speech during the formation of intracerebral hematomas or delayed against the background of angiospasm. Magnetic resonance imaging (MRI) is the least dangerous method of diagnosing various diseases of the central nervous system in pregnant women. MRI in normal and vascular modes (MR-AG) allows you to verify the presence of SAC and its source. In cases where it is impossible to perform an MRI, it is advisable to conduct a computed tomography.

#### **A clinical case**

Patient P., 33 years old, was admitted on 05/15/2021 for prenatal hospitalization in the Department of Pregnancy Pathology No. 1 of the St. Joasaph Perinatal Center OGBUZ BOKB with a diagnosis of "Pregnancy 36-37 weeks. OAGA. 2 scars on the uterus. Chronic pyelonephritis, remission. Subcompensated placental disorders. NWRP of the first degree". At the time of receipt, she had not filed any complaints.

Life history: this pregnancy is the 3rd. 1 pregnancy in 2015 – an urgent cesarean section for the discoordination of labor, 2 pregnancy - in 2018 – a cesarean section for a scar on the uterus – without complications. She was registered for a real pregnancy in a women's clinic from 10 weeks. Ultrasound screenings are without special features. During the present pregnancy, there was no increase in blood pressure, edema, or proteinuria. Weight gain of -12 kg is acceptable. At the age of 33-34 weeks, she underwent inpatient treatment for placental disorders, fetal growth retardation syndrome, and received antibacterial therapy with amoxiclav. According to the admission, heredity is not burdened.

During hospitalization on 05/17/2021, an increase in blood pressure to 140/86 mmHg, severity in the temporal region was noted at night. Dopegit 250 mg was added to therapy 3 times a day under blood pressure control.

**The results of the clinical and laboratory examination:** Blood type O(I), Rh- (+) positive. General blood test from 05/15/2021: hemoglobin 117 g/l, erythrocytes  $3.27 \times 10^{12}/l$ , hematocrit 0.323%, leukocytes  $15.4 \times 10^9/L$ , platelets  $223 \times 10^9/L$ . Coagulogram 05/15/2021g: TV 15.6 sec, ACTV 29.4 sec, fibrinogen 4.45 g/l, PTI 84.31%, INR 1.18. Biochemical blood test 05/15/2021: total protein 69.2 g/l, urea 2.5 mmol/l, creatinine 44 mmol/l, total bilirubin 10.6 mmol/L, glucose 3.6 mmol/l, AST 16.5 UNITS/l, ALT 10.6 UNITS/l. General urinalysis 05/17/2021: specific gravity 1010, epithelium in a small amount, protein was not detected. Daily proteinuria is 0.3 g/day.

**Instrumental data:** ECG 05/15/2021g-sinus rhythm, 72 beats per minute; ultrasound of the kidneys: dilation of the right kidney; ultrasound of the fetus from 05/15/2021g: Pregnancy 34 weeks according to fetometry. Intrauterine growth



retardation syndrome? Scar on the uterus.; Dopplerometry from 05/15/2021: IA degree of hemodynamic disorders; ultrasound of the heart: a slight increase in LP volume with TMR +1. Systolic-diastolic function is not impaired; fetal CTG is normal.

**Advisory data:** Optometrist 05/17/2021: Mild myopia OU.; Therapist 05/17/2021: Gestational hypertension. Chronic pyelonephritis, remission.

Against the background of the therapy, relief of heaviness in the temporal region was noted, and she did not complain. The condition was assessed as satisfactory, stable, and hemodynamic parameters within the normal range. There was no pathological weight gain, and the diuresis was adequate.

05/20/2021 at 14:00 during the distribution of food, the staff drew attention to the inappropriate behavior of a pregnant woman: she answered questions rudely, was disoriented, gave toilet paper instead of a cup, searched for something in other people's bags, was aggressive, which was reported to the attending physician. During the examination of the patient, she complained of headache, was conscious, criticism was sharply reduced, the patient was agitated, disoriented, showed a negative attitude towards the examination. She was examined by a neurologist, a neurosurgeon, and a consultation was held consisting of the deputy chief physician for obstetrics, acting head of the Department of Pathology of pregnant women No. 1, a doctor of the PRET, head of the neurosurgical department, and the attending physician. According to the data of the CT dated 05/20/2021: in separate convexital furrows and along the interhemispheric fissure, subarachnoid clots of hyperdense blood are noted, a clot of hyperdense blood measuring 3 x 15 mm in the water supply of the brain. Next to the projection of the bifurcation of the main artery, according to native scanning data, a local seal of up to 5 mm is noted, suspicious of a blood clot and / or an aneurysm. There is an expansion of the III and lateral ventricles, including the width of the III ventricle of 12 mm, the width of the bodies of the lateral ventricles of 19 mm, and the temporal horns up to 12 mm. The lateral ventricles are quite symmetrical, with a moderately pronounced area of leukoareosis around them. Median structures without lateral displacement. The subarachnoid space of the large hemispheres and cerebellum without pronounced narrowing. There were no signs of osteolytic or plastic processes. Conclusion: subarachnoid hemorrhage, intraventricular hemorrhage at the level of the cerebral plumbing. Internal hydrocephalus, which fits into a violation of the outflow of cerebrospinal fluid due to a blood clot at the level of the plumbing. For the purpose of further examination, an MRI of the brain was performed by the decision of the council on 05/20/2021: in the SWAN mode, a focal signal loss in the region of the III ventricle with dimensions of 12 x 6 mm is determined. In the convexital parts of the large brain, along the course of the furrows, against the background of signal loss from the superficial veins, focal signal loss of irregu-

