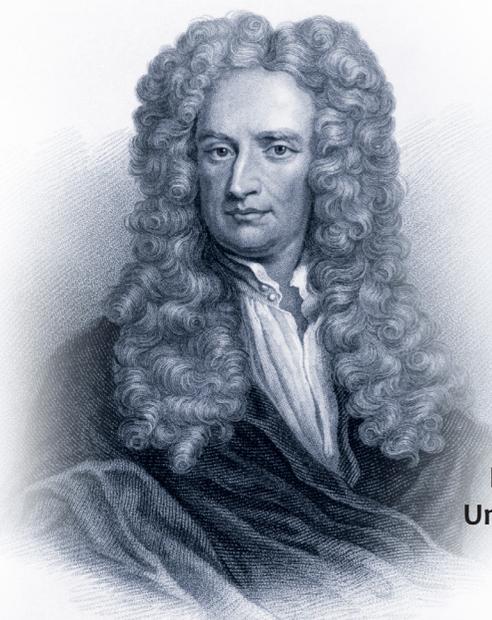




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## SECURITY OF ECONOMIC ACTIVITY IN ENTERPRISES

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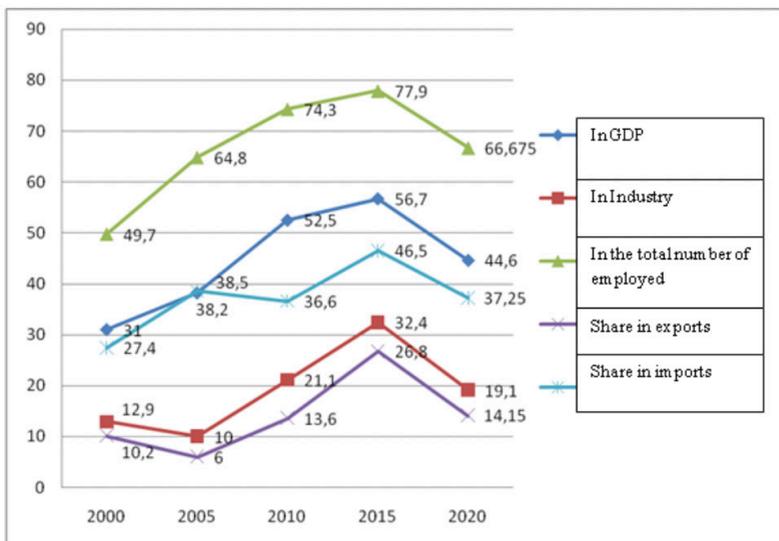
The purpose of economic reforms in our country is to achieve sustainable economic growth, improve the quality and standard of living of the population, and integrate Uzbekistan into the global economic community. In the market economy, these strategic objectives are based on the creation of conditions for the organization and development of entrepreneurial activity. Such conditions create a range of services to support small business and private entrepreneurship. During the modernization of the economy of the country great attention is paid to support enterprises of the real sector.[1] First, the creation of direct production infrastructure, and secondly indirect social, market, institutional infrastructure, and the primary basis of the national economy is the qualitative improvement in the functioning of industries and institutions that support the overall conditions of production and human life.[2] Entrepreneurship cannot develop on its own, without state support and assistance. The government encourages entrepreneurship through taxes, subsidies, export incentives, its own information services, and free general education at its own expense. Indeed, one of the main features of small business and private entrepreneurship is that this sector of the economy does not always need state support. The state supports and regulates entrepreneurship in logistics, information, technology, consulting, marketing, education, financial services and other areas. The development of small business and private entrepreneurship is important not only in the development of the state and society, but also in meeting the growing life needs of each individual, such as in the areas of services, retail and food production. Attention and stimulation of development of small business and private entrepreneurship is one of the key strategic factors of social and economic development of the country. It is worth noting in the economic literature that the need for government support for small businesses is theoretically grounded, [3] including its support for a systematic and guaranteed economic mechanism. In the system of

support for small business development in the world practice, the principle of state paternalism can be highlighted. The essence of this is that small business support comes through three models. [4] Expansion of family business is one of the important directions of development of small business and private entrepreneurship in Uzbekistan. Today, the role of this sector in the national economy is constantly increasing. Family business is becoming an important source of income. Uzbekistan has all the conditions to revive the best national traditions of our people, including the development of skills of people in the craft and private business. In this regard, family business can serve as an effective organizational and legal factor that will fully support the application and development of these social production skills. The first model is based on the protectionist idea, which reflects the experience of the developed countries in overcoming the economic crisis, and the targeted programs for supporting small businesses. The industry is supported by programs such as the Small Business Innovation Research Program (SBIR) and the Small Business Technology Transfer Program (STTR), among the most effective interventions in the United States' economy. The second model, by contrast, is a model based on free enterprise. In particular, it is worth noting that France does not accept large-scale business development programs. In the third combination model, both models are combined. This is the case with the UK. In this approach, measures to support small businesses announced at the state level are based on free enterprise. The first reason of use of resource saving processes is to save the production costs by means of decreasing of resource costs. But it doesn't result the quality reduction of the product. [5]

Entrepreneurship is a specific economic activity that is specific to the market system and is the main type of business that generates revenue through the creation and delivery of goods and services to consumers. Entrepreneurship creates a special system, which includes the object, the subject of entrepreneurship, the rules of entrepreneurship, ethics, business policy and its infrastructure. [6] In supporting the real sector there must be done work in the following areas as reducing the cost of the product, providing tax incentives for exporters and supporting by providing bank credits for expansion of production areas. [7] Entrepreneurship is proprietary private, collective and state entrepreneurship, open and secret business in terms of business, industrial, agrarian and service business, and finally small, medium and large business. Entrepreneurs form a category of entrepreneurs with hierarchy of the lower, middle, upper (elite) and upper (super elite) classes. This category is formed in two ways: first, entrepreneurship is transmitted from generation to generation; The second

route is typical of the countries in transition, and it is the same in Uzbekistan. Before independence, private entrepreneurship was prohibited. The profitability of the business is determined by the level of profitability, which shows how much profit is earned, clearly, the effectiveness of economic activities. To find out, this is compared to the cost of doing business as a result, and then calculating how many percent of the cost of the business is worth. Analyzing the firm's performance, production and product profitability are measured. In order to increase profitability, restructuring of production, resource saving, capital structure improvement, and labor motivation will be enhanced. [8]

**Table 1**  
**Share of small business and private entrepreneurship**



In the diagram, the following formula  $m = \frac{a_1 + a_2 + \dots + a_n}{n}$  based on the percentages for 2000, 2005, 2010 and 2015, is projected for 2020.

The results of the forecast are negative, as shown in the diagram. We have calculated all the results along the growth curve using the formula to better illustrate this.

The results of the forecast are negative, as shown in the diagram. We

have calculated all the results along the growth curve using the formula to better illustrate this.

Growth Rate of Gross Domestic Product:

$$y = 32,11x0,318$$

When  $R^2 = 0.690$ ;

Industrial Growth Line:

$$y = 11.03x0.487$$

$R^2 = 0.463$ .

Number of employed by growth line:

$$y = 52.89x0,229$$

$R^2 = 0.655$ ;

Share in exports:

$$y = 7,793x0,500$$

$R^2 = 0.341$ ;

and its share in imports

$$y = 29.36x0,234$$

$R^2 = 0.614$ .

We have achieved whole number of positive results on improvement of market relations and mechanisms in economic reforms. [9] The company produces goods and services. If its charter establishes the organizational and legal functions of the enterprise, its production and economic activity includes the authorized capital, which includes fixed and working capital, cash and other assets. The company has its own passport and charter. The authorized capital is formed by the founders of the enterprise in accordance with the legislation: the state, legal entities and individuals. As a result of the development of the enterprise and expansion of production, increase in revenue and other financial receipts, the authorized capital can be increased. In general, the authorized capital reflects the economic stability and financial viability of the enterprise. [10]

This requires the study and use of advanced world experience. For this, overseas training of Uzbek personnel and the involvement of foreign consultants are advisable. This is possible only with financial support from the state, since domestic business cannot yet bear the corresponding costs. [11]

In industrialized countries, government agencies have specialized intermediary services that provide customers with information about enterprises and organizations that are of interest to them. The law provides that enterprises in the country provide the government with information on tax and economic data collection and processing systems. Enterprises also publish information on their activities, including the annual balance

sheet. At the same time, enterprises have the right not to divulge trade secrets. To prevent the spread of trade secrets through government and regulatory bodies, the head of the enterprise should be aware of his authority and provide only the information that is required from the service, and not any information requested by them. First of all, this is the department of statistics, the department of antimonopoly and development of competition, representatives of law enforcement, finance, taxes, sanitation, fire-fighting and other services. The head of the enterprise must also know and follow the procedure for filing a complaint about unlawful actions of public servants, as well as a mechanism for reimbursing material and moral harm caused to the enterprise.

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## WAYS TO IMPROVE THE LEVEL OF EDUCATION IN THE RIGHT CULTURE OF THE RUSSIAN SOCIETY

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**Abstract.** The author examines possible ways to improve the legal culture of Russian society at the present stage. The article concludes that in order to resolve the problems, a purposeful state policy is needed, aimed at increasing the level of legal culture of society through law-making, the legislative process, and the media.

**Keywords:** legal culture, legal awareness, legal propaganda, modern Russian society, legal education, legal education.

Solving the complex problem of improving legal culture is an urgent task among the state and legal problems of the Russian state in the post-Soviet period. The issues of improving the legal culture play an extremely important role in solving the problems of the formation of civil society and the rule of law.

Legal culture is the result of the conviction of people to follow the rules of law. The state of the legal culture of a society is an indicator of the development of its legal system, the system of law and the system of legislation, the state of legal practice and the culture of society in general at this stage of historical development. Thus, the problem of improving legal culture is one of the main ones in the theory and practice of state-legal construction of the Russian state at the present stage.

The problems of improving legal culture, legal education and human rights protection at the present stage are undergoing serious changes, primarily in theory. In this regard, the possibilities of sociological approaches aimed at studying the real processes taking place in practice in these areas should be especially noted. It should also be noted that the categories "legal culture", "legal education" and "protection of human rights" are closely interrelated and determine the effectiveness of the policy.

The development of the legal culture of any society is influenced by

numerous factors of an objective and subjective order. Russia is characterized by a mixture of Eastern and Western cultures, a variety of religions, national-ethnic traditions and customs. The negative features of the post-Soviet transition period complicated the further development of the legal culture of society and its individual groups.

Nevertheless, it should be understood that improving the legal culture of the population is a rather lengthy process, associated in general with the state of society. As the experience of modern Russia shows, many achievements in the sphere of culture and morality of society, accumulated by the efforts of previous generations, were destroyed during a relatively short time of the transition period due to the unfavorable socio-economic situation in our country and the population's dissatisfaction with the policy of reforming the economy and social sphere.

The legal culture cannot be improved in isolation from the entire social process, for this it is necessary to create appropriate conditions, which can be general social and specially legal.

First of all, it is necessary to form a national ideology on the basis of ethical and moral principles of law, since morality in Russia still occupies a priority place among social values.

An important basis for the formation of a modern legal culture is the restoration of public confidence in the authorities at all levels, without which it is difficult to achieve respect for legal acts that consolidate the rules of law and create the basis for legal culture. Effective interaction of civil society institutions with authorities at the federal, regional and municipal levels is the most important condition for solving this problem at the present stage [1, p. 73].

An effective fight against corruption is a serious indicator of trust in the authorities. The stated tasks of building a civil society and the rule of law, raising legal awareness and legal culture will only be solved if real steps are taken to combat corruption. Lack of socio-economic stability and effective work of the authorities to ensure it cannot contribute to the formation of a law-abiding citizen, who is the basis of the legal culture of society.

Raising the level of legal culture and overcoming legal nihilism can be achieved in the following ways. First, it is necessary to raise the level of legal literacy of citizens by introducing compulsory subjects devoted to the legal education of the individual into the education process at all levels (preschool, school, special and higher). The need for such a reform is obvious. The introduction of disciplines devoted to fundamental human rights and freedoms, ways of their implementation and legal protection, will contribute to the formation of a respectful attitude towards law and laws among

citizens from an early age. In addition, the learning process in childhood is much easier than that of an adult, and the child's consciousness quickly adapts to innovations and changes. Since the younger generation is the most active in society, it is necessary to form a complex of views among young people that could turn this activity in the right direction, towards creation, and not towards destructiveness.

Secondly, it is important to use legal propaganda in order to increase the level of citizens' confidence that all issues can and should be resolved in a civilized way, based on legal norms. Legal propaganda is the dissemination and explanation in society of legal knowledge, the practice of applying certain legal norms, and is also the formation of the population's conviction in the expediency of observing laws and preventing offenses [2, p. 50].

Today, the main source of propaganda is the media, the publication of normative legal acts is mandatory in official sources, and the decisions of the courts are freely available on the Internet. To improve the quality of legal propaganda, it would be advisable to allocate special airtime for lectures by legal scholars, in which it is possible to explain in an accessible language the need to adopt certain laws, the mechanism of the law, ways to protect violated rights, etc. Such lectures can help increase the level of citizens' confidence in the state and, accordingly, increase the level of legal literacy among the population.

Thirdly, in order to increase the effectiveness of national legislation, it seems appropriate to make rational use of foreign experience.

It should be noted that at present there are many problems in the development of legal culture (legal illiteracy of the population, complex process of lawmaking, legal nihilism, etc.). To resolve these problems, a purposeful state policy is required, aimed at increasing the level of legal culture of society through lawmaking, the legislative process, and the media.

Legal culture is an indicator of the maturity of the legal system and the civilization of a person. The formation of the legal culture of an individual and society as a whole is possible within the boundaries of legal education, implemented by various institutions related to the system of law and education. Improving legal culture is associated with solving problems that are inherently complex, objective and create a certain positive socio-economic background. First of all, it is necessary to formulate a national idea, an ideology, on the basis of which an increase in legal culture should take place, and in general the state and legal development of society. As such, the ideas of civil society and the rule of law can be proposed, although in a narrower sense, the legal culture that meets the modern needs of society

can itself serve as an ideology for the formation of a new statehood in Russia. In any case, the basis for the formation of a new ideology should be the ethical and moral principles of law, since morality still occupies a priority place among social values in Russia.

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## TO THE QUESTION OF THE NOTION OF CIVIL LIABILITY

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**Abstract.** This article is devoted to the study of the conceptual essence of civil liability. On the basis of a theoretical analysis of the most recognized civil law positions, the concept of civil liability is revealed, and the author's idea of its features at the present stage of development of social and economic relations is substantiated. The result of the research is the formulated author's definition of civil liability. The methodological basis of the research was formed by general scientific and private scientific methods of scientific knowledge, for example, such as formal legal, logical, comparative legal, analytical method. The research materials were legal acts and scientific works of scientists in the field of protecting civil rights and establishing measures of civil liability of subjects of civil turnover.

**Keywords:** legal responsibility, civil liability, state coercion measure, sanction, restoration of violated right.

The selected issue of the concept and essence of the institution of civil liability is one of the most interesting aspects of the modern science of civil law. Of course, in civil science, the theory of civil liability has never been ignored by scientists. Its dogmatic positions have been developed over the centuries. However, the analysis of the current legislation, materials of judicial practice and the theory of civil and business law clearly indicate that the ongoing reformation of economic relations in recent years has generated certain changes in the legal regulation of this issue. This is due to a number of circumstances. First, economic relations are in constant dynamics, as a result of which the nature of these relations changes, their new types appear. Secondly, as a consequence of such transformations, the form of relations between their participants is changing, new subjects appear, the legal status of which has not yet been fully determined. Thirdly, the relevance of the selected issue is aggravated by the fact that during a pandemic, the economy is practically paralyzed, as a result of which the question of the onset of civil liability of subjects of civil turnover for

unfulfilled or improperly fulfilled obligations due to the onset of a pandemic arises. Thus, the foregoing predetermines the need to pay close attention to the peculiarities of civil liability of participants in civil turnover. Which, from our point of view, is of definite both practical and scientific interest.

Following a logical sequence, at the beginning of our research, we will pay some attention to the very concept of civil liability.

Civil liability is a type of legal liability, as a result, it is characterized by both general features and specific features inherent only in this type of liability. In particular, in the theory of law, the following characteristics of legal responsibility are distinguished, which we refer to as general features inherent in all types of legal responsibility. These include the following: 1) responsibility comes only for the offense; 2) is of a personal nature; 3) represents the type and measure of state coercion; 4) is characterized by certain deprivations, as a result of which the offender suffers adverse consequences for himself; 5) is determined by the sanctions of legal norms; 6) is carried out in special procedural forms [See: 1, P. 293-294; 2, P. 505-506 etc.]. And, if, in relation to the general signs of legal responsibility among legal scholars, there is a certain unanimity, there are different approaches to the question of the concept of the category of "legal responsibility" in legal science.

One of the leading figures of the civil science of the Soviet period S.N. Bratus, characterizing the concept of legal responsibility, believed that it was nothing more than "the implementation of the sanctions specified in the legal norm" [3, p. 82]. We admit that this approach to the concept of legal responsibility was characteristic of many scientists of the Soviet period. For our part, we believe that such a position is of a fragmentary nature, since it does not adequately reflect the concept of legal responsibility, but only confirms one of its features, which we have indicated above. Moreover, the presented definition conflicts with the modern development of economic relations, since it has a narrow focus that would not allow business entities to act at their own risk, show their initiative and independence, and would contradict the principles of freedom of contract.

We believe that a clearer and more complete picture of legal responsibility is given by O.E. Leist, defining it as "the application to a person committed an offense, measures of state coercion, provided for by the sanction of the violated norm, in the established procedural order" [4, P. 655].

The position of V.I. Goyman, who claims that legal responsibility is a means of localizing unlawful behavior [See: 1, P. 291].

A more detailed definition is presented to us by D.A. Lipinsky, arguing that "legal responsibility is a normative, guaranteed and secured by state

coercion, persuasion or encouragement, a legal obligation to comply with and fulfill the requirements of the rule of law, which is realized in the lawful behavior of subjects, approved or encouraged by the state, and in case of its violation, it is the offender's obligation to undergo condemnation, restriction of rights of a property or personal non-property nature and their implementation "[5, P. 10]. At the same time, such an understanding of legal responsibility, in our opinion, does not fully reveal the essence of the desired category in relation to the subjects of civil turnover in the modern conditions of the development of economic relations.

The argumentation of legal responsibility given by E.A. Sukhanov, who rightly comes to the conclusion that this category establishes the consequences of misconduct, and therefore its application becomes one of the ways to protect the violated rights and interests of others [See: 6, P. 587]. The peculiarity of this method of protection, E.A. Sukhanov sees in the application of measures of responsibility with the help of state, including judicial coercion, which distinguishes it from self-defense and other measures of influence applied to the offender [See: 6, P. 587]. Thus, the scientist concludes, "legal responsibility is one of the forms of state-coercive influence on violators of the rule of law, which consists in applying to them the sanctions provided for by law - measures of responsibility entailing additional adverse consequences for them" [6, P. 587]

Thus, taking as the basis developed by E.A. Sukhanov's position on the essence of legal responsibility, it seems possible to go directly to the study of the concept of civil liability and its features.

So, as we have already noted, civil liability is a kind of legal one. Accordingly, it is inherent in both general, inherent in all types of legal responsibility, and special features. The general features should include those that we have already named, characterizing legal responsibility. If we single out special features, then one of the main features of civil liability, as we know, is manifested in its property nature. Accordingly, the sanctions for committing an offense in civil relations are of a property nature, i.e. they are measures of property influence on the offender in the sphere of economic relations, used in order to restore the property situation that the victim had before the offense. Moreover, even in case of violation of personal non-property rights, measures of a property nature are applied in civil legal relations. Measures of property impact should be understood as those that entail for the offender, certain deprivations of a property nature, the occurrence of which is associated only with the fact of violation of the right, i.e. property adverse consequences. These include the payment of a certain amount of money (compensation for damages, fines, penalties, forfeit), the

provision of property in kind. A feature of civil liability is also the fact that by its nature it is of a restorative and compensatory nature. The peculiarities of civil liability should include the compliance of the amount of liability with the amount of damage caused, as well as, as a consequence of the principle of legal equality of subjects of civil legal relations, the responsibility of one counterparty to another.

However, in order to identify the specifics of civil liability as a type of legal liability, we would like to dwell in more detail on the general features that characterize the responsibility of subjects of civil circulation.

From the general signs of legal responsibility that we identified earlier, as well as based on the opinions of domestic civil scientists, we can conclude that the main one is state coercion. This means that only through state coercion by the judiciary is it possible to impose property liability on the offender in favor of the victim. At the same time, an analysis of the current development of economic relations and the reform of Russian civil legislation allows us to make an assumption about the possibility of questioning this hypothesis. Since, if we take state coercion as a basis, as the main of the general features that characterize civil liability, then how to assess a number of situations that we meet in practice? In particular, we are talking about cases of voluntary extrajudicial procedure for compensation for material damage due to violation of civil rights and obligations, as well as the possibility of resolving the conflict through mediation. Indeed, today, subjects of civil turnover are resorting to such methods of restoring violated rights as a result of entrepreneurial activity more and more often.

In this regard, our attention was drawn to the position of O.E. Leist, who, even in the period of development of new economic relations, characterizing the restorative legal responsibility, i.e. civil law, justifies the need for a new approach to the definition of the features of legal liability [See: 4, P. 684-685]. Such a need, the scientist argues, is justified by the fact that the offender, without the intervention of state bodies, can restore the violated right himself, settle the conflict, stop the illegal action [See: 4, P. 684-685]. F.I. Khamidullina comes to a similar conclusion in her studies. [See: 7, P. 36-39]. S.S. Kournikova also draws attention to this circumstance. [See: 8, P. 29-32]. Supporting the opinion of these authors, we, for our part, believe that the definition of civil liability should include the possibility of its application to all types of violation of civil rights and obligations, including the possibility of independent restoration of the violated right without contacting the appropriate state authorities of the subjects of civil turnover.

The rationale for our position, in particular, we see in the fact that paragraph 1 of Article 11 of the Civil Code of the Russian Federation provides

for the possibility of protecting violated or challenged rights, in accordance with their competence, not only in the arbitration court and courts of general jurisdiction, but also in the arbitration court ( arbitration) [9]. And, as practice shows, in recent years, the activity of using the mechanism of out-of-court consideration of disputes by appealing to arbitration courts has been growing every year. V.F. Yakovlev, for example, in his works repeatedly draws attention to the positive role of such intermediary conciliation procedures [See, for example: 10, P. 47-53]. Noteworthy, from the standpoint of the problem we are considering, is the fact that Article 38 of the Federal Law of December 29, 2015 № 382-FL "On Arbitration in the Russian Federation" directly establishes the obligation of the parties that have entered into an arbitration agreement to voluntarily fulfill arbitral award. And the legislator emphasizes that the parties and the arbitral tribunal make every effort to ensure that the arbitral award is legally enforceable [11]. This wording only confirms that the offender has a voluntary opportunity to independently restore the violated right, i.e. without government coercion. This is also evidenced by the possibility of concluding an amicable agreement in the course of arbitration, if the parties have settled the dispute among themselves (Article 33 of the Arbitration Law). The possibility of reaching an amicable agreement is also provided for by the norms of Article 153 of the Arbitration Procedure Code of the Russian Federation [12], Article 39 of the Civil Procedure Code of the Russian Federation [13]. The independence of making a decision on the restoration of the violated right can also manifest itself in the fact that the offender himself addresses the victim with a proposal to restore the violated right, as a result of which he voluntarily suffers both property and personal non-property consequences that are unfavorable for himself. Thus, our conclusion is obvious: the sign of state coercion is not always characteristic of civil liability.

O.S. Ioffe's conviction echoes our conclusion, who notes that "the peculiarity of civil liability is that even after the commission of an offense, its consequences can be eliminated voluntarily by the offender himself, without the intervention of judicial or other state bodies, by virtue of the mere possibility of coercion and on the basis of the offender's awareness of the nature the actions he committed and their negative significance for the socialist society"[14]. Therefore, we are more impressed by the concept of civil liability given by O.S. Ioffe, - "a sanction for an offense that causes negative consequences for the offender in the form of deprivation of subjective civil rights, or the imposition of new or additional civil obligations" [14]. It is necessary to clarify that in the above definition, additional obligations should be understood as additional encumbrances for the infringer of

the law that arose for him due to the violation. Moreover, O.S. Ioffe rightly emphasizes that responsibility is not just a sanction (coercive measure) for an offense, but a sanction that entails certain deprivations of a property or personal nature [14]. Sanctions, in particular, are losses, fines, penalties, interest for the misuse of other people's money [See, for example: 15, P. 947-956].

Thus, our research and reasoning about the concept of civil liability as a kind of legal liability led us to the opportunity to form the author's position on the desired definition. In our opinion, civil liability is a sanction provided for by law, agreement, or established voluntarily and independently by the offender himself, as a result of his violation of civil rights and obligations of participants in civil turnover, aimed at undergoing adverse consequences in the form of deprivation of subjective civil rights, or imposing additional civil legal obligations. However, it can also be said, based on the essence and characteristics of civil liability, that this is a sanction aimed at restoring the violated right by undergoing adverse consequences by the offender in the form of deprivation of subjective civil rights, or the imposition of additional civil obligations. It seems that such a perception of the concept of civil liability is possible in relation to any civil law relationship based on legal equality of the parties, inviolability of property, freedom of contract, the inadmissibility of arbitrary interference by anyone in private affairs, the need for the unimpeded exercise of civil rights, ensuring the restoration of violated rights, their judicial protection.

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## THE ROLE OF THE UNITED NATIONS IN INTERNATIONAL COOPERATION IN THE FIGHT ORGANIZED CRIME

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**Abstract.** The article is devoted to the discussion of problems of development of international cooperation in the fight against organized crime. Undoubtedly that the criminality, especially its organised forms, long since got beyond national borders, therefore struggle against it seems to be possible only by wide international cooperation. Create global programs for international cooperation to fight organized crime reveals the latest trends in the activities of organized criminal groups and highlights potential dangers, which makes it possible to carry out appropriate preventive measures.

**Keywords:** organized crime, international cooperation, cooperation of the states, United Nations

In every country crime is not only varies, but also has a general criminological characteristics. With all the specificity of national objectives in the struggle against crime, many countries are resolving the same significant problems. This allows considering the problem of crime prevention as international.