lar shape. The lateral ventricles are dilated, with rounded contours. Conclusion: subarachnoid hemorrhage. In order to exclude aneurysmal brain disease (with aneurysm rupture), the patient was shown to perform angiography of the main arteries (MAG) of the head for vital indications. If a rupture of a cerebral aneurysm is detected during the study, if technically possible, simultaneous endovascular embolization is recommended. It was decided to carry out an emergency surgical delivery by cesarean section in the conditions of the X-ray operating room of the cardiac surgery center, followed by emergency surgery.

At 17:58, cesarean section was started under endotracheal anesthesia, at 18:03 a live girl of 2380 g, 44 cm, 7-7 Apgar points was extracted. Cesarean section surgery according to a typical procedure, without complications. The blood loss was 400 ml. At 18:50 - 19:40: the ascending aorta was catheterized by right-sided femoral access. The aortic arch was catheterized, both common carotid and both vertebral arteries were selectively removed. Angiography of the brachiocephalic arteries and the main arteries of the head was performed. Taking into account the angiography data, a sacral aneurysm of the supraclinoid section of the right internal carotid artery measuring 3.4 x 2.4 mm with a neck of 1.9 mm is determined, it was decided to embolize it with a microspiral using a JR 6 Fr guide catheter. The right ICA was selectively catheterized. The flushing system has been adjusted. Angiography was performed. A Vasco+10D microcatheter is inserted into the aneurysm cavity on the Hybrid 14D microconductor. During the insertion of a microspiral into the aneurysm cavity, angiography determines the extravasation of the contrast agent in the projection of the aneurysm (there is a repeated rupture of the aneurysm). The aneurysm was embolized with a Barricade Coli microspiral (D — 3.0 mm, L - 10 cm). On a control angiography, an embolized aneurysm is determined, there is no extravasation, the filling of the sections of the right SMA and PMA is satisfactory. The surgical intervention has been completed. A total of 200.0 ml of Optire solution was injected. Hemodynamics at the end (pulse 68 beats per minute, blood pressure 130/80 mmHg). At the end of the intervention, the catheter is removed. The introducer has been deleted. Hemostasis. The pulsation of the artery is preserved. Aseptic pressure bandage. For further treatment and observation, the patient was transferred to the Department of Anesthesiology and Intensive care at the cardiac surgery center.

Postoperative diagnosis: III premature operative delivery at 36 weeks. Aneurysmal disease of the cerebral vessels. Aneurysm of the internal carotid artery on the right with rupture, unexpressed intraventricular hemorrhage (from 05/20/2021). 2 scars on the uterus. OAGA. Gestational arterial hypertension. Chronic pyelonephritis, remission. Mild myopia. Compensated placental disorders. VUI. Laparotomy according to Pfannenstiel. Cesarean section by Derfler. Sterilization of the fallopian tubes. BCA angiography, MAG. Embolization of the supraclinoid aneurysm of the right ICA by a microspiral.

Until 08:15 on 05/21/2021, the patient's condition was severe, stable, and prolonged ventilation was performed. Extubated at 08:15. Taking into account the neurological status and positive dynamics, conservative therapy was carried out. She was examined by an oculist (fundus without features), a neurosurgeon (conservative therapy is recommended), a neurologist (intravenous infusion of Nimotope, magnesia therapy is recommended), received uterotonic therapy, prevention of thromboembolic complications, antibacterial therapy (Cefepime 2 grams 2 times a day intravenously, Metronidazole 100 ml 3 times a day intravenously). Lactation is turned off by the appointment of Bergolac.

On 05/22/2021, a control spiral computed tomography was performed. The contrast agent has been eliminated from the liquor spaces. There are no pathological areas suspected of ischemic infarctions of the brain substance. The condition after embolization of the aneurysm of the right ICA with the presence of artifacts from spirals is determined. The ventricles of the brain decreased in size: the III ventricle to 6-7 mm, the width of the bodies of the lateral ventricles to 13 mm, the temporal horns to 3 mm. There is a small amount of sedimented hyperdense blood in the posterior horns. Median structures without lateral displacement. Conclusion: the condition after embolization of the aneurysm of the right ICA with resolving SAC. Positive dynamics regarding brain CT data from 05/20/2021.

On 05/24/2022, the patient was transferred to the Department of Neurosurgery in a stable satisfactory condition to continue conservative therapy.

03.06.2021 according to spiral computed tomography data, control images of sub- and supratentorial structures of the brain in native form were obtained on a series of axial sections and multiplanar reconstructions. The condition after embolization of the aneurysm of the right ICA with the presence of artifacts from spirals is determined. Regarding the CT data of the brain examination dated 05/22/2021, changes of the following nature are determined: single lysing weakly hyperdense blood clots are differentiated along the furrows of the large hemispheres. There are no pathological areas suspected of ischemic infarctions of the brain substance. The ventricles of the brain are of the same size: the III ventricle is up to 6 mm, the width of the anterior horns of the lateral ventricles is up to 9 mm, the temporal horns are up to 3mm. There is no hyperdense blood in the ventricular lumen. Median structures without lateral displacement. Otherwise, the CT scan is the same. Conclusion: the condition after embolization of the aneurysm of the right ICA with resolving SAH. The positive dynamics regarding the CT scan of the brain dated 05/22/2021. 06/04/2021 was discharged in a satisfactory condition without complaints.

### **Conclusion**

The literature describes cases of treatment of SAC in pregnant women, with a positive outcome, both for the mother and for the child. First of all, it is nec-

essary to assess the severity of the patient's condition, neurological status data, instrumental diagnostic methods for further selection of neurosurgical tactics and delivery method. The above-described clinical case proves that the consideration of patient complaints, examination data, assessment of severity, as well as the decision of a council of obstetricians-gynecologists, neurologist, neurosurgeon, anesthesiologist-resuscitator led to the correct and timely diagnosis, timely treatment of the patient and successful completion of pregnancy.

**The authors declare no conflicts of interest.**

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## PROSPECTS AND PROBLEMS OF UTILIZATION OF PYRITE STUBS IN THE PRODUCTION OF PORTLAND CEMENT

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**Abstract.** *This article discusses promising areas of utilization of pyrite stubs for their further use in the production of Portland cement. It is highlighted that the use of pyrite stubs inclusions as additives in cement clinker significantly reduces the costs that are usually directed to their storage and processing. It is noted that for the use of pyrite waste in the cement industry, it is necessary to use particles of stubs with a size of less than 60 microns. A pressure-type hydrocyclone is used to control the size in the technological line for the preparation of stubs. The design and principle of operation of the pressure-type hydrocyclone HCC-360-10, as well as its modified model with a dividing area in the working area, are described. The advantages and disadvantages of these devices are revealed. It has been established that in order to ensure the necessary volume of prepared pyrite suspensions with stubs in the cement industry, it is recommended to use a modified pressure hydrocyclone with a separation area based on HCC-360-10. Its precise separating ability makes it possible to efficiently capture particles smaller than 60 microns, reducing re-feeds to the hydrocyclone and the grinding mill. This significantly reduces energy consumption and allows you to process a larger volume of pyrite stubs. Globally, this contributes to the disposal of more hazardous man-made waste and the reduction of pyrite stumps.*

**Keywords:** *hydroclassification, efficiency of particle separation, utilization, ecology, energy intensity.*

In the modern world, industrial enterprises are faced with issues of efficient use of resources and ecology, with acute issues of waste disposal. To date, more than 250 million tons of pyrite stubs have been accumulated in Russia, which are and are considered high-risk waste (man-made waste) - these are the products of firing pyrite concentrates for the production of sulfuric acid, with an annual for-

mation of about 5 million tons. Pyrite stubs consist mainly of iron (40-63%) with small impurities of sulfur (1-2%), copper (0.33-0.47%), zinc (0.42-1.35%), lead (0.32-0.58%), precious (10-20 g/t) and other metals [1]. Their storage is carried out without proper supervision and control over their condition.

Pyrite stub dumps disfigure the landscapes of industrial zones of enterprises, since the processing of these wastes is a very expensive process [2]. Pyrite stubs include pathogens of the 1st (extremely dangerous) and 2nd (high-hazard waste) hazard classes, because they contain Cd, As, Hg, Tl (cadmium, arsenic, mercury, thallium), which do not decompose or decompose for more than 30 years, respectively [1]. According to experts, there are about 20 tons of arsenic in 15 million tons of pyrite stubs. "Clay shirts" (anti-filtration curtains) have been erected around and under the dumps, which prevent toxic substances from entering the soil with wastewater. It should be noted that the measures taken do not allow to finally solve the problem and partial drainage of these substances into the soil occurs. Based on this, it is extremely important to solve the issues of disposal of pyrite stubs.

The utilization of pyrite stubs is possible in several directions [2]: for the extraction of non-ferrous metals and the production of cast iron and steel; in the cement industry; the glass industry, etc.

In the Russian Federation, about 75% of the mass of pyrite stubs formed is used mainly in the production of building materials. Modern requirements for the quality of cement and the constant desire to improve its properties lead to increased interest in high-quality cements. These materials have unique characteristics such as increased strength and the ability to cope with special operating conditions. In this regard, enterprises are increasingly using three- to four-component mixtures, which involve the introduction of corrective additives to obtain clinker with a certain mineralogical composition. Pyrite stubs are one of the significant corrective additives in the manufacture of Portland cement of a certain composition – ferrous cements.