In the long-term practice of international cooperation in the struggle against crime cooperation mechanism has developed, including international organizations such as the United Nations organization (UN) and its specialized agencies, non-governmental international organization, the International Criminal Police Organization (INTERPOL).

The UN is the only agency that has a universal mandate and international support needed to provide effective assistance to countries in the prevention and struggling against the crime [1]. For 70 years thanks to the efforts of the UN as a result of the negotiations it have been concluded over 560 multilateral treaties, including treaties concerning human rights, the struggle against terrorism and international crime, refugees, disarmament, trade, commodities, the oceans and many other issues [2].

Article 3 of the UN Charter establishes the need for cooperation of

states in solving the social and humanity problems, including the struggle against the international crime. All the principal and subsidiary organs of the organization, as well as a number of UN specialized agencies are actively includes in this work.

The General Assembly is the main deliberative, policymaking and representative organ of the UN, which consists of 193 Member States. The General Assembly at its sessions considers the issues of crime prevention, the relationship of crime and social changes, assumes the international legal conventions, and creates special committees and the authorities to struggle against international crime [3]. The problem of struggle against the crime discussed in the main committees of the General Assembly - committee on social and humanitarian issues (3 committee) and Committee of Legal Matters (6 committee) [4].

Security Council considers the issues of struggle against the crime in connection with the complaint of the States of specific crimes and acts of aggression, the most serious of them are discussed on its meetings. According to the Charter, the Security Council has the primary responsibility for maintaining international peace and security. Members of organization agree, in accordance with the Charter, to obey the decisions of the Security Council and to carry them out [5]. The Security Council plays a leading role in determining the existence of threats to the peace or act of aggression. It encourages the parties in a dispute to settle it peacefully, and recommends methods of settlement and terms of settlement. In some cases, the Security Council can resort to sanctions or even authorize the use of force in order to maintain and restore international peace and security. In addition, the Security Council makes recommendations to the General Assembly regarding the appointment of a new General Secretary and the admission of new members to the UN. The General Assembly and the Security Council are elected by the judges of the International Court[6].

The UN General Assembly with the help of the International Law Commission prepares and adopts convention to struggle against the certain crimes, recommendations for the coordination of measures to prevent acts of international terrorism, mercenary, drug trafficking, etc. At the UN Security Council meeting these issues are addressed in relation to complaints of countries on acts of aggression, terrorism and others. If necessary, it transmits these issues in its commission of inquiry. UN International Court of Justice considers the specific cases concerning the issues of struggling against the crime. (It was considering the case of the seizure of American hostages in Iran, and made recommendations to States in 1980).

Once every five years, the commission conducts United Nations Congress on the Prevention of Crime and the Treatment of Offenders. They have become global forums on coordinating the efforts of all mankind in the struggle against crime and harmonization of international criminal law [7].

In the era of globalization, there is a new form of transnational crime. Organized criminal groups emerge and expanding at an alarming rate, which is accompanied by the growth of the scale of physical violence, bullying people and government officials' corruption. To better respond new challenges in the field of crime prevention and criminal justice the combined efforts of the international community requires. The Centre for International Crime Prevention (CICP) promote the strengthening of international cooperation to prevent and deter the crime; supports the development of criminal justice systems; and helps Member States solve the problems and overcome the threats posed by the changing of nature of transnational organized crime. CICP supports efforts of Member States with the ratification or the UN Convention against Transnational Organized Crime and additional protocols and the UN Convention against corruption. To counteract of the criminal activity CICP provides targeted programs. Global Program of struggle against corruption designed mainly for countries with vulnerable developing or transitional economy, contributes to the adoption of anti-corruption measures and helps to improve the transparency of the public sector. One of the problems, the scale of which increases with the highest rates in the world, is the issue of smuggling of migrants and human trafficking. Studies suggest that in this case all the more significant role is played by organized crime groups. Global program against trafficking helps the countries of origin, transit and destination for such people to develop joint strategies and practical actions against trafficking. Criminal groups pose the international networks using the most advanced technologies and a variety of techniques to effectively act as at legitimate and at illicit markets. The global program against transnational organized crime reveals the latest trends in the activities of organized criminal groups and highlights the potential dangers, in order to be able to take appropriate preventive measures.

Thus, the higher level of internationalisation of criminality, the more active and all-round there should be interaction of the states at struggle against the organised crime.

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## BASIC RESOURCES OF THE EDUCATIONAL ENVIRONMENT OF THE MODERN RURAL SCHOOL

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**Summary.** In this article, we tried to determine the main resources of the educational environment of a modern rural school, as well as the influence of a multinational society on the development of a creative, independent, active, responsible person. Various theoretical positions of the influence of the educational environment on the development of the personality of rural schoolchildren are analyzed. In this article, we tried to determine the main resources of the educational environment of a modern rural school, as well as the influence of a multinational society on the development of a creative, independent, active, responsible person. Various theoretical positions of the influence of the educational environment on the development of the personality of rural schoolchildren are analyzed.

**Keywords:** basic resources, educational environment, rural school, specialized education, rural schoolchildren.

Recently, in Russian society, changes in priorities in educational policy have led to a state of crisis in the educational and educational system. Society in the search for innovative approaches to the organization of the educational process aimed at meeting the educational needs of each rural student. Federal state standards suggest a completely new paradigm of education - a systemic-activity approach focused on the development of a creative personality. These tasks should be met only by those rural schools that will not only focus their work on the strengths of rural society, but will be able to realize their economic, educational and educational resources in their practical activities.

In this regard, it is advisable to dwell on the concept of "educational environment." In the framework of our research, we use a multifactorial

approach to the very concept of "educational environment" because to build a theoretical model, an analysis of the influence of all components on the development of personal and professional self-determination of rural schoolchildren is necessary.

So, A.V. Khutorskaya by the "educational environment" means the created natural or artificial environment of the student, which includes various types of means and content of education, capable of ensuring the effective activity of the student [5, c.302].

The educational environment is a set of conditions organized by the school administration, the entire pedagogical team with the obligatory participation of the students themselves and their parents in order to implement the educational tasks assigned to the school. The totality of such conditions determines the unity of people resulting from their joint activities. The rural school, which manages to create such conditions, turns into a territory of a competently and comprehensively built system of personal and professional self-determination of students.

We are close to the position of M.G. Golubchikova, who by the educational environment understands the specific space of an educational institution, considered as a set of conditions, connections and interactions of subjects of education [4, p. 56].

According to Ts.R. Bazarov, the educational environment also has a large measure of complexity, since it has several levels - from federal, regional to its main primary element - the educational environment of a particular educational institution and class [3, p. 112].

The rural environment is a special world. The village is characterized by monotony of life, scarcity of information, stability of social norms, much less social differentiation and mobility compared to the city. A limited number of behaviors, inadequate communication leads to slowed cultural development, poor speech and imagination, less general awareness [2, p. 32].

The peculiarities of the educational environment of the Irkutsk region are determined, first of all, by the geographical position, unevenness of population density, large distances between settlements and the underdevelopment of the transport network. Irkutsk region is located on the territory of 768 thousand square meters. km, with a population of 2735 thousand people. If the total density is 3.5 people. sq. Km, in rural areas it is 1 person. per square km. The length of the territory from both north to south and from west to east exceeds a thousand kilometers. In total, there are 1083 general education schools in the region, of which 652 are rural, half of which are at a significant distance from the regional center, which determines serious difficulties in developing the educational information

infrastructure. The unification of the Irkutsk region and the Ust-Orda Buryat Autonomous Okrug in January 2008 increased the problems of both a geographical plan and an ethno psychological nature. In the village of Bohan, a unique educational environment has been formed that favorably affects the development of personal and professional self-determination. Here, as in the entire Ust-Orda Buryat Autonomous Okrug, the multi-ethnic structure of the population, the basis of which is composed of Russians, Buryats, Tatars, Poles, etc., distinguished by the identity of national cultures. In addition, as a result of long cohabitation, a special, Siberian community of people has developed. The ethnographic type of the Siberian is characterized by such features as peacefulness, high morality, hard work, independence of character, self-esteem. All levels of vocational education (ПУ-57, teacher training college) are presented here. This allows rural students to learn more about the peculiarities of education, the specifics of professions. Rural school is an important component of the domestic education system, a serious factor in the development of the state and society. The inextricable connection between rural school and society is obvious. A distinctive feature of rural is its higher social status compared to urban educational institutions [1, p. 66].

Thus, we believe that this is the specificity of the conditions, the uniqueness of their combination in each rural school favors the study of the adaptability of pedagogical innovations introduced during experimental work, when used in different schools. Autonomy and relative isolation of the rural educational environment makes it possible to exclude the influence of a number of metasystem factors on the results of experimental research.

We believe that the maximum use of the basic resources of the educational environment of a modern rural school opens up new prospects for conducting high-quality scientific research in the school, the results of which will fully meet the requirements of scientific novelty, theoretical and practical significance. And most importantly: the results - new pedagogical ideas and technologies - will be formed taking into account the peculiarities of the rural school as much as possible, and the rural school from the consumer of ready-made scientific and methodological developments will turn into an environment of activity and pedagogical creativity.

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## FEATURES AND CONDITIONS OF DEVELOPMENT OF SOCIAL AND PROFESSIONAL ORIENTATION OF RURAL TEACHERS

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**Summary.** In this work, the author considers the features and conditions for the development of the socio-professional orientation of rural teachers, the main criteria for the development of personal and professional development. We analyze the impact of modernization processes and socio-psychological, socio-economic conditions on the psychological state of rural teachers.

**Keywords:** social and professional orientation, rural teacher, environment, social conditions, rural school. social and professional orientation, rural teacher, environment, social conditions, rural school.

Today, a rather significant place in the content of the work of rural schools is occupied by issues of vocational education: vocational orientation of young people to agricultural professions, taking into account the traditions of the village, fixing graduates in the countryside, staff demand, professional competence. In our opinion, the social partnership of the educational sphere aimed at developing human resources is an effective mechanism for the development of rural municipal vocational education. The analysis of the theory and practice of strengthening the socio-professional orientation of rural teachers showed the presence of organizational and methodological reserves that provide on the one hand assistance in the professional formation of graduates, the development of human potential, on the other hand - consolidation, integration, interaction of social institutions on the basis of innovative forms of social partnership.

The modern education policy presents the rural school with global tasks that cannot be realized unless the worldview of the rural teacher is com-

pletely changed, the attitude to activity, to students, to social reality, to innovations in the education system. We consider it the most important for a rural teacher to have an interest in the students themselves, creative approaches to solving a variety of different pedagogical problems, an interest in his pedagogical activity, a tendency for her to grasp, a level of professional self-awareness and all the above directly reflects the professional orientation of the teacher [1, p. 56].

Thus, we believe that the socio-professional orientation of rural teachers is key in the personal-professional formation of the teacher. A teacher with an active life position has a more developed professional self-awareness and socio-professional orientation [2; 3]. This process is directly connected with the teacher's awareness of norms, rules, the model of pedagogical behavior, with a special knowledge of the adoption of certain professional ethanol, samples and the correlation of himself with them on the basis of self-esteem and assessment by others of their pedagogical abilities, nature and effectiveness of their activities, as well as professionally significant personal qualities [4, p. 32].

For our research, the opinion of A.K. Markova is significant that professional qualities are human qualities that affect the effectiveness of his work according to the main characteristics. They serve as a prerequisite for professional activity, being its neoplasm [5, p. 83]. Also in Table 1. presented the vision of great teachers to the basic requirements of the personality of a teacher, the professionalism of a teacher, the worldview and self-consciousness of a teacher.

**Table 1**

**Socio-professional requirements for the teacher**

<b>Scientists teachers</b>	<b>Socio-professional requirements for the teacher</b>
Helvetius	Be intellectually developed, the bearer of deep and comprehensive knowledge. "A man who has taken on the work of teaching others without deep knowledge is immoral."
Ya. A. Komensky	Urged teachers to love their profession, to understand that it "is as excellent as no other under the sun."
K.D. Ushinsky	Systematically update and replenish his knowledge. "The teacher teaches as long as he learns himself. As soon as he ceases to study, the teacher dies in him. "
A.S. Makarenko	Being a patriot, a citizen of his Fatherland, an active carrier of moral convictions.
V.A. Sukhomlinsky	Being a great humanist, loving children, understanding, "in order to become a real teacher of children, you must give them your heart"

Thus, the modern village, being in constant dynamic, historical development, creates completely different conditions that sublimate certain requirements for the professionalism of a rural teacher. Participants in the educational process in the new conditions are undergoing transformations of both positive and negative nature, therefore we consider the design of the educational environment, the management of the processes of socio-cultural, pedagogical interaction will reduce the negative social impact. In this vision of the professional qualities of the personality of the teacher, the socio-professional orientation of the rural teacher plays a special role. The training of teachers at the level of university education, at the school at the level of school methodological associations, mainly focuses on the subject area, but insufficient attention is paid to the psi of the educational, pedagogical and cultural fields. Modern reality requires teachers of mobility, versatility, creativity and give the child the maximum representation of future professional activity, life, while presenting many behaviors for successful future socialization.

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## THE EDUCATIONAL CONCEPT OF THADDEUS (USPENSKY) (BASED ON THE MATERIAL OF "NOTES ON DIDACTICS")

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**Abstract.** The article is devoted to the analysis of the educational concept of Thaddeus (Uspensky), presented in the scientific and methodological manual of the author "Notes on Didactics". The work reflects the classification of types of education, presents the author's views on the ways, methods and means of education, substantiates the opinion of a scientist, teacher and clergyman about the role of education in the educational process.

**Keywords:** Thaddeus Uspensky, didactic work, "Notes on didactics", pedagogical ideas, education system.

Today, in view of the worldview transformations in the Russian socio-cultural space, the educational paradigm is changing from the traditional (knowledge) to the humanistic (competence) one. Under current conditions, the center of educational impact is a person as the highest value. The most important in the context of the humanistic paradigm of education are the tasks of the education system, aimed at providing opportunities for the all-round development of the individual, for each person to realize his needs, capabilities, abilities and aspirations.

The personality-oriented vector of humanistic education justifies the need to search for new methodological foundations for its implementation, in particular, innovative approaches to building an educational context for the comprehensive harmonious development of the student's personality. In this vein, as a significant methodological basis, one can substantiate the provisions of Orthodox pedagogy based on the achievements of the pedagogical thought of the clergy of the Russian Orthodox Church. For modern philosophy of education, the didactic heritage of clergymen, whose names were forcibly erased from the pages of the national history of pedagogy, is

of particular value. The actualization of the pedagogical heritage of Orthodox clergy of the past, in our opinion, allows us to build an optimal innovative paradigm of truly humanistic personality-oriented education aimed at human development, taking into account modern pedagogical concepts.

Among the outstanding pedagogues-clergymen, whose names have been criminally hidden for several decades, it is worth mentioning Archbishop Thaddeus (Uspensky), teaching experience, pedagogical innovative ideas, whose author's didactic system is still not rightfully appreciated by modern science.

Thaddeus (worldly name Ivan Vasilievich) Uspensky (1872 - 1937) from early youth the path of a clergyman was closely connected with teaching. Serving in the bosom of the church and teaching, he considered inseparable issues, and Orthodoxy was the basis of the process of teaching and raising a child. The analysis of the life of Archbishop Thaddeus made it possible to determine the main directions of the bishop's educational and educational activities:

- teaching activities in institutions of spiritual education;
- administrative and social activities in educational institutions;
- teaching at advanced training courses for teachers of parish schools;
- scientific and methodological activities [2].

The result of many years of pedagogical experience and the study of various aspects of the educational system by the clergyman was the creation of the methodological manual "Notes on Didactics", published in 1902 in Ufa. According to the author himself, this work is not an integral course in pedagogy. It was created by him in order to provide methodological assistance to teachers in various aspects of teaching and educational activities in parish schools [5]. The structure of work includes theoretical issues of pedagogy, practical recommendations for improving the educational process in primary school, methodological developments for teaching school disciplines.

In the book "Notes on Didactics" the author paid special attention to the issues of education. Coming to the theoretical solution of these issues, he analyzes, first of all, the views of Western European teachers on education.

Analyzing the views of Ya.A. Komensky, I.G. Pestalozzi, F.A.V. Disterweg, Saint Thaddeus shared their views on the need for a nature-friendly upbringing. Studying the same in "Notes on Didactics" the pedagogical concept of J.-J. Rousseau, who, in the name of conformity to nature, offered to acquaint young people with religion only at the age of at least 18 years, since "a person really comes to understand God only in his mature

years, when he is already able to understand what exactly he is looking for in religion, and he can choose for himself the religion to which his mind is drawn "[5, p. 219], bishop Thaddeus sharply criticizes this position. According to the archbishop, the absence of religious education since childhood definitely affects the character of a person, manifesting itself in a broken psyche. Children are very sensitive to religious impressions: they are instinctively drawn to everything that reveals the meaning and beauty of the world around them [4]. Thus, according to the author of "Notes on Didactics", only Christian education and training is capable of combining everything that teachers strive for, and achieves high didactic and educational goals. "So, if they say that upbringing should lead to the happiness of the pupil, then only Christianity can give true happiness to a person. If they say that education should cover all aspects of a person's life, then most of all this is achieved through Christian education, which embraces all the forces of the soul and body of a person "[5, p. 27-28].

On the basis of an analysis of the theoretical works of scientists-educators, the bishop independently ponders the question of what education is. "Assigning education an extremely important place in the education system, Archbishop Thaddeus expresses thoughts and judgments about the very concept of" education ", the types of education, the origins of new differences in understanding the main task and shortcomings of education" [3, p. 182].

Bishop Thaddeus sees the purpose of the upbringing process in fostering in the child's soul a free love for goodness and a free disposition for a moral course of action. And this all can develop only when they learn to independently act correctly without the constant supervision of a teacher [1].

Bishop Thaddeus defines upbringing as "the development of the pupil's powers" [5, p. 18]. Given that the forces are different, he identifies the following types of education:

1) physical or, in other words, bodily education, the purpose of which is to strengthen the health of the child, develop a healthy lifestyle;

2) spiritual:

a) mental upbringing, the purpose of which is the acquisition of sound concepts and views on things by children;

b) education of the heart, with the goal of making the pupil's heart kind, sincere, trusting, gentle;

c) education of the will, making the will of the pupil firm, persistent [4].

The purpose of educating the mind - is the formation of attentiveness, observation, intelligence. The goal of educating the heart - is gentleness, patience, sincerity, trustfulness, benevolence. The purpose of educating

will is to develop firmness, stability, consistency [5].

The ultimate goal of the educational process can be neither happiness (eudemonism), because it can cause anxiety of conscience, nor benefit (utilitarianism), since it generates selfishness [5]. In a broad sense, the goal of education, according to the bishop Thaddeus concept, is the formation of a harmonious personality.

According to Saint Thaddeus, the education and upbringing of children in school should be implemented in parallel, since a person is respected in society not only for extraordinary knowledge, but also for his kind heart and strong-willed nature. An individual must be not only a well-developed intellectual, a highly qualified specialist in his field, but also a highly moral person [5].

The fundamental idea of the didactic work of Archbishop Thaddeus is the Christian basis of the entire educational process. The author of "Notes on Didactics" emphasized that only the Christian model of education can combine both a humanistic approach to students and the implementation of a comprehensive development of the individual. In turn, according to Thaddeus Uspensky, only a Christian upbringing can give children full happiness in that it is absolutely consistent with human nature.

Summarizing the above, we conclude: the analysis of the didactic heritage of Thaddeus (Uspensky) allows us to say that the provisions of his theory largely correspond to modern pedagogical concepts and meet the goals and objectives of modern education. This substantiates the need for actualization and scientific rethinking of the experience of educational and upbringing activities and the didactic heritage of an Orthodox priest and an outstanding teacher.

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**COMMUNITARIANISM IN SOCIAL SERVICE METROPOLITAN JOHN  
(SNYCHEV)**

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**Abstract.** The article considers the social ministry of the Metropolitan of St. Petersburg and Ladoga John in the context of communitarianism. A communitarian community gathers the righteous who want to serve society and God not for kinship, but for ideological and soteriological reasons. Communitarian change begins with the elimination of their own sins. The concept of communitarianism is aimed at the theoretical and practical implementation of a new method of social modeling for the exit of society from the institutional trap that arose as a result of the loss of the conceptual war at this historical stage.

The whole philosophical and theological journalism of the righteous bishop makes you think about the regeneration and search for a new self-organized and self-developing socio-political system that can solve the contradiction between the desire for objective truth (cognitive function) and the system of consumer values that prevail in liberal society.

The futurological approach of Metropolitan John makes a choice between the next collapse of criminal oligarchic capitalism and the new construction of social modeling of the state: either as a colony with the role of a satellite country, or as a state with sovereign national development. The second dominant thesis involves the search for passionaries for the spiritual and moral transformation of the Russian communitarian world.

The study of the writings of Metropolitan John on the problems of creating a fraternal Christian community at the "church fence", we found a forgery of shifting values as the semantic foundations of human life in the ongoing consensual war, where they shoot not from guns at soldiers, but from created socio-political technologies aimed at destroying conscience, self-awareness and traditional value fortifications. The disintegration into parts of the collegial unity of the Russian people (in alliance with autochthonous ethnic groups) entails a split in society, loss of respect in international relations, illness, hunger and humiliation by slavery.

According to the theologian I. Snychev, collegiality can become a panacea for the spiritual crisis in our days. In our opinion, the collegiality, which A. Khomyakov and Metropolitan John spoke about, is an important attribute in the soteriological and ontological picture of the world, but not sufficient. It is necessary to supplement the concept of "collegiality" with the content of communitarianism and then the primordial spiritual principle will organically combine with economic (artel), family (small church) and political goal-setting (the "big" communities must become experts and head not only municipalities, but also the government).

**Keywords:** traditionalism, communitarianism, consensual security, monarchism, liberalism, homiletics, soteriology, existentialism.

### Introduction

Twenty-five years have passed since the death of Metropolitan John Snychev (November 2, 1995), who was buried in the cemetery of the Holy Trinity Cathedral of the Alexander Nevsky Lavra, but his memory is only growing stronger. There are volunteers who collect miracles that took place during his lifetime and after his death for the further canonization of the righteous. There are admirers of the theological and patriotic literary heritage. In our study, we will consider the social ministry of the metropolitan in the context of communitarianism.

The characterization of the bishop in the press is made up of the most vile words to laudatory odes. Those who did not know the bishop personally cannot figure out who the deceased really was. In liberal circles, Snychev is criticized for traditionalism, anti-Semitism, monarchism, nationalism and anti-Westernism [16, p. 147-150].

We will leave to the judgment of God the labels of Russophobes and ecumenists with whom the Metropolitan fought and present the names corresponding to his human rank. Some call John a "prayer book" (he shone at prayer) [18], others - a "non-possessive, modest, humble pastor" (secretary of Metropolitan John Anna Ivanova), still others - "a tsarist bishop" (rector of the Leushinsky courtyard, Archpriest Gennady Belovolov), the fourth - "a sickly old man" [4], the fifth - "a prophet" [9], sixth - "a wise mentor" [30, p.81-82].

Ioann Snychev was a real monk. He avoided luxury and ate modestly. His cassock was torn and darned "a hundred times" from old age. After his death, no amount of money was found with him. Paradoxical as it may seem, the atheist A. Nevzorov raised money for the Vladyka's funeral. The host of the radio channel "six hundred seconds" announced the death of the righteous man on the air and asked the "brothers" to send a truck with bricks to cover the grave as it should be for the hierarch.

Ioann Snychev lived his entire humble, humble life as a "highway", first

in Samara, then in the Leningrad region. Where Vladyka was, people gathered there. The Metropolitan spent all his Petersburg holidays in Samara. In the Ivanovs' house on Artsybushevskaya from 8 am to 12 am, the Metropolitan received all the suffering, and numerous petitioners even stood on flower beds in the yard and quietly discussed the gangster, painful for Russia, nineties.

### **Research methods**

The method of homiletics shows how in the bishop sermons the mondialists were frightened, first of all, by the formation of a consistent and integral ideological concept, an alternative to liberal democracy and much more attractive, familiar, convenient for a Russian person [9]. This alternative could be communitarianism, for which the bishop advocated, but rarely turned to the analysis of the life of the communes. Concern for the communitarian state structure is expressed in its criteria for pleasing God, correlation with the millennial shrines of the faith [11].

By creating a “model of the world” in the context of communitarianism, we are constructing a new reality, different from the globalization imposed by the West through the market mechanism. The new “model of human life is not invented by anyone in particular. It rises, ascends from the broad empirical to the theoretical, from the unconscious to the conscious, from the elemental to the conscious, from the indefinite to the definite” [33, p.136].

Comparative analysis of comprehending the picture of the world through science and religion shows their common source of birth and the dominant of the sacred. Research in science presupposes an ontological approach, with a view from the outside through a laboratory or field experiment, which determines the adequacy. Soteriological study of an object requires the entry of the observer into it, and therefore the “measurement” of religion is associated with existential, moral and spiritual [20, p.137] approaches.

The civilizational approach to the analysis of social development helps to comparatively study the East-West dichotomy. For Western thinking, the theoretical aspect of the study is closer. For Russia, the empirical aspect is important, turning into the metaphysics of non-being, going beyond the framework of our immanent reality.

The narrative method, as a primary analysis, tells about the hardening of the Russian people, its originality, great language and grandiose culture. The historical and genetic method is considered as a way of understanding the past, present and probable predictive future. The analysis of historical examples of Russian self-organization is known in the experience of creating a militia by Minin and Pozharsky, in the information space of the works of Slavophiles, the Orthodox labor brotherhood N.N. Neplyuev, labor communes A.S. Makarenko [14].

Snychev's historicism is based on the traditions of the Russian people,

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which are a condition and basis for subsequent successful socio-cultural creativity. In communitarian communities, the ideals of piety act as a successful self-organization, on the basis of which the unification of their carriers took place [14].

### **Research results**

In distorting the reality of Russian history, the Metropolitan places the blame on the Freemasons hiding under the guise of enlightenment. Initially, N.M. Karamzin, Russia appears to be almost an "earthly hell", seething with lawlessness, cruelty and vices. And his followers, S.M. Soloviev, N.V. Kostomarov, V.O. Klyuchevsky and other "thoughtless copiers" have significantly strengthened this vicious methodological principle in their research [14, p.394].