When cement is produced in the Russian Federation in the amount of 70 million tons per year, the need for pyrite stubs powder with a particle size of less than 60 microns is about 4 million tons per year. The introduction of pyrite stubs as corrective additives into the raw mixture of Portland cement clinker in the range of 2-5% and with a particle size of less than 60 microns allows you to change the physical properties of high-quality cements. Such ferrous cements:

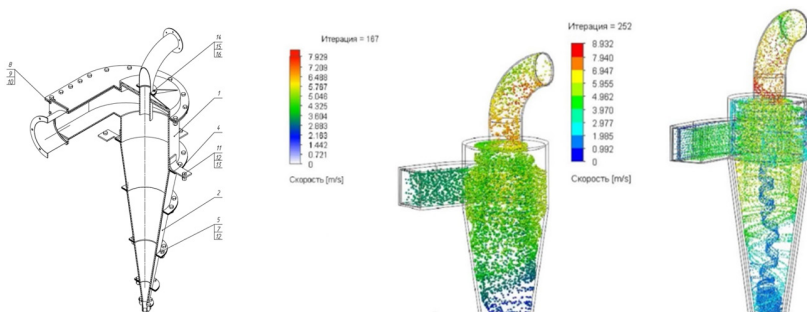
- have increased setting times when up to 3% gypsum is introduced into the raw material mixture;
- have increased compressive strength by 2-2.5 times during steaming and autoclave treatment;
- they are non-shrinkable with a content of bicalcium ferrite up to 40%;
- capable of expanding during hardening.

The following equipment is used to prepare the use of pyrite stubs in the cement industry [5, 6]: ball mill; heat pump; agitator; sand pump; hydrocyclone. The stubs are crushed in order to reduce the particle size. After that, they are classified to produce particles of less than 60 microns in size. The stage of hydraulic classification is key [7, 8], because it allows you to control the fractional composition of the stubs, which is important for their further use as an iron-containing additive.

Hydrocyclones [7, 8] are devices with a wide range of applications in various industries, such as processing, metallurgical, cement, chemical industry and others. They are devices used for the classification and enrichment of finely ground materials in a liquid medium. The main purpose of which is the separation of particles according to the speed and direction of movement of the pulp, which contributes to improving the quality and technical properties of the final product.

The use of hydrocyclones in production processes makes it possible to effectively optimize the processes of classification and enrichment of materials. In cement production, hydrocyclones are actively used to achieve optimal raw material processing parameters and improve the final product quality.

A pressure-type hydrocyclone ГЦК-360-10 is used to classify pyrite stubs [7] (Fig. 1, a). Its principle of operation [7, 8] (Fig. 1, b): particles entering through the inlet pipe enter the cylindrical part, where, under the action of centrifugal force, large particles are thrown to the wall, and losing speed fall into the conical part of the hydrocyclone, where they exit through the lower drain, and smaller particles move to the center and exit through the upper drain, while part of the particles with a size of less than 60 microns, for one reason or another, they go into the lower drain and enter the ball mill for grinding, which reduces its loading of incoming raw materials to 10-15% [9], as a result, the energy intensity of the process increases.



**Figure 1.** Scheme of the hydrocyclone ГЦК -360-10 (a) [9]; hydrodynamic model of the workflow (b) [10]; hydrodynamic model of the workflow of a hydrocyclone with a dividing area in the working area (c) [10]:

1 – snail; 2 – cone; 4 – gasket; 5,7,8,9,10,12,14,15,16 – fasteners



The pressure-type hydrocyclone is lined with silicon carbide, which makes it resistant to aggressive chemical environments, has a simple design that simplifies the operation process, and is characterized by low operating costs. It can be used as a separate device or included in batteries in open or closed grinding cycles. The disadvantage of this hydrocyclone is the lack of an accurate boundary for the separation of particles into fractions, which makes it necessary to re-supply the material to the hydrocyclone.

The preparation of pyrite stubs is a process that requires significant energy and money costs due to the large losses of concentrate during its extraction from the pulp. In order to optimize energy consumption and increase process efficiency, it is necessary to establish precise particle separation parameters in the final product. To eliminate the above-mentioned technological disadvantage and in order to increase the volume of use of pyrite stubs, it is rational to use a modified pressure-type hydrocyclone with a separation area in the working area [10, 11]. Its use will reduce the number of repeated feeds of material into the device.

The principle of operation of the modified hydrocyclone (Fig. 1, c): particles entering through the inlet pipe enter the cylindrical part, after which, under the action of centrifugal force, smaller particles move to the center and exit through the upper drain, the remaining particles through holes in the cylindrical part of the separation area enter the conical part, where particles of 60 microns in size gradually lose speed and go to the the bottom drain, and particles with a size of 60 microns rapidly lose speed and then gain it due to the formed plug from them, and form an upward whirlpool from the bottom of the cone. This is due to the fact that by washing the walls of the separation area with water, the speed of which is higher than the speed of the pulp, the particles of a large fraction quickly enter the lower drain due to the fact that the density of water is much less than the density of the pulp, which creates a vacuum in the lower part of the cone, which organizes the movement of particles with a size of 60 microns up the spiral trajectories to the upper drain (fig. 1, c) [10].

By establishing the exact boundary of the separation of particles of the required size, the use of a modified pressure-type hydrocyclone makes it possible to reduce the number of repeated feeds into the hydrocyclone, and, consequently, repeated feeds into the grinding mill, which significantly reduces the energy consumption of the process of selections particles of the desired size from the pulp. This makes it possible to prepare a larger number of pyrite stubs over a specified period, which increases the efficiency of disposal of a larger volume of hazardous man-made waste - pyrite stubs.

### **Conclusions.**

1. It is known that the use of pyrite stubs as components of a mixture for firing cement clinker saves significant funds that are spent on the extraction and pro-



cessing of non-metallic materials, as well as on the construction of “clay jackets” around dumps.

2. The analysis of the problems and prospects of the utilization of stubs in the production of Portland cement reveals the importance of developing effective and sustainable technologies to solve current environmental and technological problems.

3. It was determined that the problems of waste disposal include the need to process aggressive material with precise particle separation (less than 60 microns in size) in order to achieve increased characteristics of Portland cement.

4. It was revealed that the use of pressure hydrocyclones is key for the preparation of pyrite stubs, which seems promising and justified from a practical and technological point of view, they allow you to work effectively with aggressive environments and provide relative ease of management and maintenance.

5. It has been established that in order to provide the necessary amount of prepared pyrite suspensions with stubs for their further use in the cement industry, it is advisable to use a modified pressure-type hydrocyclone with a separation area in the working area of the apparatus. It has an accurate separating ability, which allows you to capture a significantly larger number of particles of the required size (60 microns), and also reduces the number of repeated feeds into the hydrocyclone and into the grinding mill. This significantly reduces the energy consumption of the process of obtaining particles of the desired size, and also allows you to prepare a larger number of pyrite stubs over a specified period. I.e. globally it will allow you to dispose of a larger amount of hazardous man-made waste and reduce the number of pyrite stubs dumps.

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## THE EFFECT OF A-QUARTZ ON THE IMMUNOLOGICAL PARAMETERS OF THE ANIMAL BODY

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**Abstract.** *The emergence of quantum biology, as a science based on the phenomena of quantum physics, attracts scientists from various fields, including veterinary immunologists. First of all, because understanding the immunological process is the shortest path to animal health, the creation of effective, safe vaccines and modern diagnostic test systems. The conducted studies showed the promise of using the information properties of natural minerals to study and modulate the mechanisms of immunoreactivity. The experiments showed:*

*- increase in the concentration of immunoglobulins in the blood serum of laboratory animals;*

*-changes in the phagocytic activity of cattle blood cells in vitro;*

*-increasing the bactericidal activity of blood cells;*

*-a study of biochemical parameters of cattle blood serum showed the influence of  $\alpha$ -quartz on indicators responsible for energy processes in the body.*

*In this work, experiments were carried out that make it possible to use quantum effects at the macroscopic level in living systems. Understanding the quantum properties of biosystems will help expand knowledge about the protective functions of the body and provide new approaches to the diagnosis and prevention of various diseases.*

**Keywords:** *minerals, macroscopic quantum nonlocality, information properties, immunological parameters.*

**Relevance of the topic.** *Currently, the impact of negative environmental factors on the body of animals and humans has increased, including infectious mi-*

croorganisms that are constantly changing their antigenic structure. To determine and maintain the normal state of the animal's immune system, it is necessary to take into account a whole range of parameters (habitat, feeding diet, living conditions, indicators of various immunological tests, etc.). Taking into account all aspects affecting animal health seems very labor-intensive and not always possible. Therefore, scientists are looking for alternative ways to diagnose and prevent animal diseases. The interaction of sciences forms interdisciplinary research, the proportion of which increases as science develops. The emergence of quantum biology, as a science based on the phenomena of quantum physics, attracts scientists from various fields, including veterinary immunologists [1]. First of all, because understanding the immunological process is the shortest path to animal health, the creation of effective, safe vaccines and modern diagnostic test systems. Research continues on the effects of ultra-weak forces on living biological systems, including effects at the electron level. Using the natural mineral SiO<sub>2</sub> ( $\alpha$ -quartz), processed using a special frequency program "Alpha-Quartz", you can influence the processes occurring in various ecosystems at arbitrarily large distances. Some of the potential mechanisms of this action include regulation of gene expression, activation of transcription factors, protein phosphorylation, which may lead to modulation of immune system function.

**Materials and methods.** Developing ideas about the phenomenon of macroscopic quantum nonlocality in relation to the treatment and prevention of animal diseases [2, 3, 4], studies were conducted on the local and nonlocal effects of SiO<sub>2</sub> ( $\alpha$ -quartz), processed according to a special frequency program, on the state of the immune system of animals. The agent-recipient distance ranged from 0.15 m to 1200 km.

The experiment used Soviet chinchilla rabbits (1 year old), which were intramuscularly injected 4 times with 0.5 ml of physiological solution treated with SiO<sub>2</sub> for 6 weeks. Control animals were injected with untreated saline. After completion of exposure, blood was taken from laboratory animals. The protein spectrum of blood serum was studied by immunoelectrophoresis using standard methods. Samples of experimental and control sera were added to the wells, and serum to rabbit blood proteins was added to the trenches.

A number of experiments were carried out to study the effect of crystalline silicon dioxide SiO<sub>2</sub> on blood samples (n=5) of cattle. Alpha quartz was located at a distance of 0.15 m from the test samples, the exposure time was 30 minutes, after which a biochemical analysis of blood serum was carried out. At the same time, control samples (n=5) were located in an adjacent room 15 meters from the test samples under similar conditions. Biochemical blood tests were carried out according to standard methods. The authors express their gratitude to Ph.D. Soshnikova E.M. (All-Russian Institute of Experimental Veterinary Medicine) for conducting biochemical research.

The phagocytic activity of cattle blood cells ( $n=5$ ) was determined with latex particles ( $1.5 \mu$ ) according to the standard method after local exposure to  $\alpha$ -quartz on blood samples for 30 minutes. Similarly, from a distance of 1200 km, studies were carried out on the bactericidal activity of neutrophils in the blood of dogs ( $n=4$ ) and cats ( $n=4$ ), which was determined in the NBT test (nitro blue tetrazolium). Control animal blood samples were not exposed.