With the help of the Metropolitan, we found out that there is a huge area of our life - colloquially called humanitarian - where rationalistic scientific methods and positivist philosophical schemes are completely unsuitable as tools of cognition "[14, p.399].

Metropolitan John unperturbed, with paternal care, separates the "wheat" from the "chaff" in anti-Christian socialism and suggests that this historical period should be regarded as a religious phenomenon. But he does not accept the phenomenon of Eurasianism because of "lukewarmness" and throwing at both one and the other. Russia with its unique originality must follow its own mystical path, prepared by the Providence of God.

The East-West dichotomy for the metropolitan is absolute and eschatological. For him, a dialogue of cultures in different ways of confessing existential life is impossible. Here the West is the Antichrist, and Russia is the Christ.

From our point of view, the West-Eastern world cyclicity changes the dominant: the West fades away, and the East-Russia "blossoms" and regenerates its matrix. Futurological design in the analysis of the roadmap between man-made disaster and traditional society, we choose the second thesis with a return to the ecological asceticism of Eurasia.

From the above, we conclude that communitarianism is *dichotomous*, antinomical and alternative in the presented Eastern and Western civilizations. The first, communitarians, are looking for sacred meanings and are ready to "lay down their souls for their friends" (John 15:13). The second, anti-communitarianists, imitate a just society in legal and legislative bodies. The first stand for an ideal society, the second for market relations. The first live in a conciliar manner, the second on the principle of social Darwinism.

According to Metropolitan John, “the whole life of the Russian people and the Russian state has been permeated with the spirit and light of conciliarity for many centuries” [12, p.103]. The idea of a “monastery in the world” [29, p.31], “intuitive evidence” [8, p.19], “metaphysical total unity” or “world-historical universalism” [6, p.123], as the idea of spiritual gathering of Russian people goes back to the traditions of Holy Russia and the Third Rome [21, p.54].

Sobornost can be thought of as an introverted Russian code of global responsiveness and adaptability. The idea of communal “unity in the multitude” [34, p.16] was comprehended by Russian philosophers in the image of the Holy Trinity, which is “eternal conciliarity” [7, p.11] and “essentially perfect Council” [35, p.192]. Sobornost as “universal unity” [29, p.6] is an “extraordinary compass” [5, p.15] in the ideology of communitarianism. The collective principle of “conciliar phenomenology is the idea of the whole mind”, which is nothing more than a converted form of Hegel's “absolute idea” [28, p.60], built in three stages from a logical idea (substance) to nature (an activity-based embodiment of an idea) and further to spirit as human self-consciousness.

The concept of conciliarity has its roots in the apostolic communities where people gathered to save their souls. The most famous historical period of the fruitful creation of communitarianism was the first centuries of Christianity, when everyone was ready to “give his soul for his friends” (John 15:13). Under the onslaught of the Romans, who pacified Galilee and began to exterminate Christians in Jerusalem, fleeing persecution, people under the leadership of Bishop Simon gathered in the Syrian desert.

The prototype of the veche, the Zemsky Sobor and the communes was the Apostolic Cathedral under the direction of Paul and Barrabas. It was the joint fraternal residence in communes, where people voluntarily, to the best of their ability, brought their property for the benefit of the entire Christian community - that became the symbol of all subsequent councils. The communitarian consciousness is the conciliarity of the Christian brotherhood. In our opinion, conciliarism is of a church nature, and communitarianism is complemented by economic and socio-political attitudes.

In New Testament communes, “the believers were together and had everything in common. They sold estates, and every property, and shared it with everyone, according to everyone's need ”(Acts 2: 44-45). These Christian communities can be considered role models. “Faith, if it has no works, is dead in itself” (James 2:17). “A good tree cannot bear bad fruit, nor can a bad tree bear good fruit. Every tree that does not bear good fruit is cut down and thrown into the fire ”(Matt. 7: 18-19). All community rela-

tionships are built in joy and “simplicity of heart” (Wisdom of Solomon 1:1).

The Metropolitan is in solidarity with the well-known opponent of democracy K.P. Pobedonostsev, but this should be discussed with the bishop. Democracy itself (the rule of the people) was carried out at the veche and existed in the “country of the Gardariks” in pre-Christian Russia. Another thing is that conspiracy theorists used their good name and betrayed democracy from the predatory usurious minority. The organization and management of the state is the rule of a great family - “the only model that people had in mind when they entered a new great society” [36]. But if this “great” beginning has become a monstrous “Leviathan”, then it is necessary to return to the starting point of tribal relations or find mechanisms for restoring the stratification system, where the most worthy sages, cultural-historical people, and noble men belong to the first stratum.

Liberalism is interpreted by the metropolitan as the hardest times of turmoil and anarchy, where sacred things are trampled and spat upon, the state is betrayed and thrown to plunder by unscrupulous and greedy money-grubbing priests, the priests of the new official religion - the cult of spiritual and physical debauchery, the cult of unrestrained profit - at any cost [13, p. 14].

G. Uspensky in his analysis of capitalism through observation made an interesting conclusion: how good, hardworking and economic peasants, in the course of liberation from the community, under the new conditions of capitalist relations completely incomprehensible to them, turned into drunkards, swindlers, exploiters and even murderers. As soon as they were atomized in the market system, they easily became criminals [25, p.215]. It turns out that the degree of capitalization and globalization is directly proportional to the formation of atheistic consciousness. V.Yu. Katasonov in the book “Spiritual and moral foundations of capitalism” proves the incompatibility of Orthodoxy and capitalism in terms of goals and dogmas. The technology of mankurtization of consciousness, especially of young people, implants a race for fashion brands, as well as a senseless waste of time in social networks, which entails a “degradation of society” [15].

The monarchist, according to his convictions, metropolitan criticizes the Emperor Peter I for the “cut through the window to Europe”, which broke the protective mechanisms of Orthodox Russia. On the contrary, words of gratitude restore the name of the outstanding Russian tsar Ivan the Terrible, stained by the geopolitics of the conscientious war, who multiplied Russia in numbers, territories and glory. The heroic oprichnina service became a form of church obedience and the struggle for the churching of all Russian life, without a trace, to the end. The decree on the oprichnina as

a state community did not appear suddenly, but became a natural completion of the long process of Ivan the Terrible's search for the best, most Christian way of solving the tasks that stood before him as the anointed of God [14, p.151].

In the empire Snychev saw the preservation of the true faith and the unification of the cultures of different peoples and tribes, welded into a single social organism around a certain sovereign core [14, p.418].

Ioann Snychev stands for "the rehabilitation of the spiritual meaning of Russian life" through the restoration of the ideals of the image of Russia in past centuries. It is the memory of Holy Russia that still continues to resist the worldwide apostasy [2]. Our research with the help of a historical retrospective is faced with the task of returning to the tribal communities that preserve the purity and chastity of the Russian people, where the "pacifying and harmonizing function of love" is "the best" extinguisher "of interhuman aggression, enmity and struggle" [22, p.131] ... Plato and Aristotle were also convinced in their assertion that true friendship or love is a vital material in all genuine social relations [19, p.104].

**Conclusion.** The theoretical and practical significance of the obtained results of the study of communitarianism in the social activities of Ioann Snychev shows the need to search for an alternative socio-political arrangement of society. From our point of view, in order to search for a new scientific work in comprehending the "Russian scenario" of futurological forecast, in addition to communitarianism (NA Berdyaev), there can be a study of "noospherism" by V.I. Vernadsky and "Christian socialism" S.N. Bulgakov.

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## ABOUT THE PROBLEM OF SOCIAL REHABILITATION OF WOMEN WHO HAVE BEEN RELEASED FROM PRISON

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**Abstract.** Resocialization of convicted women may be successful in case of using different forms and possibilities of educational work with them, technologies and methods of social rehabilitation; special attention is paid to the system of post-penitentiary social support aimed at social and labor adaptation of women released from prison.

**Keywords:** correctional institution, women, social, re-socialization, rehabilitation measures, professional reorientation, psycho-correction work, readaptation .

*Give a person a goal worth living for, and they can survive in any situation.*

Johann Goethe

One of the dominant trends in the modern policy of the penal system is the resocialization of convicts. Penal code states that "punishment is to restore social justice and to correct the convict and prevention of new crimes" [10]. The ultimate goal of the penal correction system, despite the presence of a repressive component in the deprivation of liberty, is to resocialize the individual, to return him to a full, normal life. Therefore, both the conditions of detention of prisoners and the educational work carried out with them should be determined by this goal.

Unfortunately, a large number of citizens who have been released from prison are still unable to adapt to society again. This is because many of the citizens who have served the sentence set by the court, face a number of problems, the most significant of which are: lack of residence and

employment opportunities, alcohol or drug addiction, lack (or significant distortion) of domestic and social behaviour skills, violations in the value-motivational sphere of behavior, low self-esteem,

Indeed, during the execution of the penalty of deprivation of liberty remains a difficult question of optimization of the interconnecting relationship of the punitive and correctional components, which requires further improvement of the mechanism of correctional influence, motivate law-abiding behaviour of convicted persons and their personal interest in the outcome of re-socialization [6].

Many problems arise directly as a result of incarceration. Often, convicts who have served their sentence are not able to make the right decisions independently and navigate the conditions of modern society when they are released. Often, these people have lost their social connection and contacts with their loved ones and those who could provide them with the necessary support.

Women are a category of convicts in places of deprivation of liberty that requires special attention, professional competence and tolerance, because many of them end up in a correctional institution with a number of unresolved problems of various types: from the lack of basic documents to the domestic instability of minor children who were left without maternal care and participation [1]. It is for this reason that educators, teachers, and psychologists need to provide assistance in finding solutions to the primary problems of convicts, and only then pay attention directly to the process of personal correction.

First of all, the resocialization of the personality of a convicted woman is the restoration (or formation) of socially useful properties and habits. The process of re-socialization is long and consists of several stages. It usually consists of:

\* restoring lost or interrupted social ties of the convicted person with relatives, relatives and labor collectives;

- psycho correction work under the guidance of a psychologist;
- solving subsequent domestic issues (determining and choosing a place of residence after release from a correctional institution, determining employment opportunities based on education, specialty, qualifications, work experience, professional skills);

- acquiring the knowledge, skills and abilities of the human community, instilling in convicts the awareness of the need to comply with the requirements of the law and the formation of behaviour approved and supported by civil society [11].

In the special literature, there is an opinion that the presence of a fam-

ily in a convicted person acts as a deterrent. Observations made by the author of the article in the course of professional activity, as well as the study of prisoners' documents, showed that the majority (64.2%) of female convicts who committed crimes while serving their sentence did not have a family at that time. Only 12.8% were officially married.

The loss of a family also has a negative impact on convicts, often affecting primarily a decrease in self-esteem [7]. In the literature concerning this problem, it is noted that women's family breakdown after conviction is observed twice as often as among convicted men [5]. Most of the convicted women try to maintain family ties. First of all, this desire is connected with the opportunity to have financial support, long meetings, receive parcels and transfers. The absence or loss of family ties negatively affects the behaviour of a convicted woman while serving her sentence. The presence of children of prisoners are one of the limiting factors in the Commission of repeated crimes.

In order to the resocialization of this category of convicts to be successful and effective, it is necessary to take into account the peculiarities of social and educational impact on women who have minor children [2].

At present, the number of people who have lost socially useful connections, have a low level of education and lack of professional training is growing. The common difference between women criminals and men is also a high emotional instability, dependence on the current life situation, concentration on their inner world and high anxiety due to the understanding of guilt. That is why effective work aimed at re-socializing convicts while serving their sentence in a correctional facility not only contributes to the development of moral strength in women to pass this difficult stage in their lives, but also lays the foundation for post-penitentiary adaptation in the modern world after release.

One of the vital and motivating factors that will contribute to the prevention of recidivism among women released from prison is social and labor adaptation [3]. It determines the vector of further understanding of women, how likely and possible it is to live independently in modern society after serving a sentence. A woman's awareness that she can provide the necessary comfort for the rest of her life is a very powerful motivating resource for positive readaptation.

Social and labor adaptation is formed on the basis of medical, social and psychological rehabilitation, while implementing the following tasks-functions:

- compensatory: the formation of a desire to compensate for a social disadvantage by strengthening activities in the area where there are pros-

pects for self-realization;

- stimulating: the emphasis is placed on the activation of pro-social activities;

- corrective: involves changes in the personality of the rehabilitated person;

- regulatory: coordinates the index of participation of rehabilitees in general group activities and within different groups [9].

In addition, one of the significant aspects of social and labour adaptation of women released from prison is the possibility of professional re-orientation and retraining. It should be emphasized that this aspect does not focus only on employment, it assumes a broader field for correction: establishing social ties and restoring/acquiring social contacts, finding a vector of additional self-realization in the leisure environment, resolving socio-legal problems and the possibility of finding ways to answer questions of a social, legal, personal and spiritual nature [8].

An important condition for successful social and labour adaptation of women after the end of the sentence is assistance in the development and maintenance of an adequate level of self-esteem, which is facilitated by psycho correction work that helps to acquire and establish social and psychological relationships in micro - and macro-groups [4]. This work is certainly very significant, because it lays the psychological foundation for the successful resocialization of women, contributing to the formation of a stable motivation to achieve success, while at the same time eliminating the motivation of fear of failure.

Thus, a woman undergoing social and labour adaptation during re-socialization in the post-adolescent space has more practical opportunities to restore and change her previously disturbed life.

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## FORTUNE TELLING BEFORE PICKING BERRIES AND MUSHROOMS IN POSHEKHONYE. "TIMKA-TIMOSHKA"

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**Abstract.** The materials of field research carried out by the author in 2000 - 2001 in the Yaroslavl region (Poshekhonye and environs) are presented for publication. The local folklore tradition has well preserved various small genres of children's folklore. In this report, we will consider fortune telling on the occasion of picking berries and mushrooms.

**Keywords.** Children's folklore, fortune-telling, Spirit of the forest.

In 2000, we together with the folklorist Yu. I. Smirnov, who was then working at the Institute of World Literature. A.M. Gorky (RAS), went to the conference in Poshekhonye. In our free time, we decided to collect folklore from the local residents of the city and surrounding villages. In 2001 I undertook a second trip to continue recording ethnographic material. Among the various genres collected, I would like to note the well-preserved children's folklore. Fortune-telling on the occasion of picking berries and mushrooms took a special place in it.

1. When you go into the forest with a small basket, throw the basket, shout:

Timoshka - Timoshka!

Fill-up my basket!

And they looked - how it would land: if it stands on the bottom, like this [shows with her palms – ed.], then you will dial it full, and if on the side or down [that is, upside down - ed.] - means nothing will happen. This is when they went to the forest for berries. They threw it on the road, while you walk into the forest (so that it is not dirty, somewhere in the grass). They threw and talked. If the basket lands like this, then you will gather, but if not ...

"But with you - no, you will not gather! I will gather!" Yes, it came to a fight [FNF].

2. When they went to the forest, they said:

Timka - Timoshka!

Fill-up my basket!

And toss the basket. So, I don't know why, they were small. [And who is "Timoshka"? - ed.] Timoshka? How do I know. For the red word, for the neatness.

But if the basket falls and turns upside down, it means that you won't pick up anything, but if it becomes like this [shows - stands to the bottom - ed.] - it means you'll fill it full [DMI].

3. Get together and run into the forest for mushrooms, and we run, we throw, and we shout:

Timka - Timoshka!

Fill-up my basket!

[Who is "Timoshka"? - ed.] Who knows! [AMV].

4. Until the age of twelve, lived in the Telepino village. [Lenin village council - ed.], Poshekhonye county.

Go picking mushrooms, someone in the front throws a basket:

Timka - Timoshka!

Fill-up my basket!

Upside down!

With a rollover!

[And what did it mean, the way it landed? - et.] Well, now no one really can remember - how it falls, whether it will be filled or not. We were wondering what we would or would not get [AMV].

5. We threw the baskets. So we go into the forest, which means we went into the forest, our baskets are not so big, we throw them, like this - we'll throw them up: who has - what? Then say: "Lord have mercy! Get us whole baskets!" Then throw. We throw it three times. Well, they recruited. We recruited. "Help, Lord, we collect baskets of mushrooms!" Threw them up. They fell with us. Then throw it, they will fall on the handle. If it gets up, you won't pick up anything, it will stand on the bottom. It will stand on the bottom, like this, like a cup - it means you get nothing, you will come back with an empty one. And if she rolls on her side, then you will fill it whole.

And the berries too. And for mushrooms too. Everything was like that with us [TGA].

6. [Have you ever done fortune telling when you went into the forest to pick mushrooms and berries? Shouted something? - ed.]

Timka - Timoshka!  
Fill-up my basket!  
Upside down!  
With a rollover!

Yes. Threw it, because the baskets are all broken! And if the basket is on its side - then half, and if it stands like this [shows - "like a cup" - ed], you throw it - this is how it stands up: "Oh! Wait, I'll get the full basket! " And upside down - you won't get anything. [And who is this - "Timoshka", whose name was? – ed.] Timoshka? Who knows. This is probably a saying that someone has? [And why "upside down"? - ed.] Don't know [GEI].

Timoshka - Timoshka!  
Fill-up my basket!  
Upside down!  
With a rollover!  
So you throw the basket, and break all of the baskets!

From the above examples, it can be seen that the tradition of fortune telling on the occasion of picking berries and mushrooms in the forest has come down to our days in a destroyed form. This is evidenced by the following facts.

Firstly: there is a discrepancy in the explanations – what does an rolled upside down basket means in fortune-telling:

- a) rich harvest;
- b) complete absence of it.
- c) Also, along with the two above-mentioned, fortune-telling options, which are interpreted in different ways, there is another one, when the "basket falls on its side". This means that the child will collect half of the basket or not at all.

Secondly: the performers indicate different options for fortune-telling:

- a) collective - ("we did fortune-telling "), when all the children going to the forest are doing this. The group performed fortune-telling, but each determined his own luck;
- b) and vice versa - individual fortune-telling, of one, singled out, non-random person, but determining the success of all. Fortune-telling of one person is an older version, usually it was the child who was enclosing or walking in front. In this case, the one in front was guessing ("who is throwing a basket forward"), who determined the "fate" of the entire group (whether or not the forest harvest would be collected).

Thirdly: who is "Timka - Timoshka", to whom they turn for help, no one knows.

Fourthly: there is a formation of a later tradition bearing a Christian imprint:

a) the appeal of the believing population to God: "Lord have mercy! Get us whole baskets";

b) tossing baskets with a sentence is carried out three times. This fact no longer points to fortune-telling whether or not I will get the forest harvest (although this moment is also present), but to a request to higher powers not to leave a person without food: berries or mushrooms.

Fifth: the time of fortune telling itself and its place are different:

a) on the way to the forest;

b) when they enter the forest.

Sixth: why they say "Upside down! / With a rollover! ", If an inverted basket indicates a lack of harvest, there is no explanation either.

Having examined the recorded tradition, we see how fortune-telling and at the same time a magical spell for good luck on the occasion of harvesting the forest harvest passed into a playful, entertaining form of existence for children, without losing, however, its sacred essence and relevance as a magic ritual. Moreover, the magical aspect of witchcraft (the order: "Pick up a full basket!") Dominates over fortune-telling, as an older ritual bearing a glimpse of fatality, as manifested by the exclamations of children: "But you don't, you won't get any! I am gathering!" Yes, it came to a fight. "Also, the words that no one can explain "With a rollover!" - carry in themselves the same magic load that any somersault, recorded in different folklore genres, contains.

a) "... And the little goat, for joy, rolled over and became a boy Ivanushka again ..." - the tale "Sister Alyonushka and brother Ivanushka";

b) "When we first saw flying cranes in the spring, we were children tumbling! Sometimes the grandmother would say: "Roll over!" And we, children, are happy! Somersaults! This is not to get sick ... " [SGP].

c) "At the first thunder, they sometimes tumbled. This is all kid stuff ... " [PEG] \*1).

And, if the time of fortune-telling and the fortune-telling options themselves do not play a significant role in custom, then - who is "Timka-Timoshka", to whom the children turned, going into the forest, asking for help to collect the forest harvest - we will try to figure it out. Everyone knows various appeals to Spirit of the forest, with presenting him with small gifts, at the entrance to the forest or at the gate with special sentences, in order to obtain the desired result \*2), 3). In the stories presented, there is an echo of just such a ritual. But why is it Timka-Timoshka that they turn for help? Who is that? Let's compare the following facts:

1. Timothy-spring, the day of St. Timothy, is celebrated on March 6, when "the warmth is at the gate." On April 6th, according to legends, Spirit of the forest wakes up. But at this time there are still no berries and mushrooms in the forest. It's too early to go to the forest for a quiet hunt.

2. But June 23 is already quite warm and this is also the day of Timothy, but Timothy the martyr. Timofey – the mousesqueak, it is considered a hard day when something can be imagined, seen. If on that day none of the men in the village dreamed of anything, then it is considered a great happiness. Also June 21st is the day of the great martyr Theodore Stratilates - Spirit of the forest-well. "Theodore Stratilat - rich in threats." At this time, thunderstorms begin, and when there are heavy warm rains, then mushrooms grow and berries ripen. In addition, on the night of Ivan Kupala from 6th to 7th July (24th June - old style), all sorts of forest creatures, including Spirit of the forest, are active. At this time, the harvesting of medicinal herbs, wild berries and mushrooms is also in progress.

Probably, in the minds of people there was a confusion of two images: St. Timothy and the owner of the forest - "the grandfather of the forest." (Maybe once the patronal feast of St. Timothy was in one of the villages of Poshekhonye - the question remains open), but the parallels drawn clearly indicate the transfer of the appeal to Spirit of the forest, with a request to collect more berries and mushrooms, to St. Timothy, who was honored in time close to waking up and activity of Spirit of the forest.

(Moreover, the day of St. Timothy was considered difficult, when any "hassle" was natural). And since children tend to translate everything into a play form, they began to address him in a somewhat free form: "Timka - Timoshka." The fact of the continuation of the transformation of the protector image, as we can see, continued further, when children from believing families began to turn to God directly for help. Such a development of the worldview of the people is taking place constantly, and was the seventh and strongest point in our study, indicating the inevitable changes both in the traditional local culture and everywhere.

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Note № 1. The symbolism of somersault, as a magical act, also includes:

a) rolling on the ground, after the end of field work, with the sentence: "Zhnivka, Zhnivka,

Give the force for the yarovinka! " [VVI];

b) rolling (in the fairy tale "Cornflower") of Baba Yaga on the ground strewn with bones of the eaten victim, with the proverb: "I roll and roll on

Vasilka's bones" - in order to absorb the life force of this victim.

c) hit "on the ground" in the magical tales of the protagonist, followed by his transformation from an animal (or bird) into a man: "Hit the ground and became a good lad!"

Note № 2. "Prohibitions and injunctions in Poshekhonye". P. 270. Report at the conference "Prohibitions and prescriptions in the Slavic and Jewish cultural tradition." Institute of Slavic Studies of the Russian Academy of Sciences. Center for Scientists and Teachers of Jewish Studies in Universities "Sefer". Academic series "Culture of the Slavs and the culture of Jews: dialogue, similarities, differences." Moscow, 2018, P. 266 - 273.

Note № 3. So I go to the forest - that is bread, so I take a piece of bread and put it at least on the tree, then on the stump: "Here, forest grandfather, here's bread for you, here's salt for you. Eat." [And salt? - ed] Yes. Here I'm the ambassador, not that I'm salt, but I'll add the bread, I say: "Grandfather of the forest, this is for you, eat." Does he eat, does he not eat – I do not know! And this, too, my mother told me: "You will, Katyunka, go to the forest, take bread with you and on a stump or there, put it on a fir-tree and let the forest one eat." [And the fir-tree - on the lower branches? - ed.] Well, yes, any place. And that's all. Well, I say: "No matter if he eats it or not, I leave it there anyway." I do this all the time, and I never go without mushrooms, without berries - I go home with something. Put the bread on a stump: "Grandfather of the forest, I'll feed you." When I go into the forest, I take about two pieces of bread with me, and I put them on a stump and say: "Grandfather of the forest, here you are singing, I will feed you." And that's all. And I come back all the time with mushrooms. I've salted four buckets today... [GEI].

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3. GEI – Gavrilova Ekaterina Ivanovna, b. 1932 Local. Peasant. Recorded in 2001 in Poshekhonye, Yaroslavl Oblast. Zaporozhets V. V.

4. DMI – Doshlygina Maria Ivanovna, b. 1931 Originally from the village of Bychikha, Dmitrovsky district. Teacher. Recorded in 2000 in Poshekhonye Yaroslavl Oblast. Zaporozhets V. V.

5. PEG – Padkina Efimia Grigorievna, b. 1909 Local. Peasant. Recorded in 1996 in the village Gonobilovo, Vladimir Oblast. Zaporozhets V. V.

6. TGA – Taranets Galina Alekseevna, born in 1930 Originally from the village of Glushkovo. Peasant. Recorded in 2000 in Poshekhonye Yaroslavl Oblast. Zaporozhets V. V.

7. FNF – Fomina Natalya Fedorovna, b. 1920 Originally from the village of Shishilovo. Peasant. Recorded in 2000 in Poshekhonye Yaroslavl Oblast. Zaporozhets V. V.

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## FEATURES OF THE EMOTIONAL-VOLITIONAL SPHERE OF YOUNG WOMEN SUFFERING FROM EATING DISORDER

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### **Introduction**

Currently, the scientific community is faced with the problem of early detection of eating disorders, which also concerns practicing psychologists, psychotherapists and psychiatrists, and at the same time the problem of motivating women suffering from this disorder themselves.

The emotional and volitional sphere of young women with an eating disorder is practically not studied at the moment. Accordingly, the study of the features of this area becomes an urgent request, due to the fact that it is the regulation of the emotional-volitional sphere that contributes to the achievement of remission. [2].

Knowledge of the emotional-volitional sphere of young women with an eating disorder can contribute to the early detection of disease syndromes.

It is necessary to be attentive to the state of health, the earlier the disease is diagnosed, the higher the chances of recovery and return to a full life.

Often women suffering from this disease do not admit their illness, the patients have no criticism of their condition. Conscious women can hide the symptoms of eating disorders, do not tell anyone about their emotional problems, physiological disorders, avoiding joint meals, referring to what they ate elsewhere, hiding moments of cleansing, endless weighing and measuring their own body, dressing in a shapeless clothes, in other words, women dissimulate their condition. In most cases, a person with an eating disorder tends to do their best to hide the problem, thereby delaying treatment. And the disease only gets worse and progresses, the person's

condition worsens. Unfortunately, quite often, the forecast can become fatal. [4].

There are still misconceptions about the term eating disorder. People with complaints about the digestive system (K00-K93, in the international classification of diseases ICD-10) come to the center for therapy of eating disorders, clinics for eating disorders.

An eating disorder or compulsive eating is a psychogenic behavioral syndrome associated with nutritional disorders. [3].

An eating disorder is a mental illness that belongs to class V, ICD-10 "mental and behavioral disorders" F00-F99, block "behavioral syndromes associated with physiological disorders and physical factors" F50-F59, heading "eating disorders" ... Eating disorders are classified into anorexia nervosa F50.0, atypical anorexia nervosa F50.1, bulimia nervosa F50.2, atypical bulimia nervosa F50.3, overeating associated with other psychological disorders F50.4 - psychogenic or compulsive overeating, vomiting associated with other psychological disorders F50.5, other eating disorders F50.8 and unspecified eating disorders. Anorexia nervosa with bulimic disorders is also distinguished.

Eating Disorders (ED) - are mental disorders characterized by nutritional disorder, extreme dietary control, or uncontrolled overeating. The most common and dangerous of these, both for mental and psychological well-being and physical health, are anorexia nervosa and bulimia nervosa. Achieving the results of increasing self-esteem by controlling your own weight, measuring your body itself, can cause people to have an unhealthy attitude towards food intake. Quick results bring more satisfaction, improve self-esteem significantly faster, but end up causing more problems than solutions. Lack of nutrients, significant weight loss at the same time, a feeling of success, starvation, exhaustion, distorted perception of the body image, severe or critical body weight deficit, leads to anorexia nervosa and certain consequences. And bulimia nervosa, in turn, develops along the path of excessive preoccupation with food, endless violation of dietary rules and subsequent overeating, increased self-criticism, "all or nothing" thoughts, when you stumbled and ate something that you shouldn't have and can't stop or is present the thought "I'm going to induce vomiting anyway," thus leads us to compensatory behavior. Compensatory behavior - behavior aimed at compensating for the amount eaten. Women after "breakdowns" begin to constantly resort to cleansing behavior, excessive physical exertion, and physical activity can manifest itself in prolonged walking, perhaps even in a confined space, room, exhausting repetition of abdominal exercises. Women may take more laxatives and / or diuretics than the norm.

[7].

Often, anorexia can also lead to breakdowns and turn into bulimia, or the so-called, mentioned above, anorexia nervosa with bulimic disorders.

Factors affecting eating behavior

The conditionality of the presence of eating disorders is determined by the interaction of biological, sociocultural and psychological factors. There is a tendency to understand the reasons of the occurrence of eating disorders, as being on the border of mental and somatic and creating a unified biopsychosocial model [12]. The manifestation of the genetic factor of heritability of the type of the nervous system characterizes the biological factor in the development of the disease. The weak nervous system inherent in people suffering from an eating disorder is expressed in increased emotional sensitivity, irritability.

Aware of the peculiarities of their nervous system, young women call themselves "fragile flowers."

The influence of the social environment on the worldview, attitude and feeling of the "I" itself forms in women a kind of standard of beauty and success.

Intra-family and extra-family psychological problems also provoke the development of the disease.

Excessive physical exertion is one of the significant risk factors for the onset of the disease; more than 60% of people with anorexia before the disease were intensively involved in various sports [12].

Women after a short period of euphoria, increased mood caused by overeating and subsequent cleansing, may experience anxiety, irritation, and irrational fear. Subsequently, an anxious-depressive state is formed, with manifestations of aggression towards loved ones, suicidal intentions, obsessions, as well as senesthypocondriasis syndrome and emotional disorders [2]. Eating disorders are accompanied by endless obsessive thoughts about food. Women spend most of their lives thinking about food, eating, compensatory strategies, anxiety over the amount eaten, weight, body image, guilt and shame. Often, women do not have enough energy and time for other spheres of life. And sometimes women are adept at weaving eating disorders into their regular schedules, completely immersed in their work, thereby avoiding any meals. [10].

The premorbid characteristic of the patient's personality traits also corresponds to the nosological systematics: insecure, anxious, dependent personality traits of the neurotic level, a high level of claims with an overestimation of their own abilities to achieve it, rigidity, a minimal set of response strategies at the emotional, cognitive and behavioral levels,

characterize patients who are able to form overvalued or crazy ideas [1].

The behavior of people with eating disorders is characterized by such conditions as abulia, lack of willpower, apathy, lack of emotional response to what is happening, indifference, isolation. Such people have no desire to do anything, the circle of interests is reduced to eating behavior.

An eating disorder is associated with a person's emotional state. People with this disorder often experience intense emotional distress. Sudden mood swings, a tendency to depressive states lead to the formation of various disorders, including disorders associated with eating behavior.

The lack of the ability to recognize one's emotional states also leads to a number of problems. When a person does not understand what he is feeling, does not know how to describe such a state, he can be distressed, possibly depressive symptoms with suicidal intentions [10]. The main problem in patients with eating disorders is precisely the difficulty in differentiating and describing emotional states. One of the important factors in eating disorders is alexithymia, a psychological problem characterized by difficulties in understanding one's own emotions and feelings, in expressing emotions using facial expressions and pantomime, and in the verbal description of emotional states [8]. People focus on perceiving negative characteristics of the body, those parts of the body that they do not like, in order to avoid emotional experience. Thus, the presence of alexithymia can lead to an increase in the level of dissatisfaction with one's own body, which in the future can develop into a violation of eating behavior [5]. Dissatisfaction with one's own body is one of the most important factors leading to the onset and development of eating disorders [4].

There are four main characteristics of alexithymia.

1. difficulty in recognizing and describing emotions;
2. difficulty in differentiating emotions from bodily sensations;
3. scarcity of fantasy;
4. low level of self-awareness.

An eating disorder is a serious, life-threatening mental illness. There are currently seven subtypes of eating disorders, the most common of which are anorexia nervosa, bulimia nervosa, and atypical forms. In addition to mental disorders, the patient's body suffers greatly. The consequences of the disease are dire.

This disease requires a lot of effort and time of the patient herself and her family, relatives, to achieve remission. During the period of hospitalization, young women may understand the fact that they need to be treated, but the realization, like the feeling of satiety, comes a little later. The formation of the disease itself occurs due to the biopsychosocial model.

Women with eating disorders are more emotionally sensitive. It can be disastrous for a person, a young woman with an eating disorder, to take for granted by a non-eating disorder person.

“The emotional-volitional sphere is a person's properties that characterize the content, quality and dynamics of her emotions and feelings, including the ways of their regulation. Component of emotional stability. The degree of volitional possession by a person of her emotions”[7].

Emotional and volitional manifestations are mental functions of activity regulation.

Emotions and feelings form certain behavioral reactions, by controlling the emotional sphere, a person is able to regulate her behavior [11].

Will acts as the driving force of human life. Lack of will, abulia or weakness, hypobulia give rise to the loss of the meaning of life. Energy, initiative, decisiveness and perseverance, as manifestations of volitional qualities of a person, are important characteristics of a person's life and activity.

Often, women do not have criticism of their state, in a constant state of suppressing their own emotions through food or, on the contrary, its almost complete absence, they no longer manage to recognize their emotional manifestations, the decision-making process, volitional regulation becomes difficult. Complete denial of one's illness can lead to death, in the absence of attention from relatives and friends, or in a situation of untimely referral to specialists. In anorexia nervosa, the highest mortality rate is observed among all patients with mental disorders, and suicide is the second most common cause of death after somatic complications. Mortality in anorexia nervosa increases with the duration of follow-up observations and reaches 40% with a duration of observation of more than 10 years [9].

Since it is the suppression of emotions that occurs, in other words, the relief of problems, the pain does not disappear, but slowly kills a person from the inside, lowering her level of vital activity, worsening her health, mood.

Food is becoming the main value in life. Food becomes the meaning of life.

The difference between emotions and feelings lies in the duration of the reaction processes. Emotions are quick changes, feelings are slow, long-lasting. Even slower changes are manifested in the mood, you can also talk about the state of a person, then about the characterological characteristics of a particular personality.

### Conclusion

Girls with ED may often experience negative feelings, such as guilt and shame in favorable conditions, due to increased emotional sensitivity when

they feel they do not deserve these favorable conditions, and may subsequently feel angry with themselves for experiencing negative feelings in favorable conditions.

Anxiety is an emotional manifestation of a person associated with a basic need for security, manifested in a state of excitement, characterized by a certain threat in adverse conditions, and an undefined threat in favorable conditions. Anxiety is a sthenic emotion that prompts action. May be accompanied by excessive anxiety, fussiness, restlessness, heart palpitations, headache. Anxiety as an important signal of distress can occur in the initial period of any mental illness. Anxiety is one of the main manifestations of the disease in obsessive-compulsive disorder and psychasthenia. A strong feeling of anxiety that occurs in favorable conditions is one of the early symptoms of the onset of acute delusional psychosis. At present, the so-called panic attacks are also distinguished as an independent disorder, which are manifested by sudden severe attacks of anxiety, which often give rise to certain psychotraumatic situations. ED is a current problem that requires special attention in the scientific community.

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## FEATURES OF ANXIETY DISORDERS IN PROFESSIONAL WORK

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### **Introduction**

One of the most pressing problems of psychology, affecting the quality of life and professional efficiency of a person, is the problem of anxiety in professional activity. Anxiety, being a fairly common phenomenon in the framework of human life, takes an important place among the negative experiences of a person. The growth of dynamics and activity in the professional and social environment leads to additional negative experiences. These experiences are directly related to the desire to meet the increasing level of social and labor market demands.

The individual desire to ensure his professional competitive superiority and the growth of professional responsibility towards the person in the workplace, in most cases, increases the level of anxiety and leads to the occurrence of chronic anxiety and depressive disorders. Of course, the state of anxiety negatively affects the productivity of activities, efficiency and the effectiveness of professional and social communications. This deviation contributes to the development of somatic diseases. Timely provision of professional psychotherapeutic assistance can reduce the risk of onset and prevent the consequences of anxiety disorders and their negative manifestations.

From a professional point of view, one should distinguish between the types of anxiety. In some cases, we talk about anxiety as a characteristic property of a person, in other cases we distinguish it as a state.

The concept of "anxiety" was introduced into psychology by S. Freud (1925), who distinguished fear itself, specific fear and indefinite, unaccountable fear - anxiety, which is deep, irrational, internal [1]. Anxiety, from

the point of view of Freud, is a function of the "Ego" and warns the "Ego" of an impending danger, threat, helping the individual to react in such situations (situations of danger, threat) in a safe, adaptive way [2].

Anxiety is viewed in psychology as an unfavorable emotional state or internal condition, which is characterized by subjective feelings of tension, anxiety, and gloomy forebodings. According to Spielberger Ch.D., it is a generalized, diffuse or pointless fear, the source of which may remain unconscious [3].

The state of anxiety has been widely considered in the works of foreign psychologists: A. Adler, A. Beck, R. Freeman, R. Leahy, Ch.D. Spielberger, O. Rank, Z. Freud and others, and domestic authors: V.M. Astapov, L.V. Borozdin, B.S. Bratus, N. D. Levitov, V.N. Myasishchev, T.A. Nemchin, A.M. Prikhozhan, K.R. Sidorov, etc.

The authors who worked on the problem of anxiety sought to define and describe the state of anxiety, as well as to identify the causes of its occurrence. Among the many causes of anxiety states, both physiological and social causes can be distinguished.

According to the results of the survey "Anxiety Disorders in Russia" conducted by the Russian Society of Psychiatrists in 2017, 59.4% of patients complain of anxiety and / or anxious experiences, 45.7% have a detailed anxiety syndrome (chronic anxiety combined with its vegetative manifestations and avoidance behavior), including in combination with other clinically significant psychopathological symptoms, and 20.2% - isolated anxiety syndrome (ie, anxiety syndrome that is not part of other psychopathological syndromes) [4].

Manifestations of anxiety disorders reduce the natural resistance to disease, reduce the efficiency and quality of life of employees. In this regard, the need to conduct a study of the effectiveness of the use of cognitive-behavioral therapy in clinical practice for anxiety disorders in professional work is highly relevant. This will increase the effectiveness of the therapeutic effect on patients and increase the level of their emotional and professional stability in the face of growing stressful environmental factors.

The problem of anxiety is a fairly long-standing subject of research by many specialists. The appropriate level of anxiety determines the ability to cope with many difficulties and the ability of a person on the way to realizing his social and professional potential.

Experimental study of the influence of anxiety on the effectiveness of human activity gives fairly unambiguous results. The typical situation of the level of anxiety can contribute to successful activity in relatively simple situations for a person, and interferes in difficult [5].

If you look at the manifestations of anxiety objectively, then it is possible to derive certain benefits from it that can draw attention to danger and possible difficulties. This reaction can be a signal for mobilizing forces in order to achieve positive results in their activities and increase the level of natural adaptability. Low or absent levels of anxiety can interfere with normal productive activities.

Low anxiety can be responsible for poor performance. It all depends, obviously, on the type of activity that a person is engaged in. For example, according to N.E. Vysotskaya (1979), a low, according to teachers, the level of such professionally important qualities as hard work, emotional expressiveness, artistry, was observed among students of the choreographic school, who had not only a high, but also a low degree of anxiety (moreover, there were more persons from the middle than from the high). At the same time, a high level of these qualities was observed in students with high and medium degrees of anxiety, but not with low [6].

But, nevertheless, an excessively high level of anxiety can lead to maladjustment and disorganization of behavior with negative consequences for professional activity.

As R. Cattell and I. Schreyer have shown, a high level of anxiety reduces the success of professional activity. Increased personal anxiety, according to Yu.A. Tsagarelli (1979), negatively affects the success of musicians' concert performance. Sports psychologists (V.M. Milenin, 1970) have established that athletes, who are characterized by a high degree of anxiety, usually perform poorly in important competitions. Since anxiety and fear are closely related, in a number of sports (diving, parachuting), people with high personal anxiety practically do not practice, and this applies not only to high-class athletes, but also to beginners. In addition, according to N.P. Fetiskin (1981), such people are less resistant to monotonous work than people with low anxiety [6].

In turn, it should be noted that high anxiety is more common in people with a mild (liberal) style of activity than in hard ones (N.A. Bukseev - 1987), and people with high personal anxiety have lower self-esteem and an authoritarian style of main activity (studies of teachers were conducted), avoid social contacts [6].

It should be noted that the desire to reduce or maintain at an acceptable level anxiety in the performance of their professional duties and thereby reduce the level of professional risks of making mistakes is a fairly popular request from both working professionals and their employers.

The psychological literature is replete with various definitions of anxiety. Nevertheless, many authors agree that the concept of anxiety should be

differentiated and considered as a situational manifestation and as an integral part of a person's character, indicating some personal characteristics of a person.

According to A. M. Prikhozhan, anxiety is an experience of emotional discomfort associated with the expectation of trouble, with a presentiment of impending danger. Distinguish between anxiety as an emotional state and as a stable property, personality trait or temperament [7].

Based on the definition of S. S. Stepanov, anxiety is an experience of emotional distress associated with a premonition of danger or failure [8].

Anxiety is a constantly or situationally manifested property of a person to come into a state of heightened anxiety, to experience fear and anxiety in specific social situations - this is how R.S. Nemov defines anxiety [9].

Anxiety according to B.G. Meshcheryakov - is an individual psychological feature, which is expressed in a person's tendency to frequent strong feelings of anxiety, as well as in a low threshold for its occurrence [10].

I.V. Vachkov defines anxiety as follows - a psychological feature, a stable property of a person, a trait characteristic of him [11].

Based on the above definitions, we can conclude that the term "anxiety" reflects a certain state of a person with expressed anxiety, negative emotions, fears and experiences.

The history of research into the nature of the manifestation of anxiety states has accumulated significant baggage that determines the classification and types of anxiety. Many authors, conducting research, have structured the criteria of influence and the specifics of the occurrence of anxiety states from different angles, taking into account the individual specifics and certain aspects of their research.

Depending on where the threat to the "Ego" comes from, Freud's psychoanalytic theory identifies three types of anxiety:

- Realistic anxiety;
- Neurotic anxiety;
- Moral anxiety.

Realistic or, as it is also called, objective anxiety is a response to the really threatening dangers of the surrounding world.

Neurotic anxiety reflects the fear of punishment. In this case, the fear of punishment means the uncontrolled manifestation of the "Id" needs arising from the "Id" impulses and the experience that they will be realized, but not controlled. Neurotic anxiety - the fear that the "Ego" will not be able to restrain impulses at the level of instincts (sexual, aggressive). Thus, S. Freud described anxiety as a consequence of the fear of creating terrible actions that entail negative consequences.

Moral anxiety is based on the expectation of a reaction from the “super-ego” in the form of punishment for behavior that does not meet the standards and norms accepted in society. As a result of moral anxiety, a person may develop a sense of shame or guilt for committed acts [2].

The consequence of the manifestation of anxiety is the activation of defense mechanisms [12].

Today, psychology also distinguishes two types of anxiety: mobilizing and relaxing. Mobilizing anxiety gives an additional impulse to activity, while relaxing reduces its effectiveness until it stops completely [13].

Anxiety level is a characteristic feature of vigorous human activity. Each person has some distinctive level of anxiety. It distinguishes him from other people and determines the optimal level of anxiety, that is, effective anxiety. In each case, it is a determinant of self-control and well-being in achieving a successful balance of anxiety levels.

In professional literature, anxiety is most often divided into two types:

- Situational anxiety;
- Personal anxiety.

Situational anxiety is a phenomenon whose very name implies an understanding of the emergence of anxiety based on the expectation of significant positive or negative life situations. It works more often as a mobilization mechanism, capable of provoking the adaptive mechanisms of the human psyche, aimed at normalizing its reactions and actions in the current situation.

Personal anxiety - this is often defined as a low threshold of perception of environmental conditions that can provoke an anxiety state with minimal values of an objective threat to the existence or other human activity. This condition has a chronic form, which affects many aspects of a person's personality and creates conditions for a pronounced depressed mood, difficulties in the field of professional and social communications, as well as a general decrease in the level of a person's self-esteem.

A.M. Prikhozhan responds with types of anxiety based on situations related to:

- with the learning process - educational anxiety;
- with ideas about oneself - self-rated anxiety;
- with communication - interpersonal anxiety [14].

In the classical professional literature, the level of anxiety can be defined as: low (normal) and high (maladaptive), and in some cases - associated with professional activity: constructive, destructive and insufficient.

A.M. Prikhozhan also identified open and closed forms of anxiety based on verbal and non-verbal expressions of behavioral characteristics.

Open:

- severe (acute), unregulated anxiety;
- adjustable and compensating anxiety;
- cultivated anxiety.

Closed (masked "mask"):

- aggressiveness;
- excessive dependence;
- apathy;
- deceit;
- laziness;
- excessive daydreaming [10].

### Conclusion

An analysis of modern professional and scientific literature in the field of psychology shows that there are many classifications and types of anxiety. Many authors look at this issue in accordance with the tasks that reflected their research and pioneering. Nevertheless, it should be noted that the result of their work was the understanding that anxiety as a psychological phenomenon considers the specifics of the individuality of an individual and its tendency to experience anxiety and dismay. Currently, this topic is relevant and important, given the modern features in professional activity.

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## AFFECTIVE DISORDERS IN OLDER MEN IN INFERTILE MARRIAGES

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### **Introduction**

**The relevance of research** of the main psychological mechanisms of the formation of borderline mental disorders and psychological characteristics of the response in men with male factor of infertility, as well as the development of appropriate methods of psychocorrection remains high.

Couples who have been diagnosed with infertility experience severe psychological stress at the stage of delivery of the diagnosis and then during the entire period of infertility treatment. But most couples who have difficulty conceiving are usually subfertile and with appropriate treatment, pregnancy is possible and the birth of a healthy child.

Currently, there are effective methods of treating infertility using assisted reproductive technologies. Participation of spouses in a treatment program using assisted reproductive technologies (ART) requires certain physical, material, and, no less important, psychological resources from them. The effectiveness of psychological support for patients in the ART program has been confirmed by a number of works by both foreign and domestic authors. A large number of works are devoted to the study of relationships in married couples with or the psychological characteristics of childless women, with tubal-peritoneal factor of infertility.

The issue of the characteristics of the emotional-volitional sphere of men in the ART program has not been sufficiently studied, which determines the relevance of our research. In the structure of marital infertility, 75% is female infertility, 45% is male, 22% is male and female.

The high incidence of infertility in married couples under the age of 35 indicates the need to study the psychological state of the spouses be-

fore the ART program. According to the literature, a large number of works are devoted to the study of the emotional state in women. Currently, the question of studying the psychological state of men in the ART program is relevant.

Affective disorders in men in infertile marriages are found in more than 72% of patients seeking help in the treatment of infertility in ART programs (Khritinin D.F., Kulakova E.V., Gardanova Zh.R., 2017). The work contains a detailed description of the relevance of this issue, the novelty of the study is correctly determined. The novelty lies in the study of the emotional-personal sphere in men in infertile marriages in a program of assisted reproductive technologies in a sample where all patients enter the ART program after at least 3 unsuccessful IVF attempts. This study included all patients with a preliminary study of sperm analysis for apoptosis and possible genetic diseases, which determines its novelty. [12].

The place of the emotional and personal sphere in the structure of personality, and its relationship with the sides of the psyche are described in the works of K. Izard, A.G. Kovaleva, N. D. Levitova, A.N. Leontyev, P.V. Simonov and other scientists.

The emotional and personal sphere determines the content, quality and dynamics of emotions, feelings and volitional characteristics of a person. The main aspects of emotionality are manifested in situations that have special strength and advantage at the moment. They exist only together with other personality parameters, such as worldview, morality, will, motivation.

The volitional sphere of the personality is manifested in how it can control various mental processes, its activities, as well as in how it defines itself.

The volitional sphere has many functions, some of them are: the allocation of goals, tasks and motives, as well as the regulation of motives for action (selection of the more important and beneficial ones), mobilization of physical and mental abilities in a situation of overcoming obstacles to achieving goals.

Emotions and will are often combined into one emotional and personal sphere. Nevertheless, different researchers of this problem highlight various aspects. The emotional side of regulation, occupies a place in the psychological structure of the personality and relationships with other aspects of the psyche are quite comprehensively described in the works of V.K.Vilyunas, Ch. Darwin, K. Izard, P.K.Anokhin, V. James, P.V.Simonov and other scientists. [4].

At the same time, the distribution of labor on this basis is rather arbi-

trary, since the emotional-volitional regulation is closely related. VK. Vilyunas, analyzing the doctrine of emotions noted that many theories consider only individual cases of the emergence of emotions, touch only a certain aspect of the problem and are not characteristic of the desired continuity. And yet, he also comes to the conclusion that there can be no unified theory for emotional phenomena [7].

In the XIX century, philosophers began to think seriously about the essence and nature of emotions, and two main approaches emerged in this report. The adherents of the intellectual position (the best representative is J.-F. Herbart) said that the manifestation of organic emotions is the result of mental manifestations. According to Herbart, emotion is a kind of connection that is established between different representations. Emotion is a mental disorder caused by a certain conflict between these ideas [12].

Sensualists are representatives of the other side, insisted on the opposite, in their opinion, organic reactions can affect mental manifestations. F. Dufour refuting the idea that passion is the source of the soul, it provides information about the connection between emotions and the nervous system about its excitation in the brain [10].

The founder of the theory of evolution, Charles Darwin, in his book "Expression of Emotions in Man and Animals" describes how the emotions of people developed, changed and formed in the process of evolution. According to his hypothesis, emotions play either a positive role in human life, or are remnants of those emotions and reactions that were useful to their ancestors during their existence, but at this stage of development they have lost their relevance.

For example, during anger in a person, the adrenal glands secrete adrenaline, which causes the peripheral vessels to expand, resulting in increased blood flow, and with it oxygen and nutrients in the tissue, which increases the production of energy in them. Externally, you can observe hyperemia (redness) of the face, tachypnea (rapid breathing) and increased muscle tone. This phenomenon is called "fight or flight", and both are aimed at the struggle for survival.

In his research, Charles Darwin proved that in modern people and in ancestors who lived many years before our era, the expression of feelings, emotions, as well as their development in the process of ontogeny are very similar [9].

The assumptions and ideas that Darwin spoke about became the basis for the creation of many theories about emotions, and also served for the "peripheral" theory of W. James - G. Lange.

The authors of this theory argue that, depending on the impact of the

environment, emotions are manifested, causing physiological changes in the human body. Physiological and physical changes that are the result of emotions are the cause. Each emotion has a specific set of physiological manifestations. External manifestations can cause some changes in the work of the heart, respiration, blood circulation, and muscle tone.

In the body, with different emotions, different sensations appear, from which the experience of emotions is composed. Following the James-Lange theory, events should be in this order: we are sad because we cry; we are afraid because we are trembling; enraged because we beat. If there were no bodily manifestations before perception, then, according to this theory, there would be no emotion [6].

The Soviet physiologist who studied higher nervous activity, P.K. Anokhin, in his writings argued that emotions are such a physiological phenomenon of the body that helps an animal, in particular a person, to adapt to various changes in the environment. According to his theory, negative emotions arise when an animal (or a person) experiences any need. At the same time, the physiological state of the body is aimed at the fastest satisfaction of needs. Positive emotions are a factor aimed at strengthening and memorizing the state during which the need is satisfied. This helps the animal (or person) to further direct its forces to find a way in which the need will be satisfied. If the previous path cannot help in solving the problem, then anxiety may arise, which will be directed towards finding other ways to solve the problem.

The systematic repetition of the satisfaction of needs, in which the animal (person) experiences positive emotions, leads to memorization and learning. [7].

Representatives of the psychoanalytic direction kept their attention only on negative emotions that arose as a result of conflicting drives.

As a result, they note three components in affect:

- the energy component of the instinctive drive ("charge" of the affect);
- the process of "discharge";
- the perception of final discharge (or the experience of emotion).

P. V. Simonov, who put forward the "information" theory of emotions, in which he assumes that emotions help fill in the shortcomings of certain information, can be classified as cognitive. People can act "correctly" due to emotions, despite the fact that they may be in a deficit of any information, i.e. following the concept of PV Simonov, emotions - are a "special" kind of knowledge.