**Results and discussion.** As a result of the studies, it was established that the protein spectrum of the blood serum of experimental laboratory animals (rabbits) differs significantly from the spectrum of control rabbits (Fig. 1). As can be seen in Fig. 1, the protein spectrum of the blood serum of an experimental rabbit is represented by 3 precipitation lines in the  $\gamma$ -globulin zone and 1 in the albumin zone (track 2), and of the control rabbit - two in the  $\gamma$ -globulin zone (track 1).



*Figure 1. Immunoelectropherogram of rabbit serum.*

In our opinion, the effect of  $\text{SiO}_2$  ( $\alpha$ -quartz) on laboratory animals leads to changes in the process of protein synthesis (immunoglobulins and albumins). Thus, the non-local effect of the mineral on a remote biological object (rabbits) is shown, leading to a change in the protein composition of the blood serum of laboratory animals. To understand this mechanism associated with the transformation of energy in biological structures to maintain homeostasis of the body, further research is necessary [5].

It is known that glucose is a substrate for obtaining energy based on its oxidation, and triglycerides provide cells with energy under starvation conditions. Among the cations present in the cell, magnesium and calcium occupy an important place. These elements regulate the activity of many enzymes, which are proteins that catalyze biochemical reactions in the body, including controlling the spontaneous electrical activity of nervous tissue.

**Table 1.***Results of the study of cattle blood sera (n=5).*

No.	Index	Norm	Sample No.	1	2	3	4	5	Average values	Relative changes %
1	Glucose mmol/l	2,4 – 4,1	Before after	3,3 3,7	2,7 3,7	3,3 4,0	3,3 4,0	3,0 4,3	3,12 3,94	126,3
2	Total protein g/l	60 – 85	Before after	78,3 87,6	78,3 90,3	66,8 90,3	78,3 87,6	64,4 81,7	73,22 87,5	119,5
3	Urea mmol/l	2,8 – 8,8	Before after	6,1 5,6	6,6 5,1	5,9 5,1	6,1 3,9	<b>4,1</b> <b>4,6</b>	5,76 4,86	84,4
4	Creatinine $\mu$ mol/l	55,8 – 162	Before after	70,8 51,7	94,4 47,4	70,8 47,4	70,8 59,1	71,4 51,7	75,64 51,46	68
5	Alkaline phosphatase IU/L	30 – 150	Before after	88,2 71,8	97,8 66,4	82,6 66,4	97,8 76,2	103,4 66,4	93,96 69,44	73,9
6	Calcium mg%	9,5 – 13,5	Before after	11,6 12,2	11,6 12,2	10,4 13,5	12,2 11,8	10,4 12,2	11,24 12,38	110,1
7	Phosphorus mg%	4,5 – 6,5	Before after	5,2 5,2	4,8 5,0	4,8 5,2	5,2 5,0	5,2 5,0	5,04 5,08	100,8
8	Magnesium mmol/l	0,6 – 1,5	Before after	0,97 1,1	0,85 1,1	0,79 0,9	0,82 1,2	0,85 0,9	0,856 1,04	121,5
9	AST IU/L	10 – 40	Before after	<b>24</b> <b>27</b>	27 27	27 27	24 24	<b>24</b> <b>27</b>	25,2 26,4	104,8
10	ALAT IU/L	7 – 40	Before after	13,6 13,6	16,2 13,6	16,2 16,2	17,8 13,6	18,0 18,0	16,36 15,0	91,7
11	Total bilirubin $\mu$ mol/l	7 – 13	Before after	9,4 9,4	9,4 8,9	8,9 8,9	8,9 9,4	8,9 9,4	9,1 9,2	101,1
12	Direct bilirubin $\mu$ mol/l	0 – 1	Before after	0 0	0 0	0 0	0 0	0 0	-	-
13	Cholesterol mmol/l	1,6 – 5	Before after	4,1 3,1	2,9 3,1	2,9 2,6	3,1 3,1	4,1 2,9	3,42 2,96	86,5
14	Triglycerides mmol/l	0,4 – 1,5	Before after	0,66 0,66	0,72 0,83	0,5 0,7	0,58 0,7	0,66 0,66	0,624 0,710	113,8

As a result of the studies, it was found that the glucose content increased by 26.3%, magnesium by 21.5%, total protein by 19.5%, triglycerides by 13.8%, calcium by 10.1% and AST by 4.8 % compared to control values. At the same time, a decrease in creatinine by 32%, alkaline phosphatase by 26.1%, urea by 15.6%, cholesterol by 13.5% and ALT by 8.3% was established - the enzyme alanine aminotransferase, a catalyst in the process of alanine transfer, which as a result of biochemical reactions it is converted into glucose. It should be noted that all biochemical parameters remained within normal limits. Thus, the effect of SiO<sub>2</sub> on cattle blood showed its influence on indicators responsible for energy processes in the body and in the future it can be used as a universal regulator of biochemical and physiological processes, providing ATP hydrolysis and regulation of glycolysis.