Other works are devoted to the aspect of regulation of activities. There is no single, precise terminology for the definition of will, many scientists

have worked to create a unification of the doctrine of will, but a clear terminology has not appeared. In psychology, will is understood as the ability of a living being to regulate his own actions, which help to cope not only with internal, but also with external difficulties that could arise during the execution of any planned actions.

Among the well-known directions in the study of the problem of will are heteronomous and voluntaristic theories. Heteronomous theories combine volitional actions with complex mental involuntary character-associative and intellectual processes. G. Ebbinghaus gives an example of how a child instinctively gravitates for food and establishes a connection between satiety and food.

The mechanisms of emotional and personal regulation are so closely intertwined with each other that we can talk about the emotional and volitional regulation of activity. In theoretical terms, it is possible to separate the emotional and volitional side of regulation, but in psychological and pedagogical research, it is more correct to consider the emotional and volitional regulation as one single mechanism.

From the point of view of psychology, self-determination is considered as the implementation of the choice of individual value orientations, goals and a conscious understanding that only the person himself is responsible for making decisions in choosing and building a professional career. S.L. Rubinstein viewed self-determination as the acceptance of external circumstances into an internal plan, awareness, and work on their implementation [5].

According to V.F. Safin and G.P. Nikova, a self-determined person, is a person who is firmly aware of his ideals, goals, life plans and his real possibilities, and the determinants of professional self-determination are: a built image of his future, self-regulation of behavior and volitional efforts. Thus, the psychological mechanism of professional choice is always socially conditioned. I.S. Cohn claims that any biography of a person answers only four questions: what does a person do; what is his substantive activity; how he himself relates to her; what is his relationship with other people. The choice of a profession changes a person's future life: the degree of creative freedom, place of residence, level of material wealth and social responsibility. The process of self-awareness, as an integral part of the process of socialization, also undergoes changes in adolescence, since it is at this moment that a stable image of "I" is formed. The process of building a stable image of your personality is formed in the following areas:

1. There is an awareness of their inner world. The young man for the

first time begins to feel his individuality, understands the relationship of external events and actions with personal emotions.

2. The irreversibility of time, the meaning of one's existence here and now, is realized. The fact of the inevitability of death gives an impetus to thoughts about the meaning of life, its purpose, about one's dreams, about possible prospects, about a possible future. Ideals and patterns of behavior acquired at the previous stage of age development are revised, rethought, transformed [7].

### **Conclusion**

Waiting for ART results is a very stressful period for both men and women. When treatment fails, couples end up face-to-face with infertility, and therefore poor treatment experience often means the end of further treatment options [8]. This can negatively affect the psychosocial functioning of men and women. After an unsuccessful ART, couples may experience intense tension, frustration, and reactions such as sadness, anger, and depression often occur. Feelings of guilt, helplessness, and loss were most common in couples who had failed treatment experiences. Couples could also feel cheated, as after all the trials during treatment, they received nothing in return. Lack of adaptation to unsuccessful ART manifested itself in a high level of helplessness and determined negative prognosis for further treatment [12]. It has also been confirmed that increased levels of anxiety and depression can contribute to a decrease in the number of pregnancies [10].

Reactions to treatment failures are a complex of interacting stressful aspects of both the treatment procedures themselves and the effect of experiencing infertility, which, after a failed attempt, patients again come face to face with. Differences in results obtained before and after treatment procedures may indicate not only stress caused by a negative outcome, but may also be the result of previously unrealistically high expectations of successful completion of treatment, which can function as strategies for coping with stress and anxiety from ART procedures [12].

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## NEW TRENDS IN ENSURING SECURITY IN CENTRAL ASIA AND ISSUES OF FORMING A NEW MODEL OF REGIONAL SECURITY

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**Abstract.** The theses reflect the new trends in Uzbekistan's foreign policy on ensuring security in the Central Asian region.

**Keywords:** regional security, pandemic, foreign policy transformations

1. The relevance of the study is due to two factors: on the one hand, the positive intensification of the foreign policy of Uzbekistan, and the emerging new world order in the context of a pandemic, on the other. Since 2016, Uzbekistan has been pursuing a more open policy with neighboring states, establishing relations with neighboring countries, aimed at ensuring regional security. In this regard, constructive partnership based on reasonable compromises, mutual benefit, consideration of each other's interests, began to yield results. Summit meetings began to be held systematically. There is a trend of emerging trusting relationships between countries. Trade, economic, cultural and humanitarian relations are developing rapidly. Work has intensified to involve the Islamic Republic of Afghanistan in economic projects in Central Asia. People's diplomacy is actively developing. All these processes have radically changed the approaches and methods of ensuring security, stable and sustainable development of the region. In turn, these issues are relevant from the point of view of scientific understanding and development of a conceptually strategic vision of regional cooperation as the basis of security. Also, timely identification of new and traditional challenges and threats for making a joint decision becomes relevant. In this regard, the purpose of this work is to disclose certain aspects of the new regional foreign policy of Uzbekistan aimed at radically improving interaction between the countries of the region.

2. The ongoing processes associated with the ongoing COVID-19 pandemic around the world and its consequences show that, along with the traditional threats of religious extremism, transnational crime and drug trafficking, there is a threat of coronavirus infection, and the importance of the

social, medical, epidemiological situation around the world has increased. The global economy and global players in international relations began to lose their influence in addressing security issues.

In these conditions, the confrontation between the main players in world politics becomes more noticeable. The coronavirus pandemic forced to take immediate domestic decisions, regardless of the status, economic condition, superiority and development of states.

In such conditions, the growing threat from terrorist organizations and other destructive elements of security comes to the fore. All this requires a new approach to the study and development of new models for ensuring regional and international security.

3. In December 2019, the world faced an unprecedented crisis caused by the coronavirus pandemic. Each country has identified appropriate measures to combat this disease, taking into account the local specifics and socio-economic conditions in the country.

Unprecedented measures are being taken around the world to combat the pandemic. Despite this, the pandemic caused a sharp decline in production and consumption in all countries of the world, disruption of global production chains and trade links, lower commodity prices and deterioration in the global financial markets, and finally the global economic crisis began.

The pandemic has become a test of the unity and strength of international cooperation. First of all, it manifested itself in a willingness to share not only epidemiological and organizational experience, but also to provide financial, economic and food assistance to each other. Uzbekistan is well aware that no state will be able to ensure its own security by suppressing the coronavirus only on its territory, as long as the spread of the disease continues in neighboring countries.

4. Strengthening the independence and sovereignty of the state, further strengthening the place and role of the country as a full-fledged subject of international relations, joining the number of developed democratic states, creating a belt of security, stability and good-neighborliness around Uzbekistan is the most important priority of Uzbekistan's foreign policy. The international conference "Central Asia: One Past and Common Future, Cooperation for Sustainable Development and Mutual Prosperity", which took place on November 10-11, 2017, in Samarkand, played a strategic role in the development and implementation of the modern concept of regional security. The purpose of the conference was to discuss topical issues of strengthening peace and stability in Central Asia, development of regional cooperation. In his speech, President of Uzbekistan Sh. M. Mirziyoyev

noted that, "... The future of the region is formed by each state of Central Asia. A strong foundation and guarantor of its sustainable development is the willingness and desire for cooperation, as well as the responsibility of all Central Asian countries for our future." The main goal is to turn Central Asia into a stable economically developed region by joint efforts, the head of state said. "It is necessary to eliminate the reasons feeding the conflict potential. We are looking for reasonable compromises in resolving issues related to borders, water use, transport and trade"[1].

Due to such a real approach to regional security and political processes, it should be noted:

**Firstly**, based on the fact that the Central Asian region is one of the priority directions of the country's foreign policy, Uzbekistan has resolved regional tensions on all issues that have been accumulating for decades with neighboring countries ... Thus, Uzbekistan normalized relations with its closest neighbors, and unprecedentedly improved cooperation between them. Today, these processes have a serious positive impact not only on the region, but also on world politics;

**Secondly**, there was a real opportunity to discuss problems, develop joint projects identified on the agenda for the region as a whole;

**Thirdly**, today the rapprochement with neighboring states is rapidly gaining momentum. Uzbekistan has achieved the adoption and implementation of a breakthrough decision on the regulation of state borders. Uzbekistan, Kazakhstan and Turkmenistan signed an Agreement on the area of the junction of state borders within the framework of the High-level International Conference on Central Asia in November 2017. in Samarkand [1];

**Fourthly**, the signing and real implementation of breakthrough decisions on the settlement of state borders. The Treaty on the Uzbek-Kyrgyz border [2] and the Treaty on the area of the interface between Uzbekistan, Kazakhstan and Turkmenistan [3], as well as the Treaty on individual sections of the Uzbek-Tajik border [4], which became an important historical event in the political life of all Central Asia.

**Fifth**, the holding of regular consultative meetings of the heads of state of Central Asia began. These meetings are a kind of a permanent platform for high-level participants to discuss regional problems and act, develop mutually acceptable solutions;

5. In recent years, there have been systemic positive changes in the foreign policy of Uzbekistan in matters of regional cooperation based on the national interests of the country, as well as general regional interests in general. A new milestone has opened in relations with the Islamic Re-

public of Afghanistan, cooperation with regional and world powers such as Russia, China, the United States and other countries of the European Union and the Asian continent has intensified.

### Conclusion

The results of agreements on state borders also opened up wide opportunities for Uzbekistan in the development of trade, economic, cultural and humanitarian cooperation, public diplomacy, border trade favorable conditions have been created in transport and communication spheres for citizens living in border areas. The creation of a permanent platform by organizing and holding meetings, events, conferences at the highest level, etc., at which topical issues of regional cooperation are discussed and the development of mutually acceptable solutions contribute to solving regional problems, taking into account national interests.

6. An open and pragmatic foreign policy contributes to finding a diplomatic and tolerant compromise in decision-making regarding the complex regional problems that have been put on the agenda. Foreign policy transformations in Uzbekistan have become a catalyst for enhancing interaction between Central Asian countries: in the near future, common traditions, culture, religion and history of Central Asian countries will contribute to positive changes in the region. The path to mutual cooperation aimed at ensuring sustainable and stable development, which does not burden the sovereignty of the states of the region, lies through close economic ties and relations, intertwining interests, mutual interest in development. It was economic complementarity and interdependence that made it possible to find compromises, avoiding conflicts. The economy is becoming a priority criterion for regional cooperation.

7. In modern conditions, the main trend in the formation and development of institutions for ensuring regional security is the course towards integrating functions, structural ties, activities, etc., both within the regional and interregional levels. A separate state, despite its any goals, will not be able to cover the whole range of problems, the solutions of which directly depend on the stability and sustainable development of the region. With the strengthening of the negative processes associated with the coronavirus pandemic, as well as the accompanying crises, today there is an acute issue of modernizing the international security system, creating a new model of stability and security, taking into account the emerging geopolitical, military-political, economic, cultural and humanitarian situation in the region. ...

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## SPECIFIC FEATURES OF RELATIONS BETWEEN RUSSIA AND CENTRAL ASIA

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**Abstract.** This article is dedicated to clarify specific aspects of current relations between Russia and Central Asian states. The Central Asian region has never lost its importance for Russia. Especially today, as the role and influence of other actors in the region grows, Russia needs to establish closer ties with the states of the region than ever before. Russia sees a number of promising projects in Central Asia for itself. In addition, Russia has always maintained close political ties with the countries of the region. Central Asian states also recognize Russia as one of their most significant partners. The states of the region have realized how important Russian cooperation is for them, and they are trying to act within the framework of these perceived interests. By virtue of Russia's long-term influence in the region, its constant impact on Central Asia during and after the Soviet era, as a legitimate successor of the Soviet Union, has tied Central Asian states to Russia in many ways. Therefore, the Central Asian states cannot deny Russia's impact in the region today, and they rightly discern the need for Russia in the region. At the same time, there are a number of problems that hinder the development of relations between Russia and Central Asia. And, the ongoing situation requires the parties to provide each other with new projects and opportunities.

**Keywords:** Russia, Central Asia (CA), China, The United States of America, Eurasian Economic Union (EAEU), Collective Security Treaty Organization (CSTO), security and economic relations, military bases

### Introduction

Russia and the Central Asian states have multifaceted relations with each other. The parties maintain close partnership in almost all areas. Russia has always sought to exert its influence in Central Asia, which is a geostrategically important region, and it is not indifferent to the region's natural resources also. Russia relies on self-initiated organizations such as the EAEU and the CSTO to extend its leverage in the region and it is note-

worthy that Russia, through these organizations, has created and continues to create more favorable conditions for itself than other participants in the region.

But lately, it has become clear that the projects put forward by Russia are not attracting a high level of interests of Central Asian states. Because these projects are often unilaterally beneficial and do not assure auspicious results for the states of the region. This situation can be useful for other participants in the region to promote their own projects and plans.

### **Russia`s presence in CA: interests and practical mechanisms**

Russia, which is considered a traditional partner of the Central Asian region and is recognized by the states of the region as one of the major foreign partners, has always had its own political attitude to the region. In turn, the Central Asian region occupies an extremely important place in Russia`s foreign policy strategy. It represents an extensive territory that borders on Russia from south, countries that are traditional economic trade partners for Russia, rich in natural resources, and that export most of the raw hydrocarbons they produce through Russian territory, and states, most of the population of which, comprises Russian-speaking citizens.[1] Although Russia is interested in Central Asian resources, its main goal in the region is to maintain and strengthen its influence. Russia`s economic ties with the countries of the region are also aimed at bolstering its dominance in the region.

According to expert Leonid Gusev, Russia`s foreign policy in Central Asia has three main goals. The first is promoting security and military-technical cooperation (from the modernization of the armed forces of the states of the region to the construction of military bases in Kyrgyzstan and Tajikistan). The second is facilitating energy projects in the oil and gas sector and hydropower. The third is strengthening the integration institutions of the Eurasian Economic Union, in which Kazakhstan and Kyrgyzstan are full members and Tajikistan is a prospective member.[2] It is clear from this view that the realization of the three goals will lead to a dramatic shift in Russia`s influence in the region, that is, Russia`s primary objective in the region is to boost its consequence.

As already indicated, Russia has exclusive opportunities unlike other actors in the region. First of all, it has mechanisms such as the EAEU and the CSTO to guide its policy in the region. Russia is also territorially close to the region, which makes it easier to control. And all the Central Asian states have historically close and multilateral ties with Russia. Russia tries to use these opportunities effectively and evince itself in the region with all its might.

Evidently, Russian approach is rooted in geopolitics. After the collapse

of the Soviet Union, Russia neglected relations with the republics in Central Asia for a few. In second half of the nineties, the Kremlin attempted to maintain political and economic domination in the region. The challenge for Russia was the emergence of Chinese and American competitions in Central Asia. Moscow failed to stop China's economic expansion. However, the Chinese recognized Russia's dominant role in the sphere of politics and security in the region. The American presence in the region by Moscow is treated as a threat to security. The Kremlin was alarmed by American investment projects related to the transmission of oil and gas, and political projects carried out under the slogans of spreading democracy.[3] It is noteworthy that Russia has not yet developed a clear strategy for Central Asia. However, the US C5+1 platform, China's "China-Central Asia" and India's "India-Central Asia dialogue" are separate strategies for Central Asia. Russia has mechanisms to implement its policy in Central Asia, but does not have a separate strategy.

China's overabundance in Central Asia in the economic sphere has already had a significant adverse impact on Russia's influence. The economic hardships in Russia after 2014, have prevented Russia from responding to Chinese economic effect in CA. And at the same time the United States, also has had a prestige in Central Asia through its presence in Afghanistan.

### **Bilateral relations**

**Kazakhstan** is Russia's closest ally in Central Asia. Russia always pays special attention to Kazakhstan, for the reason that Kazakhstan plays a key role in Russia's access to the region. Kazakhstan is also the most economically developed country in the region and rich in hydrocarbon reserves. Kazakhstan is connected to Russia in many areas, particularly in the energy sector. To give an illustration, 85 percent of Kazakhstani oil export and almost 100 percent of gas exports to foreign markets pass through Russia. [4] Lukoil and Rosneft have stakes in Kazakhstan's energy concerns. In the military sphere, Kazakhstan closely cooperates with Russia both within the CSTO and at a bilateral level. The only case where Russian military influence does not provide obvious benefits to Kazakhstan – except financial revenues – is Moscow's rental of more than 100,000km<sup>2</sup> of Kazakhstani territory for military tests, mostly for air defense, ballistic rockets, and space exploration. Were Kazakhstan's internal stability, or Russo-Kazakhstani relations, to deteriorate, Russia could potentially pressure Kazakhstan – or even intervene in it – on the grounds of protecting these strategic interests. [5] In the aggregate, Russia has seven military facilities in Kazakhstan. Undoubtedly, Kazakhstan is Russia's closest economic partner in Central Asia and the parties maintain close economic ties within the EAEU. But protests

against the EAEU have been growing in Kazakhstan recently. The main reason is that Kazakhstan's participation in the EAEU is not as beneficial as planned.

It is crucial for Russia to strengthen ties with **Uzbekistan**, which has a high economic potential and is a leader in the region in terms of military power. After Shavkat Mirziyoyev came to power in 2017, both sides began to offer new opportunities each other. In April of 2017, during his visit to Moscow, Shavkat Mirziyoyev signed a series of agreements totaling 15.8 billion US dollars. "I would like to highlight that in the course of this state visit we have signed a series of bilateral agreements covering large-scale investment projects for a value 12 billion US dollars and trade agreements valued at \$ 3.8 billion dollars," Mirziyoyev stated after his meeting at the Kremlin with President Vladimir Putin.[6] Afterwards, the trade turnover between Uzbekistan and Russia in 2018 increased by 21.2 percent compared with 2017 and made \$5.73 billion dollars.[7] Russia and Uzbekistan have close economic and energy cooperation. After Russia stopped importing gas from Turkmenistan, Uzbekistan became a major gas importer for Russia. But Russia's resumption of gas imports from Turkmenistan from April 2019, could change this situation. Uzbekistan is also in talks with Russia on the construction of a nuclear power station. "Rosatom" is also offering its devices to Uzbekistan, but the parties have not yet reached an agreement. It should be pointed out that, Uzbekistan is not a member of the two major Russian-initiated organizations both the CSTO and the EAEU. However, on March 6, 2020, the Uzbek government approved plans to apply for an observer status in the Russia led EAEU.[8] But that means almost nothing to both sides. Moscow is hopeful about Uzbekistan's full membership in the EAEU. Uzbekistan can also achieve some favourable outcomes by joining the organization. But a number of problems have been observed in the organization's activity compared to its achievements. This discourages Uzbekistan's officials from joining the organization as a full member.

Russia's relations with **Tajikistan** also have their own characteristics. However, Tajikistan is not a member of the EAEU, in the economic sphere Tajikistan has close cooperation with Russia. But Russia sees Tajikistan as a potential member of the organization. Maintaining a healthy economic relation with Russia is very important for Tajikistan in order to have a successful political and economic transformation. On the one hand, given all the political and economic compulsions, Tajikistan's inclination towards Russia is very strong. On the other hand, Tajikistan is of great economic significance to Russia as it has huge mineral deposits and is producer of commodities and goods of vital interest to Russia.[9] Cooperation in the

military sphere is of particular importance in relations between Russia and Tajikistan, because Tajikistan shares a direct border with Afghanistan. It is common knowledge that Russia has 201<sup>st</sup> Military Base in Tajikistan. Under a bilateral agreement signed in 2012, Russia has the right to keep its troops in Tajikistan until 2042. Moscow has also pledged 200 million US dollars in aid to develop the Tajik army by 2025.[10] This military base offers Russia a lot of opportunities. First, Russia has the ability to control the situation in Afghanistan through this military base. Second, Russia's military actions in Tajikistan ensure that its influence in Tajikistan remains powerful and persistent. These factors will help Russia to maintain its influence in the geopolitics of CA. Russia sees Tajikistan as a corridor between Afghanistan and Central Asia. For this reason, it closely cooperates with Tajikistan in the military sphere. Tajikistan's border with China also increases its strategic value for Russia.

**Kyrgyzstan** is a member of both the Russian-initiated the CSTO and the EAEU. The parties have close cooperation in the economic and energy spheres. Russia's Gazprom is a major player in gasification of Kyrgyzstan. Kyrgyzstan, which has a relatively weak economic potential, is striving for stimulation of closer cooperation with Russia in this area. In terms of security, Kyrgyzstan is the most active supporter of the CSTO among the Central Asian states. However, the US Manas military base in Kyrgyzstan from 2001 to 2014 created barriers to military cooperation between Russia and Kyrgyzstan.[11] The CSTO plays a significant role in the defense of Kyrgyzstan, as it provides air defense of the country. Of course, Russia's Kant air base also plays an important role in defending Kyrgyzstan. In December 2012, Kyrgyzstan agreed to lease the Kant air base to Russia for fifteen years, with an option for an automatic extension for an additional five years, after the Russian government agreed to reduce Kyrgyz debt by some \$500 million. Kyrgyzstan is also interested in opening a second Russian military base. Other former Soviet republics, even those that enjoy good relations with Moscow, have been unwilling to even consider such a possibility. Indeed, most that have bases worked hard to limit the size of the Russian military footprint in their countries, viewing it as a diminution of their sovereignty and independence. But Kyrgyzstan is different, and there are several reasons that have compelled Bishkek to consider this unusual possibility. One of the main reasons for this, Kyrgyzstan finds itself the object of intense interest by the People's Republic of China, its enormously powerful neighbor that is increasing its presence in the Kyrgyzstani economy and society. A second Russian base on its territory would be a powerful signal to Beijing that there are real limits to the expansion of Chinese power in this

direction.[12] But so far, Russia has shown little interest in the issue. The fact is that China's influence in Kyrgyzstan is growing rapidly. This could have a negative impact on Russia's interests in Central Asia in the future. Given these factors, it is important for Russia to reconsider its approach to Kyrgyzstan. However, in recent years, Kyrgyzstan has been left out of Russia's strategic interests.

The energy sector plays a key role in relations with **Turkmenistan**, which pursues a closed and completely neutral foreign policy. Although Russia is also rich in hydrocarbon reserves, the relative cheapness of Turkmen gas and its ability to serve as a transit zone for Turkmen gas exports, increase its interests in the Turkmen energy market. However, close cooperation in the energy sector has been disrupted by the fall in natural gas prices in Europe in 2009 as Russia has also tried to buy Turkmen gas at lower prices. In 2016, Russia completely stopped importing gas from Turkmenistan. For Turkmenistan, secession from the Russian market has led to huge losses, and cooperation with China in this sphere has not been beneficial. As a consequence, Ashgabat again began to look for ways to cooperate with Moscow. On April 15<sup>th</sup>, Gazprom announced that it had resumed natural gas purchases from Turkmenistan after a three year hiatus. The announcement comes at a critical moment, when Ashgabat desperately needs new gas customers to prop up its suffering hydrocarbon-dependent economy.[13] Also, Turkmen president Gurbanguly Berdimuhamedow has agreed to help supply and expand the Russia-backed Pricaspiysky pipeline, however no action has yet occurred towards this goal.[14] It should be mentioned that Russia is not fully positive about the TAPI project promoted by Turkmenistan. Inasmuch as this pipeline has received steady political support from the United States because it would enable Turkmenistan to find another alternative to dependence on Russia for exporting its gas, Russia has been very skeptical about the project. Undoubtedly, Moscow realizes that while the pipeline is now formally under construction, completion and operation are by no means certain since there are major questions connected with securing enough financing for it. And ensuring a stable and secure environment in Afghanistan also remains an issue of concern.[15] Russia and Turkmenistan also cooperate in the field of security. On October 2, 2017, Russian President Vladimir Putin and his Turkmen counterpart Gurbanguly Berdimuhamedov signed a landmark strategic partnership agreement. Even though Western analysts have focused on the economic dimension of this strategic partnership, due to the critical importance of the proposed Trans-Caspian gas pipeline for European energy markets, Russia and Turkmenistan have also made significant strides toward developing a ro-

bust informal security partnership. This security partnership aims to expand bilateral cooperation on two key issues of mutual concern: the resolution of long-standing tensions in the Caspian Sea region and the stabilization of Afghanistan.[16] Its border with Afghanistan requires Turkmenistan to collaborate with Russia in the field of security. However, most likely, the cooperation will take the form of bilateral relations, which means that Russia's chances of having a military base in Turkmenistan are extremely limited.

### **The EAEU issue**

Although only Kazakhstan and Kyrgyzstan are members of the EAEU, Russia considers Uzbekistan and Tajikistan as potential members of the organization, and is actively working to attract them to the EAEU. For Russia, economic integration of Central Asia through the organization it leads, is of significant importance. Although the word “economic” figures prominently in the organization’s title, no one doubts the treaty’s political component. Politicizing the EAEU is exactly what Kazakhstan and Belarus fear. The fear is especially palpable in Kazakhstan, whose political class fears that the country may lose some of its sovereignty as a result of its closer ties with Russia. That is why the term “multi-vector foreign policy” is now being increasingly used in Kazakhstan as a reminder that the country is also oriented toward China, the United States, Europe and the Turkic-speaking world. Kazakhstan believes that the EAEU will bring them substantial economic gains in the industrial, agricultural, and finance sectors. Besides, the key energy sector stands to gain a lot from the treaty. However, no agreement in this sphere was actually reached. [17]

The pros and cons of Kyrgyzstan’s accession to the EAEU were widely discussed in that country. Price increases for consumer goods resulting from higher customs tariffs were identified as a possible negative consequence. As for the advantages, joining the EAEU would allow Kyrgyz products to enter the EAEU market of 160 million people; reinvigorate Dordoy Bazaar, a giant market just outside the Kyrgyz capital, Bishkek; and make life easier for Kyrgyz labor migrants working in Russia and Kazakhstan. [18] Kyrgyzstan’s experience as a member of EAEU from mid-2015 to late 2016 has been largely frustrating. While favourable employment conditions have been created for Kyrgyz labour migrants, the anticipated increased access to the markets of the EAEU member states and large-scale capital investment are yet to materialize. The prospects for Kyrgyzstan’s membership of the EAEU may become more favourable in the short term, but this depends on whether the EAEU function as envisaged. While facing EAEU inefficiencies, China has become the primary creditor of Kyrgyzstan in recent years. Even though imports and subsequent re-export opportunities

have diminished, China's role in funding large-scale infrastructure projects through direct lending to the Kyrgyz Government, as well as foreign direct investment (FDI) and regional initiatives, is expected to increase in importance.[19] It becomes apparent that the problems in the EAEU are pushing Kyrgyzstan to find another alternative partner, and similar pattern also suitable for Kazakhstan. The ever-increasing Chinese influence in Kazakhstan and Kyrgyzstan is not a positive signal for the Kremlin.

Uzbekistan has been the most discussed potential member of the EAEU in recent years. Membership in the EAEU can bring some positive changes for Uzbekistan. Entering the EAEU would mean further removing trade barriers, so that Uzbek core products, such as automobiles and textiles, can access Russian and other EAEU markets. This would fit Uzbek plans to reinforce the export-oriented sectors of the national economy. In addition, the EAEU has signed and is working towards a number of preferential free trade agreements with many countries such as Serbia, Israel, Iran, Singapore, Vietnam, China, Cuba, Egypt and Thailand, which can lead to more opportunities for exporting Uzbek goods. Formal entrance into the organization can also present risks for Uzbekistan. In practice, participation in the EAEU has not prevented the emergence of trade skirmishes between the members, who have at times accused one another of violating the Union's rules using nontariff measures and protectionism. This has already happened during the crisis between Kyrgyzstan and Kazakhstan in October 2017.[20] Also, the Union is so vulnerable as an organizational structure. Although the structure of the European Union was initially modeled on, it appears that the EAEU countries do not have sufficient capacity to coordinate their foreign trade policies. Moreover, the EAEU restricts the sovereignty right of each of the members to formulate foreign customs policy. In this manner, the two states will not be able to conclude a direct bilateral trade agreement. And the most noteworthy aspect is that the EAEU remains a Russian-dominated organization and the main stakeholder in the organization is also Moscow. This creates a situation where a clearly powerful force is putting pressure on other members on controversial issues. That is why today the EAEU market is characterized by an unfair environment. Taking into account these factors, Uzbekistan has decided not to rush to join the organization. Instead, Uzbekistan has preferred to be an observer, and it means nothing to both the Union and Uzbekistan. With this decision, Uzbekistan may have expressed in soft diplomatic language that it does not intend to join the union at the moment. As an alternative, Uzbekistan is also considering the possibility of joining the WTO.

Thus, if an equal liberal environment is created for all the members in

the activities of the union and the problems in the structure are solved, the EAEU can become a promising organization that offers great opportunities for the Central Asian states. But the current situation is different. The member states of the Union are facing more and more problems. This makes the Union less attractive not only for Kazakhstan and Kyrgyzstan, but also for Uzbekistan and Tajikistan, which are potential candidates for membership. In this context, other major players in Central Asia may seek to enhance their impact by making beneficial proposals to the states of the region. So far, China is masterfully seizing this opportunity.

### **Conclusion**

Based on this, the following conclusions may be drawn. First, Russia is still one of the closest partners of Central Asian states, and this trend will not shift in the near future. The economies of Central Asian states are largely dependent on Russia, and it is in the interests of the countries of the region to co-operate with Russia in most areas. Second, a number of problems have arisen in Russian-Central Asian relations and the solution to most problems depends on Moscow. The major challenge for Central Asian states is Russia's efforts to prevent the countries of the region from pursuing policies as independent entities. Moreover, Russia is not in favor of the integration of Central Asian states. The Consultative Meetings of the Heads of the Central Asian states which held in 2018 in Nur-Sultan and in 2019 in Tashkent were not warmly received by Moscow. The main problems for Russia also depend upon this factor. Russia's attempt to maintain a permanent influence in Central Asia, using its really close economic and military ties – seeks to create obstacles for the countries of the region to pursue independent policies are forced Central Asian states to diversify their economies and establish strong links with other major players in the region to ensure a balance of power in foreign policy. This factor put in place challenges for Russia in Central Asia. Thirdly, it has recently become clear that the projects put forward by Russia for the Central Asian states are losing their attractiveness for the countries of the region. Today, Russia has already lost the status of the only close and reliable economic partner in the region. In the case under consideration, other lead actors in the region are trying to enlarge their leverage in the region by proposing new projects for Central Asia.

In general, the current processes in Central Asia require that Russia should reconsider its approach to Central Asia and develop new and mutually beneficial projects for the countries of the region. Because at present, not only the sway of other key actors in the region is expanding, but also the countries of the region are prone to changes. By way of illustration,

Uzbekistan has changed dramatically in recent years, pursuing an active foreign policy in the region and becoming the brightest supporter of regional integration in Central Asia. Kazakhstan is also striving to implement a multi-vector foreign policy and is working to diversify its foreign economic activity. Given these factors, China is increasingly attempting to captivate the region's states by offering new inspiring projects, while the United States has developed a new strategy in response to recent changes in Central Asia, and it is also willing to work with countries in the region on new plans. Therefore, it is crucial for Russia to formulate new, mutually advantageous deals for the region's states. Perhaps, as a result of the extension of Vladimir Putin's presidency until 2036, a new strategy or approach to Central Asia, new economic projects can be developed. But conversely, extending Vladimir Putin's presidency could frustrate hopes for new initiatives, because Putin was the initiator of the old projects. And the Central Asian states are ready for the novelties and they are looking forward to such enterprises.

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## TYPOLOGY OF TUNES OF THE YAKUT CEREMONIAL GENRE ALGYS

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**Abstract.** The article examines the typology of the tunes of the Yakut ritual *algyses*. Their ritual and meaningful components are revealed, which represent a prayer addressed to the deities with the performance of certain ritual actions in the form of feeding the hearth with kumis. Three methods of intonation were found in the Yakut *algys*: speech realization, recitative performance and singing in the style of *d'ieretii yrya*. The features of the Yakut singing *algys* are determined: the beginning of the *d'e buo*; chants, including extended, vocalized; narrow-volume pendulum melody; specific timbre of *kylysakh*; musical tirade form. For the first time the musical notation of *algyses* was made by the first Yakut composer and musicologist M.N. Zhirkov during the Vilyui expedition of 1943, which was recorded from the outstanding folk singer of Yakutia S.A.Zverev-Kyyi *Uola*. Typologically, the tunes of the Yakut *algys* are close to the Evenk lullabies *algavke* and the epic *alga*. Common to them are the names consonant with the Yakut genre and content. They are also ritual genres. Their musical part is characterized by a monody nature, improvisation, an opening, a pendulum melody, syllable chants and timbre decorations in the form of grace notes and trills. The differences are primarily related to language. Musically, the Evenks' chants are short, unvoiced. Falsetto overtones and tremolo characteristic of the Yakut *kylysakhs* are absent in the timbre decorations of the songs. The chants of the epic *alga* are expressed by the phrase *Ugele-ugele-ugender*, in contrast to the Yakut *d'e buo*. The same typologically common moments and differences can be observed in the ritual tunes of the Evens of Yakutia and the Buryats. In these genres, singing plays the same important role as their verbal part.

**Keywords:** ritual music, rite, style of singing, timbre, opening, chants, genre, melody, range.

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The Yakuts (self-name - Sakha) are the northernmost pastoralists living

in Siberia. Various rituals helped to overcome harsh living conditions, and were accompanied by singing. Singing, in this case, was a sacred act that enhanced the effectiveness of the rituals produced. The singing *algys* was such a ritual genre among the Yakuts, although it could be pronounced in speech without singing. Yakut *algys* opened the summer kumis festival - *Ysyakh*, which has survived to this day. V.L. Seroshevsky describes it as follows: "At the beginning of the celebration, nine immaculate youths, of ever smaller age and height, with glasses of decreasing size, stood one after another facing south. The one at the head sang, and they picked up and three times lifted to the sky the *chorons* (a goblet for drinking kumis – A.L.), then they poured kumis on the ground as a sacrifice, and the rest was passed into a circle" [11, p. 447]. Among the Yakut *algyses*, several functionally different types can be distinguished: *algys*-spell, *algys*-goodwill and glorification, *algys*-prayer, appeal to the patron spirits.

If at the present time the verbal component of the Yakut *algyses* has been studied well enough, then their melodies, which have not yet been specially studied, are a poorly studied area. The etymology of the word *algys* (blessing, goodwill) has the common Türkic root *al5a*. So, in the "Experience of the Dictionary of Turkic dialects" V. V. Radlov translates this word as "blessing ...; *mangan algys ber!* bless me!" [10, p. 395]. This word has the same meaning in the Yakut language. In the dictionary of E.K. Pekarsky, the word *algys* means: "1) blessing; goodwill, best wishes ...; 2) praise, incantation, prayer; in particular, the dedication ... pronounced by the oldest of those present" [9, vol. 1, p. 75].

Ritual *algys* belongs to the oldest genre of the Yakut traditional culture. The content of *algyses* was associated with an appeal to various deities of the Upper, Middle and Lower worlds. The meaning of *algyses* "boils down to joy about strengthening the economy and increasing wealth, about a good breeding of livestock and a successful hunt, and in general about all kinds of well-being and happiness in life. *Algys* was a constant companion of the Yakut, just as prayer was of a Christian. Yakut constantly had to remember at least some formulas for *algys*. Strong was his belief in the magical power of words, which were supposed to influence, pacify and incline the favor of gods and spirits to himself" [2, p. 64]. The performers of the *algyses* were not singers and storytellers, but special experts in the *aiyy oyuun* rite. G.M. Vasiliev writes about this: "In the old days, judging by the legends, ritual incantations and prayers were performed by white shamans or special *algyschits*, spell-casters" [ibid., P. 65]. The ceremony was carried out in the open air during *Ysyakh*, but it could also be performed in a dwelling. In the house, it proceeded as follows: "*Algyschit*, turning first to the east, then to the corner of

the house, facing southeast, then turning to the next corners and ends of the matics of the house, pronounced *algys*. And the boys standing behind him with a *choron* of kumis after each tirade dedicated to one or another deity poured a little kumis into the fire of *kamelyok* (Yakut stove - A. L.), which was accompanied by exclamations of an *algyschit*: "*Urui, aikhal buollun*". Those gathered in chorus repeated "*Urui, aikha*" "[13, p. 139].

*Algyses* were performed in a variety of ways. According to Yu. I. Sheikin "In the ritual practice of Sakha, the recitative form of intonation, based on the vocal tradition of *je-buo*, prevails. The vector of admissible possibilities of using this vocal tradition in *algys* is different: from monotonic "dry" recitative (ie, without chanting and intrasyllabic accent pulsation) to the lingering ornamental style of *jereti*" [12, p. 314]. Thus, the musical part of the sung *algys* is more often expressed in the traditional high style of Yakut singing *d'ieretii yrya* (a flowing, flowery song with guttural overtones, called *kylysakh*). The musical range *algyses* is a way of scoring a poetic part, in which the performer does not divide the musical and verbal sides. This also underlines the fact that *algys* can not only be chanted, but also expressed in speech without singing.

Singing Yakut *algyses* open with the obligatory colorfully ornamented introduction, where the solemn exclamation "*D'e-buo*" ("Well, here!") is sung. This iconic opening, performing the function of tuning the vocal apparatus, in turn plays an important formative role, setting the rhythmic-intonational structure of the subsequent musical deployment. It is characterized by the freedom of the improvisational development of the melody, expressed by rather lengthy colorful chants, which determines the character of the further advancement of the musical material. Chants of one syllable in length can reach up to 20 or more musical sounds. The *algys* melody, colorfully ornamented by the *kylysakhs*, has a pendulum-like pattern and develops in a narrow range within the newt. The *kylysakh* timbre is represented by grace notes, falsetto overtones, trills and tremolo.

The form of the Yakut *algys* is a sequence of musical tirades, which correspond to the articulation of the verbal text. The syllable of a verbal text is usually chanted with two or more sounds, forming in total a correspondingly long, often equal to a quarter, duration, as can be observed in the northern version of *algys* "*Bayanai yryata*" ("Appeal to Bayanai") performed by P.E. Sleptsov from Abyisky ulus [1, p. 67-68].

For the first time the melody *algys* was recorded by the first Yakut professional composer and musicologist M.N. Zhirkov from the outstanding folk singer of Yakutia S.A.Zverev-Kyyi *Uola* from the Suntarsky ulus during the Vilyui expedition of 1943. The materials of the expedition are kept in the archives of the National Library of the Sakha Republic (Yakutia). *Algys* "*Alaky*

*yryata* ("Song of Joy") under № 2 of 19 vols. performed by S. A. Zverev has an explanation of the collector: "*bultaan baran yuren eiekeenten kyerdye-hyuyu, yuyeryuyu uruya. Khamnaahynnaakh yrya iliitinen kyerdyehyer at-agyn ularyta ularyta* (gallops up with his feet, asks with his hands)" ("After a successful hunt, he prays for Eyeken joyfully and solemnly with a movement of his arms, asks, jumps with his feet ") [5, L. 11]. Here the collector describes the ceremony and the movements performed during the chanting. The melody is recorded in 4 lines with words, in 2/4 size, in *fis-moll* key.

Another sample "*Khatat algyha*" (Strongest *algys*) under № 8 was also recorded from S. A. Zverev (ibid., Sheets 14-15). The collector recorded it, like the previous melody in the European system of notation. Although there is no timing in the first note line, the bar only appears after 15 quarter notes. Line 6 reveals a variable meter from 4/4 to 2/4 and returning to 4/4. Overall, *algys* is set out at 4/4. At the same time, the absence of bar features at the beginning of singing, the variability of the meter indicates a free metro-rhythmic basis, characteristic of the lingering Yakut tunes of the *dyieretiy yrya* style. Key alteration marks indicate the key of *A-dur*.

That the melody is expressed in the style of *d'ieretii yrya* is evidenced by the grace notes in 1 line, which depict guttural *kylysakhs*. Further grace notes are not registered. The record contains 7 note lines with words. The verbal text is as follows:

Nuoi saagyttan olokhtommut	Since the time of Noah
Toyuu chokhuur uruiduur kyune buolla	The glorious day has come with a song
Khallaan lye Aibyt khalyyna chagylyyar	Created by Heavenly Mother dazzling clear
Kyune buolla chubuk ibik bii, bii, bii, bii	The day has come chubuk ibik bii, bii, bii, bii
lye doidu ingnestiges iitiger iitillibit	Bowing to Mother Earth pupil
Neekke dalbar	Mistress Neekke

The fact that the collector recorded the tunes in a certain tonality testifies to that initial stage of fixing folk melodies, when the regularities of the scaled non-tonal structure of Yakut folk songs had not yet been studied. In the modern period, their recordings are made without specifying the tonality, and the key characters show only a certain pitch of a particular tone.

Typologically, the well-wishes and blessings of other peoples of Siberia are close to the tunes of the Yakut *algyses*. So, among the Evenks of Yakutia, the name of good wishes is consonant with the Yakut and is called *algavke*. Evenk *algavke* (good wishes for a child) is a ritual genre of a non-calendar cycle. In the tunes of the Evenk *algavke*, as in *algys*, one can find a lot in common. They also show the presence of opening, improvisational development, chants and timbre decorations in the form of grace notes and trills. The difference lies in the fact that the chants in them are less extended than the Yakut

ones and are mainly decorated with trills and grace notes, in contrast to the falsetto *kylysakhs* and tremolo, which decorate the melody of the Yakut *algys*.

There is only one musical notation of the *algavke*, recorded by Yu. I. Sheikin and D.A. Sorokin among the Aldan Evenks [3, p. 172]. Musically, *algavke* are similar to lullabies. When analyzing the *algavke* recorded by Yu. I. Sheikin and D. A. Sorokin, S. P. Galitskaya points out: "A sample of an *algavka* in its modal and compositional appearance is similar to ... ). It seems that this may additionally testify to the magical genre genesis of the *algavka*" [ibid., P. 170]. The formulaic melody of the *algavke* begins with an ascending fourth intonation, followed by a pendulum-like pattern of the melody with a constant return to the *sound of a*. The oligotonic scale of the melody in the volume of part 5 is based on the sequence *e-g-a-h*.

The Evenk *alga* were performed in the Evenk epic legends for a big and significant occasion. So, in Evenk *nimngakans*, when they are named after a hero, they play the tambourine and "when they call a hero, they perform spells - the good wishes of ALGA, accompanying them with some appropriate actions" [6, p. 98]. The Evenk song and hymn genre *alga* is similar in recitative form to the Yakut *algys*. A similar function of the Yakut opening *d'e buo* in the Evenk *alga* is performed by the epic chant *Ugele-ugele-ugender*.

Archaic ritual genres and tunes of other Siberian ethnic groups accompanying ritual complexes are also based on goodwill spells. Among the Evens, ritual songs include *khirgechen* (blessing, goodwill). Similar genres are also found among the Buryats - these are *segee zuga* - kumis songs and *Bara bartakh* (invoking the *ongon Bara*). The genre called *segee zugaa* - kumis songs - is found among the Alar-Ungin and Tungin Buryats. In turn, according to D. S. Dugarov and O. O. Kunitsyn, "Western Buryat lingering *segee zuga* kumis songs and *ai don* songs genetically have a common origin with the classic lingering songs of the Mongol "aidzam" (or "aidan duu")" [4, p. 383].

Ritual songs of various peoples are similar in many respects and have certain differences. They have a common ritual function. Performing a magical function, songs of this kind played a ritual role in the ceremonies of the calendar and non-calendar cycles. They are performed on every significant occasion, in particular, with their help they appealed to the spirits-masters of the earth, nature, and area.

These tunes in many ethnic groups are accompanied, like the Yakut *algyses*, with a corresponding action. Among the Yakuts, *algys* is preceded by the obligatory "feeding" of the fire, when the fire is sprinkled with kumis and edibles are thrown into it: pancakes and butter. Among the Evens, *khir-*

*gechens* were also “accompanied by ritual actions and sacrificial offerings that placate the spirits. These included pouring milk into a river, burning fat in a fire, throwing coins, “gifts” in the form of matches, cigarettes, scraps of fabric and other items that were left in special places - at the bases of large trees, at the foot of a mountain, etc.” [8, p. 135].

Many peoples performed ritual songs on holidays. Thus, the naming of the hero of the Evenk legends was a solemn event. Buryat kumis songs are also sung during holidays and celebrations, as well as Yakut *algyses*, which are also performed during the *Ysyakh* summer holiday. Even ritual songs were included “in such ritual actions, now practically lost, as a bear holiday, shamanic ritual, the traditional summer holiday of *dyaalbu*” [ibid.]. Among the Evens, the *Khirgecheen* and the Buryats, kumis songs, as well as in the Yakut *algyses*, include an appeal to deities.

The words in these songs served a magical function and some of them could not be spoken openly. In the verbal part of the Yakut *algyses*, verbal clichés established by the magical meaning are necessarily present, and some words are forbidden to pronounce, and an allegorical expression must be used instead. In the Evenk *Nimngakans*, the pronunciation of the hero's name was also taboo. In the Even spells-good wishes “extensive allegorical designations, which differ from ordinary speech, served the purposes of tabooing and at the same time were landmarks for <...> the supreme deities and spirits to whom *hirgechen* were dedicated” [7, p. 73].

The musical basis of the ritual songs of many Siberian peoples also has many common features. The ritual music of many ethnic groups is characterized by untempering, and it is of the same type in terms of its monody nature. The verbal and musical components of ritual songs in various ethnic groups are based on improvisational development. Close to the Yakut, Buryat and Evenk ritual songs is that their melody is characterized by vocalized chants. The ambitus of such songs is similar. So, the range of melodies among the Yakuts does not exceed a quart or a tritone. Among the Buryats in the genre of *Bara barlakh*, as well as in the Evenk *algavke*, it makes up the fifth.

According to researchers, in the ritual songs of many peoples of North-east Asia, the verbal row is decisive, and the musical part performs a subordinate function. Thus, T.V. Pavlova believes that among the Evens the *hirgecheen* “is not a sphere of purely musical folklore. Music is included in its composition as one of the components, and not always the most important. Verbal formulas included in the context of ritual actions receive a very different sound expression: in addition to speech, shouts, whispering, saying to oneself, onomatopoeic intonation, they are often sung” [ibid, p. 74].

We assume that the musical component enhances the influence of the Yakut *algys*, and similar ritual genres of the Buryats, Evenks, Evens and contributes to the deepening of the act of prayer to the spirits and deities.

With all the similarities, the ritual tunes of various ethnic groups have their own inherent features. The main difference between them, of course, lies in the language. In the musical line of these tunes. The Buryat ritual song *segee zuga* contains quite a variety of melodic moves based on pentatonic turns within a wide range, sometimes reaching two octaves, which distinguishes this genre from the Yakut *algys*. The difference also lies in the timbre features. The Evenks sing with grace notes with vibrato, while the Buryats sing such tunes without timbre decorations.

Thus, the tunes of the Yakut *algyses*, having their own national traditional characteristics, also have many typologically similar elements with the ritual songs of other ethnic groups inhabiting Siberia, and singing in them plays the same important function as the verbal part.

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**USE OF LYMPHOCYTE CELL WALL BLEBBING INDEX TO ASSESS  
OXIDATIVE STRESS IN PATIENTS WITH LIVER CIRRHOSIS AND  
ACUTE BLOOD LOSS**

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**Abstract.** The subject was 41 patients with cirrhosis of the liver and severe acute blood loss. The comparison group was 18 healthy individuals. Blebbing of the cell wall of lymphocytes and the state of antioxidant status were investigated. Growth of severity of liver cirrhosis was characterized by decrease of antioxidant status indicators. Blebbing index of lymphocytes increased, which indicated the progression of disease severity. During ROC-analysis it was established that at the threshold value of lymphocyte blebbing index  $>15,8\%$  in patients with liver cirrhosis and acute blood loss of severe degree it is possible to determine the probability of oxidative stress development, which requires correction of antioxidant status disorders. Thus, the assessment of lymphocyte blebbing index is a reliable morphological method for determining the probability of oxidative stress development and can be used as an alternative method of biochemical study.

**Keywords:** cirrhosis of the liver, bleeding, oxidative stress, lymphocyte blebbing.

**Introduction**

The processes of free radical oxidation (FRO) in the cell occupy one of the important places in the maintenance of homeostasis. In the course of biochemical reactions, which are based on oxidation, energy is generated, which affects the plastic and energy supply of cell functions as a whole.

The development of an imbalance in the biological system between substances that inhibit oxidation and free radicals (FR) towards the prevalence of the latter leads to polyetiological damage to the cell. This condition is observed in pathological processes: arterial hypertension, vitamin D deficiency, with cirrhosis of the liver, pancreatitis, severe blood loss, stroke, placenta pathology, in hypoxic conditions, chronic alcoholism and other diseases. Oxidative stress (OS) - this is the state of the body when the formation of SR goes out of control of antioxidant systems (AOS), which leads to uncontrolled growth of reactive oxygen species (SR) and damage to biomolecules. The main link in OS is lipid peroxidation (LPO). LPO is realized through a change in antioxidant activity to prooxidant activity (POA) of blood serum due to SR imbalance, which is characterized by high concentrations of reactive oxygen species (ROS). ROS → unsaturated fatty acids → LPO → formation of modified proteins (in addition, they oxidize serum low-density lipoproteins and other substrates) → increased formation of endogenous aldehydes (leads to carbonyl stress) [1,2,3].

With the development of OS, ROS, being highly reactive compounds, leads to disorganization of cell structures, a change in the functional activity of lymphocytes, which leads to its damage, the formation of a systemic membrane-destabilizing syndrome and, as a special case, bleeding of the cell wall of lymphocytes [4.5].

Blebbing is a biochemical process of complete or partial disorganization of the biphospholipid layer of the cell wall from the cytoskeleton of a lymphocyte, which occurs when interacting with a large amount of ROS. This phenomenon is characterized by a violation of the functional state of cells up to the development of a syndrome of multiple organ failure [7,8]. It is noted that this syndrome develops in patients with severe bleeding [4].

It is possible to assess the risk of developing OS in patients, as well as to determine the state of AOS, using the lymphocyte blebbing index (LBI) [6].

At present, biochemical research methods are used to determine OS, which, in turn, are difficult to reproduce in clinical diagnostic laboratories and their implementation requires significant material costs, as well as expensive equipment.

### **Purpose**

To determine the possibility of using the lymphocyte bleeding index to assess the development of oxidative stress in patients with cirrhosis and acute bleeding.

### **Material and methods**

The object for the study was 41 patients with liver cirrhosis (LC) and

severe acute blood loss (ABL). The comparison group consisted of 18 healthy individuals.

The study of the state of AOS of blood serum on an Ultrospec 1100 PRO spectrophotometer [9]. Lymphocyte cell wall blebbing was performed using a standard optical microscope with a phase contrast nozzle. Assessment of the state of the cell wall of lymphocytes was carried out as follows: 1. Cells in the state of initial blebbing (small vesicles on the membrane up to 1/3 of the radius of the cell); 2. Cells in a state of terminal blebbing (large vesicles on the membrane more than 1/3 of the cell radius, or many small vesicles). The calculation of the lymphocyte blebbing index (LBI) was carried out using the following formula:

$$LBI = \frac{\text{Terminal Lymphocyte Blebbing} \times 100}{\Sigma \text{lymphocyte blebbing} + \text{initial blebbing}} \%$$

Statistical data processing was carried out using Statistica 13.0 software (Trial version). The normality of the distribution of numerical data was evaluated using the Shapiro-Wilk test. Numerical data were presented as the median (Me) and interquartile range (Q1; Q3). For comparative analysis between the groups of the studied, the Mann-Whitney U-test criterion was used. The correlation dependence was determined using the Tau Kendall rank test.

**Results**

Data on the state of AOS and IBL in healthy individuals, patients with severe severity of CP and OC are summarized in the table.

**Table 1 – Indicators of AOS and IBL in patients with cirrhosis and severe blood loss**

Groups		AOS, %	IBL, %
Healthy persons		+64.8 [+41.2; +114,8]	4.2 [3,2; 11,4]
Classification of severity of cirrhosis according to the Child-Turko-Pugh classification	A	-83.05 [-130.9;-53,8]	55.4 [29,0;72,6]
	B	-91.4 [-133.3;-44,8]	58.6 [24,8;77,7]
	C	-115.75 [-140.8;-49,3]	66.0 [24,5;80,0]

As can be seen from the table in healthy individuals, the AOS indicator was +64.8 [+41.2; +114.8]%. The increase in the severity of CP was characterized by a decrease in the AOS indices. The IBL had a similar upward trend: the indicator increased from 4.2 [3.2; 11.4]% for healthy individuals up to 66.0 [24.5; 80.0]% for persons with severe severity of ABL and CP, which directly indicates the progression of the disease severity. Analyzing the data obtained, it is possible to note a change in the antioxidant activity of blood serum to a pronounced prooxidant one as the severity of CP progresses according to the Child-Turco-Pugh classification and the presence of severe ABL.