The results of a study of the phagocytic activity of cattle blood cells after exposure to  $\alpha$ -quartz showed changes in indicators compared to control samples. So in three blood samples the indicators increased by 35%, and in two they decreased. When comparing the parameters of biochemistry and phagocytosis, it was found that a decrease in the parameters of phagocytic activity correlated with an increase in urea and aspartate aminotransferase (AST), which can serve as an additional marker of pathological conditions of the body and form the basis for the development of tests to assess the health status of animals.

Also, as a result of the studies, it was found that the effect of  $\alpha$ -quartz on blood samples of laboratory dogs ( $n=4$ ) and cats ( $n=4$ ) increased the bactericidal activity of neutrophils compared to the control -  $SI_{dogs} = 3.0$ ;  $SI_{cats} = 3.2$  (SI stimulation index). It is known that the bactericidal activity of blood phagocytes plays an important role in the destruction of pathogenic microorganisms in animals and humans. An increase in NBT test parameters under the influence of  $\alpha$ -quartz showed stimulation of the oxygen-dependent mechanism of bactericidal activity of blood neutrophils in vitro. This method can be used as a diagnostic test to assess the state of functional activity of blood phagocytes, both normally and in pathology.

**Conclusion.** The conducted studies showed the promise of using the information properties of natural minerals to study and modulate the mechanisms of immunoreactivity. The experiments showed:

1. Increasing the concentration of immunoglobulins in the blood serum of laboratory animals (IEF);
2. Changes in the phagocytic activity of cattle blood cells in vitro;
3. Increasing the bactericidal activity of blood cells (HCT test);
4. A study of biochemical parameters of cattle blood serum showed the influence of  $\alpha$ -quartz on parameters responsible for energy processes in the body.

The observed phenomena of information transfer from a mineral to a biological object at any distance belong to the field of macroscopic quantum nonlocality, a complete theory of which is currently missing. However, it is known that biomolecules (DNA, amino acids, proteins), consisting of elementary particles, participate in biochemical reactions according to the laws of quantum physics [1]. The question of the presence and use of macroscopic quantum nonlocality in biosystems still remains open and relates to phenomena that cannot be described by classical laws, but the fact that this phenomenon exists has already been proven by the research of many scientists. In this work, experiments were carried out that make it possible to use quantum effects at the macroscopic level in living systems. Understanding the quantum properties of biosystems will help expand knowledge about the protective functions of the body and provide new approaches to the diagnosis and prevention of various diseases.

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## THE INFLUENCE OF DAIRY HERD'S SIZE ON COWS' MILK PRODUCTION

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**Annotation. Introduction.** Effective activity in dairy cattle breeding by technological, genetic, environmental, economic, organizational and other factors is determined. These include: milk yield for standard lactation, milk yield for lifetime, livestock's longevity and health, effective management, stable feed base, intensive producing technologies using, cheap labor workers, as well as the number of dairy cattle on the farm including. Efficient infrastructure of farm logistics, interaction of production factors in the form of farm industry's digital drivers –such as the industrial Internet of Things (IIoT) and Big Data (big data) included in the milk production general system on an industrial basis, allows to become this digital program like main driving force of dairy production and combine technologies, services and services in demand as producers and consumers of dairy products, but it will not essentially replace dairy cows milk production. **The purpose of the research** is the mechanism of the milking herd's size efficiency and the farms' average annual milk yield at various production capacities studying. **The results of the research.** If the dairy enterprise has all production and technological groups of cattle (heifers, dry cows), which are not milked, but are economically necessary for the farm, the number of dairy cows can amount till 40-45-65% of the total livestock in the herd, and the value of optimized milk yield, taking into account this factor, becomes equal to not 5,0 thousand kg of milk per lactation per the average annual cow, but respectively 6750, 7750 and 8000. The programs with an up-to-date system of organizational-and-technological factors using is great importance in the optimal number of livestock at a dairy enterprise determination, taking into account the dairy cows' milk production. **Conclusion.** Studies have shown that the relationship between milk yield (organizational factor) and life expectancy (technological factor) is 0,1. The relationship between milk yield (organizational factor, the main role in the bundle) and milk yield for average annual lactation (technological factor, subordinate role in the bundle) was slightly higher and amounted to 0,35 According to experts,

*in over next 20 years, taking into account this interaction, the average profit more than in 20% can increase, and high rates of economic growth will be achieved growth.*

**Keywords:** *milk production factor, dairy enterprise infrastructure's logistics, average annual milk yield, current system of factors' interrelation.*

**Introduction.** In order to ensure an effective transition to an industrial and commodity milk production structure in the herds, it is necessary to take into account organizational and technological factors of milk production. Traditionally, it is believed that the farms of various production capacities in dairy cattle breeding's effective activity by various factors – technological, genetic, environmental, economic, organizational and others, including milk yield for standard lactation, lifetime milk yield, livestock's longevity and health, effective management, stable feed base's availability, intensive production technologies using, cheap labor force, and others is determined [1].