In order to determine the informativeness of the IBL indicators to determine the likelihood of developing OS, depending on the state of AOS, an ROC analysis was performed. Table 2 shows the results of the ROC analysis of AOS and IBL in patients with severe severity of ABL and CP.

**Table 2 - Indicators of AOS and IBL in patients with cirrhosis and acute blood loss of severe severity**

<b>Classification of severity of cirrhosis according to the Child-Turco-Pugh classification</b>	<b>AOS, %</b>	<b>IBL, %</b>
A	1. 100.0% 2. $p < 0.001$ 3. $\leq -41.6$	1. 100.0% 2. $p < 0.001$ 3. $> 15.8$
B	1. 100.0% 2. $p < 0.001$ 3. $\leq -32.1$	1. 100.0% 2. $p < 0.001$ 3. $> 15.8$
C	1. 100.0% 2. $p < 0.001$ 3. $\leq -40.2$	1. 100.0% 2. $p < 0.001$ 3. $> 15.8$

Note:

1. Area under the ROC curve;
2. Statistical significance;
3. The threshold value of the indicator.

To assess the comparability of the data of the biochemical method for studying the state of AOS and the morphological method for assessing the state of blebbing of the cell wall of lymphocytes, a correlation analysis of these indicators was performed.

Correlation comparison in the group of subjects with CP and FBL of severe severity revealed a strong negative relationship between indicators of IBL and AOS in blood serum ( $r = -0.814$ ;  $p < 0.001$ ).

Thus, the use of this method allows us to determine the likelihood of developing OS in patients with severe severity of ABL and CP.

### Conclusion

Thus, the assessment of IBL is a reliable morphological method for determining the likelihood of developing OS and can be used as an alternative method of research to biochemical.

With a threshold value of the lymphocyte bleeding index > 15.8% in patients with severe liver cirrhosis and severe severe blood loss, it is possible to determine the likelihood of developing OS, which requires correction of antioxidant status disorders.

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## THE SIGNIFICANCE OF THE ESTIMATION OF PERITUMORAL MACROPHAGES (CD68+) IN THE PREDICTION OF CLEAR CELL KIDNEY CANCER

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### Abstract

**Purpose.** Conduct a quantitative analysis of the density of distribution of macrophages (MP) in the peritumoral zone (PZ) of clear cell kidney cancer (CKC) and determine the relationship with clinical and morphological factors of prognosis and postoperative survival of patients.

**Materials and methods.** The study included 52 patients with CKC, the average age of patients was  $56.7 \pm 0.8$  years. Macrophages were detected on paraffin sections by immunohistochemical method using monoclonal mouse antibodies to CD68 (clone PG-M1, DAKO). The average number of MP in PZ was calculated in 3 fields of view (the tissue immediately adjacent to the tumor and located to the conditionally unchanged kidney tissue was taken as PZ) at a microscope magnification of  $\times 400$ .

**Results.** Correlation analysis revealed that the density of MP distribution in PZ CKC was interrelated: with the stage of the disease ( $r = 0.66$ ;  $p = 0.0001$ ); the size of the tumor node ( $r = 0.52$ ;  $p = 0.0001$ ); Fuhrman degree of anaplasia ( $p = 0.80$ ;  $p = 0.0001$ ); the presence of metastases ( $r = 0.62$ ;  $0.0001$ ) and postoperative survival of patients ( $r = 0.53$ ;  $p = 0.0001$ ). There were no correlations with gender ( $r = 0.007$ ;  $p = 0.62$ ) and the age of patients ( $r = 0.03$ ;  $p = 0.83$ ). When the number of MP in the PZ was  $< 8.8$ , the cumulative proportion of survivors by the 5-year term was 0.70 (70%), and when the number of MP in the PZ was  $\geq 8.8$ , then none of them survived to the 5-year term. of patients, the cumulative survival rate was 0 (log-rank-

test,  $p = 0.000001$ ).

**Conclusions.** The density of distribution of MP in the PZ is interrelated with important clinical and morphological parameters of CKC and is a predictor of the prognosis of 5-year postoperative survival of patients. A quantitative estimate of the number of MP in PZ can be used to predict the course of the CKC as an additional factor, in conjunction with the traditional classical forecast factors.

**Keywords:** clear cell kidney cancer, peritumoral zone, macrophages, prognosis.

Interest in the study of the tumor microenvironment has persisted over the past decades [1-5]. According to modern concepts, intratumoral macrophages (MP) play an important role in the microenvironment of tumor cells and cancer progression. Through the production of growth factors (bFGF, GM-CSF, TGF- $\alpha$ , IGF-I, PDGF, VEGF/VPF, TGF- $\beta$ ), cytokines and monokines (IL-1, IL-6, IL-8, TNF- $\alpha$ , substances P, prostaglandins, interferons, thrombospondin 1), proteases (MMP-2, MMP-9) MP are able to stimulate the proliferation of tumor cells, remodel the stroma, induce angiogenesis, activate tumor invasion and metastasis [6].

An unfavorable prognostic value of a high density of MP distribution in the tumor stroma has been shown in lung cancer [7], stomach cancer [8], breast cancer [9], colon cancer [10], and esophageal cancer [11].

There are few works devoted to the study of the prognostic value of MP in renal cancer in the literature. A high content of MP in the stroma of kidney cancer, according to some authors, correlates with the occurrence of metastases [12-13]. Toge H. et al. (2009) showed that a high number of MP in carcinomas was associated with the development of relapses after treatment [14]. At the same time, Hutterer G.C. et al. (2013), on the contrary, found that the presence of MP in a tumor was associated with favorable prognostic factors, including a low clinical stage, small size of the tumor node, absence of metastases to lymph nodes, and a low degree of atypia of tumor cells according to Fuhrman [15].

Thus, works devoted to the study of the prognostic value of the study of MP in kidney cancer are few and contradictory, and we have not found any works devoted to the study of MP in the peritumoral zone (PZ) clear cell of kidney cancer (CKC) in the literature.

Thus, the *purpose* of the study was a quantitative analysis of MP in PZ CKC, determination of the relationship with clinical and morphological prognosis factors and postoperative survival of patients.

### Materials and methods

The surgical material of 52 clear cell patients with kidney cancer was studied. The average age of the patients was  $56.7 \pm 0.8$  years. There were 29 men (55.8%) and 23 women (44.2%).

When the patients were distributed by disease stage I clinical stage (T1N0M0), 25 (48%) observations corresponded; II stage (T2N0M0) - 7 (13.5%) observations; III stage (T1N1M0, T2N1M0, T3N0M0, T3N1M0) - 13 (25%) and IV stage (T4N0M0, T4N1M0, T any N2M1, T any N any M1) - 7 (13.5%).

The degree of malignancy of tumor cells was assessed according to Fuhrman S.A. The degree of GI anaplasia corresponded to 17 tumors (32.7%), the degree of GII anaplasia - 11 (21.1%) tumors, the degree of GIII anaplasia - 14 (26.9%) and the degree of GIV anaplasia - 10 (19.3%).

There were 13 (25%) carcinomas with regional and distant metastases, and 39 (75%) localized tumors.

The average size of the tumor node was  $6.9 \pm 0.3$  cm.

The material was fixed in a 10% solution of neutral buffered formalin for 24 hours. Macrophages were detected by immunohistochemical method using monoclonal mouse antibodies to CD68 (clone PG-M1, DAKO) according to the protocol recommended by the manufacturer. The average number of MP in PZ in 3 fields of view was calculated (the tissue immediately adjacent to the tumor and located to the conditionally unchanged kidney tissue was taken as PZ) at a microscope magnification of 400 x using the Image Tool program. 3.0.

Statistical processing of the material was performed using the statistical package Statistica 10.0. With a normal distribution of data, when checking statistical hypotheses, the methods of parametric statistics (Student's t-test) were used, and if the obtained data did not meet the criteria of a normal distribution (Shapiro-Wilk test  $W = 0.89$ ,  $p < 0.01$ ), then the Kolmogorov-Smirnov test or the Mann-Whitney U test was used. Correlation relationships were determined by calculating Pearson's coefficient ( $r$ ). The analysis of survival was carried out according to the Kaplan-Meier method with the determination of the cumulative proportion of survivors; the significance of differences in the survival curves was assessed using the log-rank test. The data were considered reliable at  $p < 0.05$ .

### Results and discussion

Correlation analysis revealed that the density of MP distribution in PZ CKC was significantly interrelated: with the stage of the disease; the size of the tumor node; Fuhrman degree of anaplasia; the presence of metastases and postoperative patient survival. No correlations were found with the sex and age of the patients (Table 1).

**Table 1**

**Correlation relationships between the density of distribution of MP in PZ with clinical and morphological features of clear cell kidney cancer**

Clinical and morphological parameter	Correlation coefficient (r)	p
Patient gender	0,07	0,62
Patient age	0,03	0,83
Clinical stage of the disease	0,66	0,0001
Tumor node size	0,52	0,0001
Fuhrman degree of tumor anaplasia	0,80	0,0001
Presence of metastases	0,62	0,0001
Postoperative patient survival	0,53	0,0001

A quantitative analysis of the MP content in the PZ depending on the sex of the patients revealed that the average value of the number of MP in the PZ in 3 fields of view at magnification x 400 in men was  $9.5 \pm 1.1$ , and in women -  $7.8 \pm 1.1$  ( $p = 0.3$ ) (Table 2).

**Table 2**

**MP content in PZ carcinomas depending on the clinical and morphological features of clear cell kidney cancer**

Clinical and morphological parameter	Amount of MP in PZ	p
Gender: male	$9,5 \pm 1,1$	$p = 0,6$
female	$7,8 \pm 1,1$	
Age, years: 30 – 39	$2,0 \pm 0,1$	$p = 0,2$ $p = 0,03$ $p = 0,6$ $p = 0,4$
40 – 49	$11,8 \pm 2,0$	
50 – 59	$7,3 \pm 0,9$	
60 – 69	$8,0 \pm 1,2$	
70 – 79	$10,8 \pm 4,4$	
TNM stage: I	$3,1 \pm 0,3$	$p = 0,003$ $p = 0,009$ $p = 0,7$
II	$7,5 \pm 2,6$	
III	$15,7 \pm 1,7$	
IV	$16,7 \pm 1,8$	
Fuhrman atypia grade: GI	$2,5 \pm 0,2$	$p = 0,5$ $p = 0,0000001$ $p = 0,000005$
GII	$2,3 \pm 0,2$	
GIII	$11,6 \pm 1,2$	
GIV	$22,1 \pm 1,8$	
Tumor node size, cm: < 7	$4,2 \pm 0,6$	$p = 0,0000001$
≥ 7	$13,1 \pm 1,2$	
Metastases: NO	$5,4 \pm 0,6$	$p = 0,0000001$
N+	$17,7 \pm 1,6$	

When analyzing the number of MP in PZ depending on the age of patients, it was revealed that the lowest low values of the number of MP were in the age group of patients from 30 to 39 years old, and the highest in the age groups of 40-49 years old and 70-79 years old (Table 2). ... Thus, there was a tendency to an increase in MP in PZ tumors depending on the age of the patients.

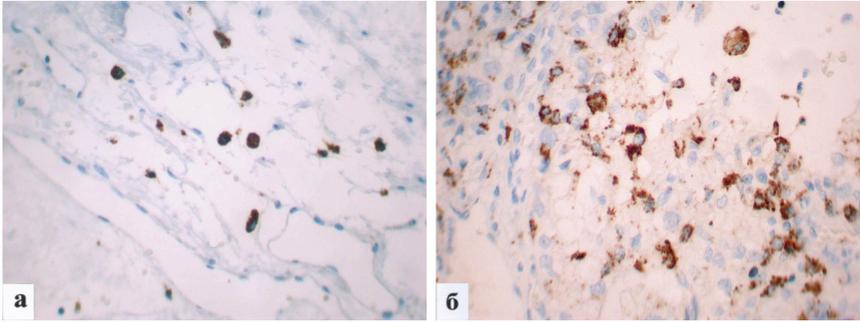
Counting the number of MP in PZ, depending on the clinical stage of CKC, revealed that at stage II compared with stage I, the content of MP increased by 2.4 times, at stage III compared with stage II by 2.1 times and at IV stage there was a tendency to increase in comparison with stage III, but the data were unreliable (Table 2). Thus, in advanced stages of the disease, an increase in the number of MP in PZ carcinomas was noted.

Depending on the degree of nuclear atypia according to Fuhrman, it was revealed that there are significant differences in the content of MP in PZ between carcinomas with grades GII-GIII and GIII-GIV, but no significant differences were found between grades GI and GII. Thus, at higher degrees of atypia (GIII and GIV), the number of MP in PZ significantly increased (5 and 9.6 times) (Table 2).

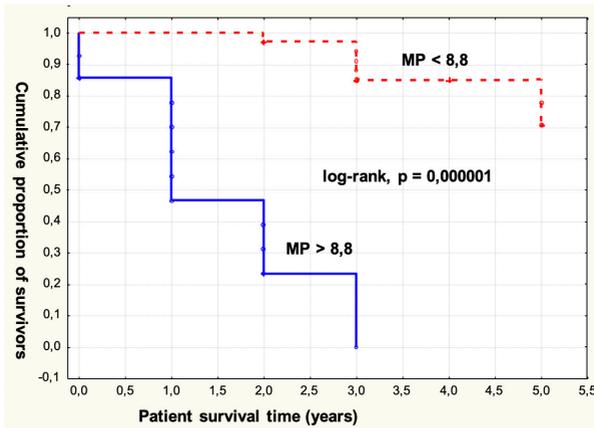
When the size of the tumor node is  $\geq 7$  cm (this tumor size, since it was median, was chosen by us as a reference point), the amount of MP in the PZ was 3.1 times greater than in carcinomas  $<7$  cm (Table 2) ...

The metastatic potential also significantly influenced the density of MP distribution in PZ carcinomas. With locally advanced CKC, the number of MP increased 3.3 times as compared with localized cancer (Fig. 1. a, b) (Table 2).

When analyzing the 5-year postoperative survival of patients using the Kaplan-Meier method, depending on the density of MP distribution in PZ carcinomas, the graphical display of the analysis showed the following. If the number of MP in PZ was  $<8.8$ , then the cumulative proportion of survivors by 5 years was 0.70 (70%), and when the number of MP in PZ was  $\geq 8.8$ , then neither survived until 5 years. one of the patients, the cumulative proportion of survivors was 0. Comparative analysis using the log-rank test revealed that the differences between the survival curves in the study groups were significant ( $p = 0.000001$ ) (Fig. 2).



**Fig. 1. Density of distribution of MP in the PZ, depending on the metastatic potential of carcinomas: a - a small number of small MP in the PZ of a localized tumor; b - a large number of large MP in the PZ of a metastatic tumor. Immunohistochemical reaction for CD68. Magnification x 400.**



**Fig. 2. Cumulative 5-year survival rate in patients with clear cell kidney cancer, depending on the density of MP distribution in the peritumoral zone of the tumor.**

### Conclusions

1. The density of distribution of macrophages in the peritumoral zone is interrelated with important clinical and morphological parameters of clear cell renal cancer.
2. The density of distribution of macrophages in the peritumoral zone is a predictor of 5-year postoperative survival in patients with clear cell

kidney cancer.

3. A quantitative assessment of the number of macrophages in the peritumoral zone can be used to predict the course of clear cell kidney cancer as an additional factor, in conjunction with traditional classical prognosis factors.

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## INFLUENCE OF MELATONIN ON THE PROCESSES OF TISSUE ENERGY SUPPLY IN DIABETES MELLITUS

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**Abstract.** The article studies the effect of the pineal hormone melatonin on the processes of energy supply to tissues in diabetes mellitus. A more pronounced (2.6-fold) decrease in the activity of succinate dehydrogenase (SDH) in diabetes suggests significant disturbances in aerobic synthesis of ATP in the mitochondria of the pancreas and intensification of catabolic processes in the liver, which increase the energy potential of the cell, which is necessary for the adaptive response. Melatonin helps normalize SDH activity. The use of molecular biology methods has made it possible to establish the mechanism of action of melatonin on SDH.

**Keywords:** diabetes mellitus, melatonin, succinate dehydrogenase.

Diabetes mellitus (DM) - a group of metabolic diseases characterized by chronic hyperglycemia, which is the result of impaired insulin secretion, the action of insulin, or both of these effects [1, 2, 3]. Pathomorphological changes in the insular part of the pancreas and disruption of the beam structure of the lobules of hepatocytes are associated with the transformation of the main pathways of cellular metabolism, provided by changes in the functioning of key enzymes of the Krebs cycle and glyoxylate pathway. According to some data, experimental diabetes induces changes in the levels of expression of the *sdha*, *mdhjntx*, and *aco* genes, causing the rearrangement of cell metabolism, ensuring the adaptation of animals to pathological conditions [4].

There is no doubt that one of the ways to correct impaired homeostasis is rational pharmacotherapy of diabetes mellitus. In this regard, the pineal hormone melatonin (MT), which is considered a powerful antioxidant and a universal therapeutic agent [5, 6], with a high degree of safety, may be promising [7].

Considering the above, it seemed interesting to us to study the effect

of melatonin on the processes of energy supply to tissues in diabetes mellitus.

**Materials and methods.** We used 30 Wistar rats weighing 120-150 g, divided into 3 groups of 10 animals each: the first one was a control group, the second one was animals receiving alloxan at a dose of 150 mg/kg, and the third group was animals receiving melatonin at a dose of 1 mg/kg against the background of alloxan diabetes. The development of the disease was recorded according to clinical symptoms (polyuria, polydipsia, polyphagia, weight loss) and blood glucose levels. And also studied the main biochemical changes in the blood serum. To assess the daily values of diuresis and glucosuria, urine was collected individually from each rat using urine collectors. After the introduction of alloxan tetrahydrate at a dose of 150 mg/kg, several phases of changes in blood glucose were observed: the first phase was hyperglycemic, reaching a maximum during the first hours; the second is hypoglycemic, which mainly manifested itself during the first days, and finally, the third phase is the phase of persistent hyperglycemia. The first signs of diabetes were manifested in the form of a sharp increase in daily water consumption up to 120 ml, polyphagia, polyuria, hyperglycemia, a sharp loss in weight, hair loss. At different periods of the experiment, trophic ulcers of the leg, gangrene with self-amputation of the tail developed. About 15% of animals died as a result of hyperglycemic or hypoglycemic coma at different times of the development of alloxan diabetes.

During the first days of the experiment after the introduction of alloxan, the animals showed heterogeneity to it. Animals in which diuresis increased from the first day after administration of the drug and remained so almost until the end of the experiment (32-107 ml/day) were assigned to the group with high uremic sensitivity (HUS), and rats in which diuresis decreased on the 15th day to the practical norm (12-14 ml/day) - with low uremic sensitivity (LUS). As a result, the ratio of rats with a syndrome of high and low uremic sensitivity to alloxan was 31 and 24%, respectively.

To confirm the contribution of changes in energy metabolism in the formation of the characteristics of the course of diabetes mellitus, an analysis of the activity indicators of the main marker of the intensity of cellular energy reactions - SDH in the tissues of the liver and pancreas was carried out.

**The results of our studies** showed that the activity of succinate dehydrogenase in the liver in animals with LUS increased to 0.48 nmol/mg protein, and in rats with HUS 0.75 nmol/mg protein in comparison with the data of the control group of rats - 0.4 nmol/mg squirrel. Such an increase in the enzyme activity in rat liver may indicate an acceleration of the CAC

functioning for the adaptation of cellular metabolism in hepatocytes. In comparison with liver tissues, the pancreas showed a low level of SDH activity, which may indicate a decrease in the intensity of the Krebs cycle as a result of the death of Langengars  $\beta$ -cells (in the control 0.6 nmol/mg protein, in rats with LUS -0.48 nmol/mg protein, and with HUS - 0.12 nmol/mg protein).

The results of the study of the activity of succinate dehydrogenase showed that the severity of changes is observed in the liver only in animals with HUS. It is known that the SDH enzyme is substrate specific and is associated with the inner mitochondrial membrane [8]. In this regard, a more pronounced (2.6 times) decrease in its activity in diabetes allows us to speak of significant impairments in aerobic synthesis of ATP in the mitochondria of the pancreas and intensification of catabolic processes in the liver, which increase the energy potential of the cell, which is necessary for the implementation of an adaptive response. The use of molecular biology methods made it possible to establish that the induction of SDH activity occurs due to de novo synthesis [4].

According to the results obtained, reciprocal relations arise between the energy-generating processes in the liver and pancreas, which indicates the intensification of catabolic processes that increase the energy potential of the cell, which is necessary for the adaptive response of the whole organism.

We were able to show that the introduction of melatonin promotes the normalization of SDH activity. Interaction between melatonin and SDH was studied *in silico*. The obtained stereochemical parameters indicate the spatial orientation of melatonin on the A domain of succinate dehydrogenase. It is known that the site of binding and oxidation of succinate is located on the A subunit. The side groups of tyrosine-254, histidine-354 and arginine-399 of this subunit stabilize the succinate molecule, while FAD oxidizes and transfers electrons to the first iron-sulfur cluster, [2Fe-2S] [9].

As a result of the oxidation of succinate, its electrons are transferred to FAD, and then are transferred along the chain from iron-sulfur clusters from the [Fe - S] k [3Fe-4S] cluster. There, these electrons are transferred to the ubiquinone molecule waiting at the binding site. Melatonin possibly inhibits complex II and thus plays a protective role by minimizing the reverse electron transport in complex I, which results in superoxide formation.

When analyzing the data, the docking results were decomposed into main components with conversion from 3-dimensional space to 2-dimensional space.

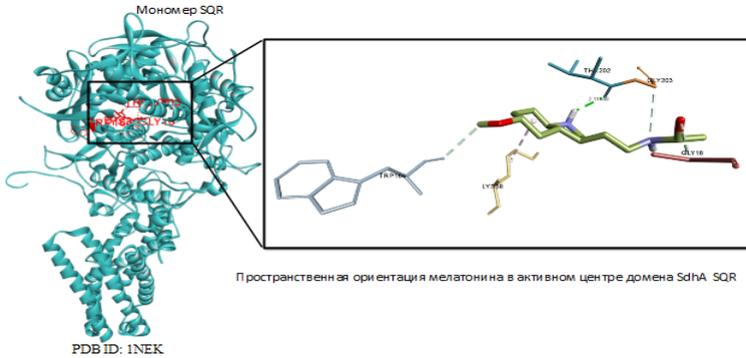
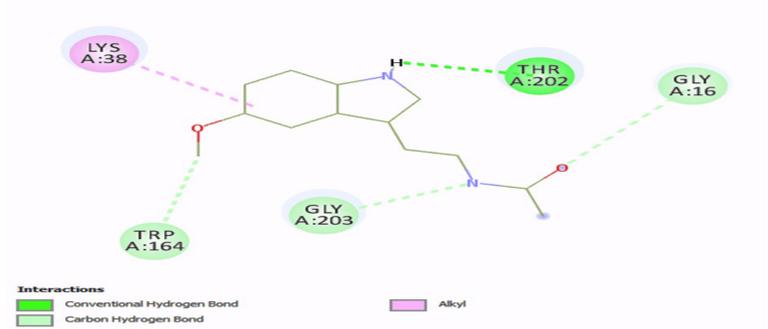


Fig 1. 3D visualization of the binding sites of melatonin with SDH.



G- (complexation energy) = -7,5 kcal/mol  
 Kb - (binding constant) =  $2,9 \times 10^5$   
 RMSD- (standard deviation) = 1,54 Å  
 H-bond (hydrogen bond) - Tyr 202 = 2,11 Å

Fig 2. Conformational map and amino acid residues of the interaction of melatonin with SDH.

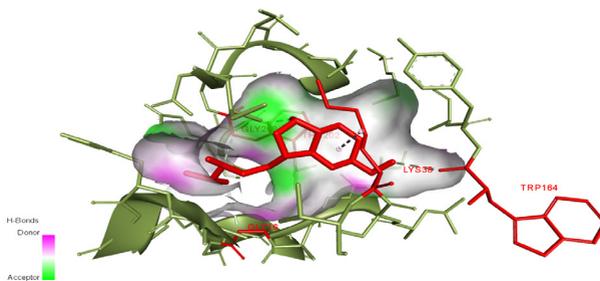


Fig 3. Energy coat of melatonin when interacting with SDH.

Calculation of the energy of conformational changes shows that the formation of a complex occurs due to hydrogen bonds.

Thus, the obtained spatial and energy parameters indicate the competitive binding of melatonin with the ubiquinone binding site and, possibly, this is an important component of the problem of the hormone's participation in maintaining the energy homeostasis of the organism as a whole, and, therefore, its possible role in the genesis of diabetes mellitus.

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**EXPERIENCE OF TREATING PATIENTS WITH ODONTOGENIC  
INFECTION OF THE MAXILLOFACIAL REGION USING THE  
TECHNIQUE OF SATURATION COMBINER ANTISEPTIC AND LOW-  
INTENSITY LASER IRRADIATION**

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**Abstract**

The current state of the problem of odontogenic infection (high frequency, pathomorphosis, increasing resistance of pathogens to antibiotics) determines the relevance of improving diagnostics and developing new alternative methods of treatment, including local treatment.

**The purpose** of the study was to improve diagnostics (laser-fluorescent spectroscopy) and local treatment of purulent wounds with phlegmon of the maxillofacial region using a combined antiseptic and low-intensity laser radiation.

**Materials and research methods.** Examination and treatment of patients on the basis of the clinics of maxillofacial surgery in Moscow (Moscow State University of Medicine and Dentistry 10, 187 patients with purulent infection of the maxillofacial region of working age from 20 to 60 years old were delivered. combined antiseptic (3% hydrogen peroxide barbated with nitric oxide) and low-intensity laser radiation.