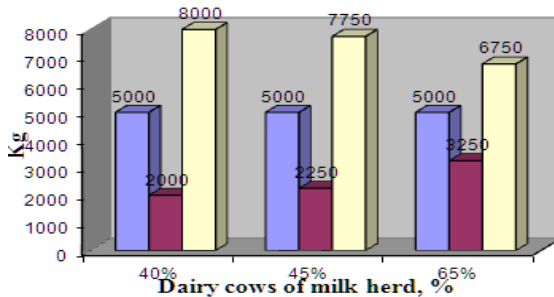
At the intersectoral level, effective infrastructure's logistics interaction between production entities of digital drivers of the industry's form – the industrial Internet of things (IIoT) and Big Data (big data) included in the dairy production system on an industrial basis, allows to become of this digital program the main driving force of production and combine technologies, services and services in demand by both manufacturers and consumers of dairy products [2]. It was the integration of vertical and horizontal chains of interaction between technological and organizational factors of milk production in the goods producing and services in the field of dairy cattle breeding that allows to reach the farms a new level of ownership and production capacity.

The scale of production in the form of the dairy herd size is one of the factors of effective dairy cattle breeding, regardless of who are the main producers of Russian raw milk – large and super-large enterprises, or small and medium-sized ones.

**The purpose of the study** is the mechanism of dairy production efficiency by digital logistics of various production capacities' farms use determining.

**Research methods:** are collection, study, systematization and processing of information obtaining from best industry practices, expert assessments, an Internet resources, scientific-and-technical funds, reference materials, methodological manuals, recommendations, specialized exhibitions, conferences, patent and licensing sources, innovative developments and own research.

**Discussion of research results.** If an enterprise has all livestock's production and technological groups (heifers, dry cows) that are not milked, but economically necessary for the farm, and the number of dairy cows is 40-45-65% of their total number in the herd, and the value of optimized milk yield, taking into account this factor, becomes equal to not 5,0 thousand kg of milk per lactation per average annual a cow, but respectively 6750, 7750 and 8000 (Fig.).



**Figure.** Comparative characteristics of milk production efficiency depending on the number of dairy cows, kg: Graph 1 - actual yield, graph 2 - optimized yield, graph 3 - planned yield

Thus, the change in the number of dairy cattle contributes to milk production efficiency increasing, taking into account production and management activities, which is closely interrelated with the technological conditions of the enterprise. . Thus, the main and non-main production modes were determined, due to economically optimal production levels were formed, and that was necessary for the deep disclosure of their reserves.

The effectiveness of a small dairy farm was shown at one time by L.Tauer [3], who studied the problems of dairy farms' agricultural activity by the above-mentioned methods in USA dairy farming traditional areas using (Table).

**Table.**

*The milk cost on US farms (n= 314) , taking into account the number of cows, \$*

Number of dairy cows	Cost of 100 kg of milk	Cost of an effective dairy farm	The price value per 100 kg of milk increasing	The value of the increase in price per 1 head
50	16,95	13,61	3,34	0,58
100	16,55	13,54	3,01	0,51
150	16,16	13,47	2,69	0,44
200	15,79	13,40	2,39	0,37
250	15,43	13,34	2,09	0,31
500	13,86	13,03	0,86	-

According to the Table in the USA, a farm with a dairy cows population of 50 heads was obviously unprofitable. However, it became more effective if the producing costs a unit of production with an optimal ratio of organizational and technological factors were reduced, or if the number of dairy cows as comprehen-

sive criteria for determining the economic efficiency of the farm was increased. A farm with 50 heads of dairy cattle, with a cost of \$ 13,61, is more profitable than a farm with 500 heads of cattle and a cost of milk of \$ 13,86. The cost increase per head was calculated in comparison with an efficient farm with 500 dairy cows.

The programs with an up-to-date system of organizational and technological factors using has great importance in the optimal number of livestock at a dairy enterprise determining, taking into account, for example, the dairy cows' lifetime productivity, as one of the options for the herd development program. Such authors, as A.S. Vsakyh, A.Z. Kvitko and some other researchers at that time reported that a dairy cow, producing 4500-5500 kg of milk per lactation, it had recouped its maintenance's cost after 6-8 lactation, spending less feed. By this time, she was producing more than 27,000 kg of milk; a more high production black-and-white cow with a milk yield of 6500-7500 kg of milk per lactation paid for itself after the 3rd lactation, but spent in 5 times more feed. Our research has shown that the relationship between lifetime milk yield (organizational factor) and life expectancy (technological factor) is 0,1. The relationship between lifetime milk yield (organizational factor) and milk yield for average annual lactation (technological factor) was slightly higher and amounted to 0,35.

**Conclusion.** Taking into account these obtained facts, it can be considered that the form of the number of dairy livestock optimizing, calculated on the basis of digital programs and optimal scale of production, has a certain importance for the successful operation of dairy production, since it uses the necessary production reserves. Moreover, it can change its parameters in accordance with the livestock owner's capabilities and needs.

The optimization process, that is, as the theoretical calculations to real production conditions approximation, is applicable for effective production activities – feeding, maintenance, rehabilitation and staff care of livestock. There is another definite relationship between the farm's production activity and the number of employees – both a large number and a small number of employees affected the farming efficiency negatively. Optimization of these main factors and their components, taking into account the associated parameters, makes it possible the optimal number of livestock on the farm determining. In order to the farm become modular, that is, optimally oriented and change the dairy cattle number without milk production decreasing, it must be organized either with the organizational and managerial measures to achieve high milk yield, or with the low-cost technologies that simplify of the of livestock feeding, maintenance, rehabilitation and care's issues using.

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