**Results and discussion.** Compared with the initial data, normalization of the main parameters of the immune status, in particular CD4 + and CD8 + lymphocytes, and the eradication of priority pathogens were observed. The number of coagulase-negative staphylococci decreased 5 times (from 51.2% to 10.9%), other coccal flora decreased 2-4 times ( $p < 0.01$ ) than in the same period in the comparison group. The frequency of isolation of representatives of the class of bacteroids (*P. melaninogenicus*, *Porphyromonas* spp., Etc.) decreased by almost 4 times, and fusobacteria and anaerobic cocci were not detected. Cleansing and regeneration of the wound took place at the optimum time.

**Conclusion.** Our results allow us to substantiate a combined method of antiseptic treatment of a purulent wound, which does not have a negative effect on the state of the body's immune system.

**Keywords:** phlegmon, 3% hydrogen peroxide solution, nitric oxide, sensitivity to antibiotics, associations of pathogens, laser fluorescence spectroscopy.

Currently, 40 to 60% of patients seeking dental care suffer from acute forms of odontogenic inflammatory diseases. The most common diseases of this group of patients are odontogenic phlegmon, which account for 20-40% of patients hospitalized in the clinic of maxillofacial surgery. The researchers note that against this background, the clinical picture of acute odontogenic infection changes, the number of complications increases (osteomyelitis, mediastinitis, brain abscess, thrombophlebitis of the facial veins and cavernous sinus, endotoxin shock) and even deaths [2, 5, 6].

One of the reasons determining the urgency of the problem of treating odontogenic infection is the progressive development of antibiotic resistance on all continents, which is considered a threat to the national security of states [3, 4, 6]. The memorandum "Global strategy for the containment of antimicrobial resistance" adopted by the World Health Organization in 2001 emphasizes the need to develop alternative methods of complex treatment of pathology associated with resistance [7].

**The purpose of the study** of the study was to improve diagnostics (laser-fluorescent spectroscopy) and local treatment of purulent wounds with phlegmon of the maxillofacial region using a combined antiseptic and low-intensity laser radiation.

**Materials and research methods.** A retrospective study of the data of examination and treatment of patients on the basis of the clinics of maxillofacial surgery in Moscow (Moscow State University of Medicine and Dentistry CCH № 1 of the Federal State Budgetary Institution (Volynskaya) of

the Office of the President of the Russian Federation. Diagnosis "K12.2 Phlegmon and abscess of the oral region" according to ICD 10 In the post-operative period, during complex treatment, low-intensity laser irradiation and a saturated solution of NO in 3% H<sub>2</sub>O<sub>2</sub> (combined antiseptic) were used in the complex treatment in order to influence the purulent wound. Isolation and identification of microorganisms was carried out using the generally accepted principles of aerobic and anaerobic cultivation, determination sensitivity to antibiotics, including the use of a new, patented method of laser fluorescence spectroscopy (LFS) using the "Spectrolux-MB" spectrum analyzer (RF) [1].

The combined antiseptic was obtained according to the author's patent: 100 ml of a 3% solution of H<sub>2</sub>O<sub>2</sub> for 6 minutes was saturated with gaseous NO, obtained using a "Plazon" device (RF). The resulting solution was used to wash the wound from the first day after surgical opening of the phlegmon and further, every day - once a day until the purulent discharge ceases. The duration of use of the antiseptic was individual for each patient, depended on the timing of wound cleansing, but did not exceed 5-7 days. In case of putrefactive necrotic forms of inflammation and the presence of extensive foci of necrosis, the wound surface was treated at least 2 times a day.

The choice of systemic antibiotic therapy was carried out taking into account the results of the LFS. The majority of patients (75.4%) received amoxicillin, including 25.4% - in combination with sodium clavulanate (amoxiclav), 10.2% - ceftriaxone, 9.6% - fluoroquinolones (ciprofloxacin, levofloxacin), 3.2% - gentamicin + metronidazole (flagil), the rest - clarithromycin.

Of the total number of patients, there were 108 (57.5%) men and 79 (42.5%) women. Patients were admitted to the clinic in a state of moderate severity, 117 (62.5%), in a severe state - 70 (37.5%). The patients admitted to the clinic were mainly between the ages of 20-50 (72.5%), that is, it was the most efficient contingent of the population. 52 (27.5%) patients had concomitant diseases: chronic alcoholism (3), diabetes mellitus (4), right-sided chronic calculous pyelonephritis (1), hypertension II – III degree. (3). Treatment of the background disease and control over the general condition of the body were carried out together with specialists of the corresponding profile.

Statistical processing was carried out using the program for a personal computer "Biostat 12.0". P values <0.05 were considered statistically significant before and after therapy for clinical parameters according to the X<sup>2</sup> criterion and for laboratory parameters according to Mann-Whitney.

**Research results.** After analyzing the odontogenic cause of the development of purulent processes in the maxillofacial region in patients, we found that in 87.6% of cases it was the large molars of the lower jaw, mostly right; small root forelocks - in 3.6% of cases, in 5.6% - upper large root forelocks; in 2.1% - small indigenous; incisors and canines in 1.1% of cases. The localization of the purulent process was varied: the pterygo-mandibular (23.7%) and periopharyngeal (21.5%) spaces in combination with the submandibular and other cellular areas were most often affected, since phlegmon of the floor of the oral cavity were diagnosed in 11.6% of patients, pterygo-palatine and infratemporal fossa - in 9.8%, in combination with the temporal region - in 13.3% of patients. In other cases (20.1%), phlegmon were localized in the submental, buccal, and submandibular regions, in 1 patient - in the anterior part of the orbit and infraorbital region.

The local and general nonspecific reaction of the body determined changes in the clinical picture of inflammation: indicators of peripheral blood and other laboratory research methods (immunological, bacteriological, etc.). With an average severity of the disease, ESR during hospitalization was recorded in the range of  $19.38 \pm 9.8$  mm/h, with a severe one -  $36.13 \pm 2.38$  mm/h. It should be noted that by the time of discharge with a moderate severity of the disease, this indicator had normalized. The number of leukocytes in all patients of this subgroup was increased upon admission, but returned to normal by the time of clinical recovery.

Monitoring the leukocyte index of intoxication in 25 patients showed that it was significantly increased in all examined patients (Table 2). At the same time, in contrast to the group of patients treated with the traditional method, by the time the patients of the main group were discharged, this indicator was statistically significantly lower ( $p < 0.05$ ), which indicates the relief of intoxication in patients of the main group at an earlier date.

As can be seen from Table 3, in patients at the height of the disease, an increase in the number of T-lymphocytes and their decrease by the time of discharge were noted.

The number of T-helpers, increased at the height of the disease, was decreasing by the time of discharge, but the immunoregulatory index (IRI) by this time, although it was decreasing, did not reach the norm, this, apparently, occurs due to a decrease in T-cytotoxic cells, which speaks of incomplete restoration of immunity regulation. The number of B-lymphocytes was reduced only in patients with a severe course of the disease and returned to normal by the time of discharge from the hospital.

Normalization of the CAI NBT-test (cytochemical activity indicator of nitro-blue tetrazolium) from 0.61 to 0.2 and 0.78 to 0.25, respectively, in

moderate and severe cases of the disease indicates the complete elimination of bacterial infection ( $p < 0.05$ ).

In general, the immunological status of patients, in whose complex treatment NO was used, is not unambiguous in the course of treatment, but it seems to be more favorable than in the group of patients receiving traditional therapy.

When studying the pH values of the wound contents, it was found that its normalization in the main group of patients occurs similarly to the indicators of the comparison group, that is, on days 11-12 (Fig. 1). However, in the course of treatment, the pH values of the wound exudate were lower than in the comparison group, which can be explained by the properties of the drug (when NO was bubbled into a solution of 3%  $H_2O_2$ , the pH decreased from 5-6 cu to 1.24-1.25 cu). Apparently, this is due to its ability to increase lipid peroxidation, as well as cell death due to the release of reactive oxygen species, which determines the mechanism of its antiseptic properties. It is this fact that limits the period of use of the combined antiseptic (no more than 5-7 days in order to avoid the destruction of cells of the reparative series) and confirms the inexpediency of its use in the II phase of the course of the inflammatory process.

As shown by the results of bacteriological studies carried out in patients of the main group, by the end of the period of use (5th day) of the drug (NO with 3%  $H_2O_2$ ), the bulk of patients showed significant positive changes in the microbial landscape (Table 4), almost 60% patients did not reveal the growth of microbes when inoculating the wound discharge.

In particular, in comparison with the initial data, the number of coagulase-negative staphylococci decreased by 5 times (from 51.2% to 10.9%), the number of other coccal flora decreased by 2-4 times, which indicates that a decrease in microbial contamination in the main group of patients was more significant ( $p < 0.01$ ) than at the same time in the comparison group. The frequency of isolation of representatives of the class of bacteroids (*Prevotella oralis*, *P. buccae*, *P. melaninogenicus*, *Porphyromonas spp.*, etc.) decreased by almost 4 times, and fusobacteria and anaerobic cocci were not detected at all. The frequency of isolation of microaerophilic streptococci decreased 4.8 times. When analyzing the dynamics of the wound process, it turned out that in the first postoperative day, anaerobes were found in the wound in 43.6% of patients with a course of the disease of moderate severity and in 47.9% of severe disease; by 3% - respectively in 17.1% and 19.3%; on the 5th - in 34% and 64% and on the 7th - in 4.7% of patients with a severe course of the disease, that is, effective eradication of the main pathogens of purulent inflammation was observed.

According to APD data, the obtained results of the microbiological study were confirmed, since as a result of the used treatment method, significant differences were established in APD parameters before and after antiseptic treatment of a purulent wound with the developed NO containing an antiseptic. This is mainly due to the detergent effect of the drug, which, as the wound was cleared of microbiota, decreased and did not manifest itself when it was completely cleared. Monitoring the course according to these parameters can be used as a prognostic sign of both cleansing a purulent wound from microbes and stopping antiseptic treatment of the maxillofacial region wound.

The dynamics of the course of the wound process according to APD data confirmed a statistically significant trend towards a decrease in the microbial contamination of the wound both in relation to aerobic and anaerobic flora. The number of "clean" wounds by the 5th postoperative day was 58.1%, which is more than 2.3 times. This indicates a positive effect on the etiotropic microflora of the bubbling NO 3% solution of H<sub>2</sub>O<sub>2</sub>.

**The discussion of the results.** According to a retrospective analysis conducted under the guidance of Professor T.G. Robustova (2006), the frequency of purulent odontogenic infection in the Russian Federation in recent years not only does not decrease, but also undergoes pathomorphosis [5].

It seems that the leading factor determining the urgency of this problem is the growing resistance of microbes to antibiotics, which, in turn, has different mechanisms of development. As is known, they can be caused by the selection of strains with a stable phenotype, genetic recombinations, in which transposons, plasmids, or resistance genes (R-genes) are exchanged, as well as the formation of microbial biofilms [4, 6].

Our results allow us to substantiate the possibility of introducing new methods for determining the sensitivity of bacteria using laser-fluorescent analysis, as well as to propose a combined method of antiseptic treatment of purulent wounds, which does not have a negative effect on the state of the body's immune system.

### **Conclusion**

Thus, clinical data, LFS, bacteriological and immunological indicators revealed in patients with odontogenic phlegmons of the maxillofacial region, in whose complex therapy was included wound treatment with 3% H<sub>2</sub>O<sub>2</sub> solution with bubbling NO, a favorable and smoother course of phase I of the wound process, showed that the period of cleansing the wound from necrotic tissue and purulent discharge in moderate and severe disease was significantly reduced. This indicates that the combined NO/H<sub>2</sub>O<sub>2</sub>

antiseptic - is a powerful antimicrobial agent that promotes rapid wound cleansing, and if used correctly, it does not harm the regeneration process as a whole, activating the entire complex of reparation mechanisms in patients with purulent surgical maxillofacial region infection.

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**Table 1**

**The total number of leukocytes and the level of ESR in patients**

The severity of the disease	Number of leukocytes, absolute number, thousand cells/l		Erythrocyte sedimentation rate, mm/h	
	on admission	on discharge	on admission	on discharge
Medium (n=25)	8,5 x 10 <sup>9</sup> /l ± 2,24	6,6 x 10 <sup>9</sup> /l ± 2,01	19,384 ± 2,98	12,127 ± 2,95*
Severe (n=25)	0,7 x 10 <sup>9</sup> /l ± 2,81**	8,7 x 10 <sup>9</sup> /l ± 2,82*	36,134 ± 2,38**	32,153 ± 2,76**

Note: the differences are statistically significant for \* - on discharge versus study data on admission ( $p_{m-u} \leq 0,05$ ), \*\* - with severe course compared with research data with moderate severity ( $p_{m-u} \leq 0,05$ )

Table 2

**Dynamics of the leukocyte index of intoxication in patients**

The severity of the disease	Leukocyte index of intoxication, cu (norm 0.3-1.5)	
	on admission	on discharge
Medium (n=25)	2,531±1,694	0,373±0,201*#
Severe (n=15)	2,727±1,124	0,475±0,291*#

Note: the differences are statistically significant for\* - at discharge compared with the study data at admission ( $p_{m-u} \leq 0,05$ ), # - for all values compared with the comparison group (control)

Table 3

**Dynamics of changes in the microbiota of wound discharge in patients**

Microorganism type	Discharge frequency (in %)	
	on admission	on the 5th day of treatment
<b>Aerobic and facultative anaerobic microbiota</b>		
Coagulase-negative staphylococci ( <i>Staphylococcus epidermidis</i> , <i>S. warneri</i> , <i>S. saprophyticus</i> )	51,2	10,9#*
Coagulase-positive staphylococci ( <i>Staphylococcus aureus</i> )	4,2	1,5#*
Hemolytic streptococcus ( <i>Streptococcus haemolyticus</i> )	4,1	1,0#*
Non-fermenting gram-negative bacilli ( <i>Acinetobacter spp.</i> , <i>Pseudomonas spp.</i> )	16,3	7,5*
Enterobacteriaceae ( <i>Klebsiella spp.</i> , <i>Enterobacter spp.</i> , <i>Escherichia</i> and etc.)	16,8	8,2*
Gram-positive bacilli ( <i>Corynebacterium spp.</i> )	1,3	0,3*
<b>Obligate-anaerobic and microaerophilic microbiota</b>		
Bacteroids ( <i>Prevotella oralis</i> , <i>P. buccae</i> , <i>P. melaninogenicus</i> , <i>Porphyromonas spp.</i> and etc.)	30,0	8,2#*
Fusobacteria ( <i>Fusobacterium nucleatum</i> , <i>F. necroforum</i> , <i>F. mortiferum</i> and etc.)	9,8	0#*
Microaerophilic streptococci ( <i>S. sanguis</i> , <i>S. mitis</i> , <i>S. intermedius</i> )	48,9	10,9#*
Peptococci ( <i>Peptococcus niger</i> )	15,4	0#*
Peptostreptococci ( <i>Peptostreptococcus anaerobius</i> , <i>P. micra</i> )	14,8	0#*
Coryneform gram-positive bacilli ( <i>Actinomyces spp.</i> , <i>Propionibacterium spp.</i> )	10,2	0#*
Clostridia ( <i>Clostridium septicum</i> )	3,5	0#*
<b>Yeast fungi</b>		
<i>Candida</i> ( <i>Candida albicans</i> , <i>C. krusei</i> , <i>C. tropicalis</i> )	1,3	0#*
<b>Microbiota growth was not detected</b>	-	58,1#*

Note: the differences are statistically significant for\* – at discharge compared with the study data at admission ( $p_{m-u} \leq 0,05$ ), # – for all values compared with the comparison group (control group without this treatment option) ( $p_{m-u} \leq 0,05$ )

## THE INFLUENCE OF LASER EMITTING ON BIOLOGICAL TISSUES

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**Abstract.** This article discusses the uses of the laser on muscle and bone tissue. Their effect on laser beam processing. The calculation of the main indicators characterizing the effect of laser radiation on biological objects was made.

**Keywords:** laser radiation, specific energy, laser beam treatment, energy exposure.

Muscle tissue is characterized by a high moisture content (72-75%), which leaves a noticeable imprint on the degree of damage to the muscle tissue adjacent to the dissection zone. Damage to muscle tissue can be interpreted as a burn.

At the site of exposure to the laser beam, a strip of tissue damage appears, which looks like a dense dry film of a yellow-brown hue.

Thermal breakdown of proteins led to a corresponding change in the smell of the product, the intensity of which depended on the value of the energy exposure to the material and on the presence of additional factors of dissection (freezing of the material).

When the frozen muscle tissue ( $T_t = 265-255$  K) was dissected by a laser beam, a 2-3-fold decrease in the thickness of the damaged area was observed. This is explained by the stabilizing effect of cold, which is expressed in a decrease in the destructive effect of radiation heat and outgoing vapors due to the expenditure of part of their energy for the ice-water phase transition.

From the dissertation work of R. Biktashev, it is known that the length of the area of muscle tissue damage was reduced by 2-4 times when using as an additional factor the dissection of nitrogen vapors, which was supplied from the Dewar vessel through the pipeline to the zone of the beam.

Nitrogen vapors, in addition to the cooling effect on the fabric (its temperature dropped from 295 K to 220-235 K), blew off the evaporation and prevented the material from burning, thereby significantly reducing the extent and degree of damage.

The width of the damage zone is much lower when nitrogen vapor is fed into the beam.

The depth and width of the incision when nitrogen vapor was supplied to the dissection zone (as in the case of freezing tissues) decreased by 8-10% compared to the size of the incision obtained when a laser beam was exposed to muscle tissue at  $T_t = 295$  K in the atmosphere.

As a result of experiments on cutting pork fat with a laser beam, data were obtained indicating the possibility of using  $\text{CO}_2$ -laser radiation to remove excess fat from pork carcasses or from semi-finished products.

When the adipose tissue is cut with a laser beam, the smell of toasted bacon is felt. The surface of the cut wall takes on a yellow tint, inherent in slightly toasted bacon.

The intensity of the color depends on the amount of energy acting on the surface.

At a high power density of the beam ( $\sim 10^7$  W/m<sup>2</sup>), a very rapid transition from the solid state to the vaporous part of the tissue exposed to the laser beam will occur. An increase in the power density with a simultaneous increase in the cutting speed will lead (when a certain threshold is reached) to "turn off" the heat conduction mechanism. Due to this, the tissues belonging to the formed incision will be heated slightly, therefore, the energy of laser radiation will be spent more efficiently. Theoretically, it is possible to calculate the values  $n$  of the power of the beam (with a known value of the diameter of its focus) and the speed  $n$  of the section for various tissues.

The phenomenon of thermal conductivity of solids (to which, with a certain degree of approximation, tissues of animal origin can be attributed) consists in the transfer of energy in the form of heat in an unevenly heated body. In general, the temperature  $T$  at different points of the body changes over time:  $T = f(x, y, z, t)$ , where  $x, y, z$  - are the coordinates of the point,  $t$  - is time. The form of the function is established by solving the Fourier heat equation, which for a homogeneous isotropic body has the form:

$$\frac{\partial T}{\partial t} = a \nabla^2 + \frac{q_v}{c\rho}$$

where  $q_v$ , — the amount of heat generated by an internal heat source per unit volume of the body per unit of time,  $c$  — body specific heat,  $\rho$  - its density,  $\nabla^2$  - Laplace operator,  $a$  — thermal diffusivity coefficient, charac-

terizing the rate of temperature equalization in an unevenly heated body.

### **Laser treatment of bone**

When a bone is dissected by a laser beam, an edge is formed with a charred black surface, which has a gray-white coating. When the resulting section is exposed to a mechanical instrument, the charred part of the bone is easily removed right down to the intact tissue.

Microscopic examination of the bone tissue immediately after exposure to it with a laser beam revealed several zones in the area adjacent to the zone of the formed cavity. A black strip with a homogeneous structure corresponds to a charred area of the bone.

From the side of the formed cavity, a narrow strip of grayish color often adjoined it. In the area of the cortical plate, the charred zone (which does not change color) is replaced by a zone of basophilic-stained bone tissue, which does not have a pronounced pattern. In the spongy tissue of the bone, the carbonization zone was located as islands, the bulk of the altered tissue was represented by coagulated substance of a yellow-brown hue.

Freezing the bone led to a slight reduction in the width of the bone damage zone (by 20-40%) compared to the value of this indicator with similar cutting parameters. At the same time, the width of the incision was reduced during energy exposure.

It is known that when nitrogen vapors were fed into the zone of action of the beam, a decrease in the width of the section was observed (by  $1\text{-}5\text{-}10^{-4}$  m). In this case, the area of tissue damage was reduced by a factor of 3-5 compared to cutting the bone with a laser beam in the atmosphere.

From the point of view of the generally accepted consumer qualities of animal tissues, the bone dissected by a laser beam has worse indicators compared to the changes occurring in the tissues of the studied group when exposed to laser radiation with similar indicators.

This is due to the difference in the physicochemical properties of the studied tissues. In particular, the bone has a higher density (1300-1500 kg/m<sup>3</sup>) in comparison with other studied tissues (muscle - 1070 kg/m<sup>3</sup>, fat -930 kg/m<sup>3</sup>) and a lower content of a relatively easily evaporating component (for example, the rib bone contains moisture 28-31% compared to 72-75% - in muscle tissue, etc.).

**Calculation of the main indicators characterizing the effect of laser radiation on biological objects.**

**Specific cutting energy.**

$$I_{sp.cut.en.} = \frac{W \cdot t}{\rho \cdot V \cdot t \cdot h \left( \frac{a_1 + a_2}{2} \right)} = \frac{W}{\rho \cdot V \cdot h \left( \frac{a_1 + a_2}{2} \right)},$$

Where W - the laser power, W;  
 P-density of meat (bone-1300-1590 kg/m<sup>3</sup>, muscle-1040 kg/m<sup>3</sup>, Fatback-930 kg/m<sup>3</sup>);  
 h- the depth of the dissected tissue, mm;  
 V- cutting speed, m/min;  
 a1- cutting width at the entrance, mm;  
 a2- cutting width at the exit, mm.

Test material	E·10 <sup>-6</sup> , J/m <sup>2</sup>	h, mm	I·10 <sup>-6</sup> , J/kg
Pork	220	73	0.33
	293	74	0.44
	440	78	0.60
	880	80	1.23
Beef	440	93	0.70
	880	96	1.29
Rib	220	18	1.88
	147	16	1.41
	110	14	1.20

**Energy exposition.**

$$E = \frac{W}{V \cdot d^2}$$

where E-energetic exposure, J/mm<sup>2</sup>;  
 W- laser power, W;  
 V- laser speed, m/min;  
 D- beam diameter, mm

Test material	$E \cdot 10^{-6}, J/m^2$	h,mm	V, m/min
Pork	220	73	2
	193	74	1.5
	440	78	1
	880	80	0.5
Beef	440	93	1
	880	96	0.5
Rib	220	18	2
	147	16	3
	110	14	4
Frozen brisket	880	60	0.5
	440	40	1

### Conclusions

1. The action of intense CO<sub>2</sub> laser radiation causes damage due to the action of the thermal factor, the zone of action of which is determined by the diameter of the beam at the focus, the radiation power, the time of its action on a given area of the object, etc.

2. The effect of radiation on a substance depends on the physicochemical characteristics and the nature of the irradiated object.

3. The method and technological features of the dissection (for example, the supply of inert gas to the cutting zone, compression, etc.) have a great influence on the result of exposure to radiation on the material.

4. Thermal exposure at certain energetic exposures for dissection causes damage in tissues, which can be interpreted as a burn, as a result of which their native structure is disrupted, the rate and direction of some specific and nonspecific reactions (oxidative, enzymatic) changes.

5. In the course of the experiment, we saw that the person was removed from the material processing area. The material cutting process is controlled by a computer located outside the laser range. The areas of direct material processing and the control area are territorially separated, which sharply increases safety and hygienics at work. Provides the ability to flexibly design the technological process.

## DISPERSING AS A WAY TO BREAK DOWN BIFIDOBACTERIA CONGLOMERATES IN SUSPENSION

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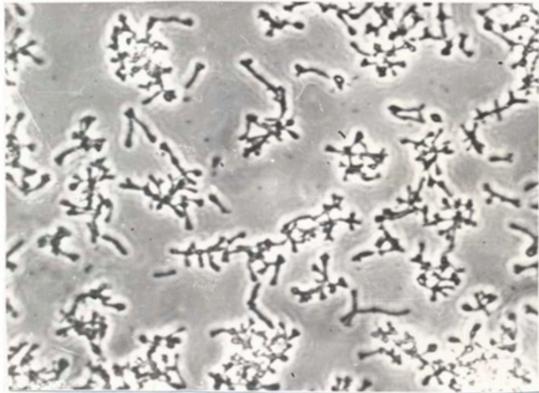
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**Abstract** It is known that during the cultivation of bifidobacteria, when they reach a certain concentration in the culture liquid, the main factor preventing cell division is the formation of conglomerates of microbial bodies. To destroy the intercellular matrix and thereby increase the yield of free colony-forming cells, the researchers used the treatment of suspensions of bifidobacteria with enzyme preparations and ultrasound. For the same purpose, we have proposed a method for dispersing the culture fluid of bifidobacteria by ferromagnetic elements in the electromagnetic field of an apparatus with a flat double-sided inductor. It is shown that the effectiveness of the proposed method depends not only on the mode parameters of dispersion (process duration, size of ferromagnetic bodies, their mass, volume of the processed suspension), but also on the species of bifidobacteria and the cultivation medium. It was found that the natural process of cell death in dispersed suspensions during storage at  $(6\pm 2)$  °C does not occur as intensively as in untreated suspensions, obeys a slightly different pattern and depends on the same factors as the efficiency of dispersion. In general, the developed method makes it possible to increase the number of colony-forming cells of bifidobacteria in suspension by 20 times as compared to that after cultivation without dispersion.

**Keywords:** bifidobacteria, dispersion, culture fluid, intercellular matrix, ferromagnetic elements, electromagnetic dispersant.

### Introduction

It is known [1] that some strains of bifidobacteria in the late exponential and stationary growth phases are capable of budding and dichotomous 2-4-6-8 lateral branching. Multiseptation of branching filaments occurs, blocking of the separation of the formed cells, as a result of which conglomerates are formed, including dozens of microbial bodies - bifidoplast (Fig. 1). Mycelial conglomerates are formed using intercellular connections mainly due to the fusion of cell walls, through capsular structures, including an organic macromolecular matrix synthesized by a cell, which resembles an extracellular matrix formed by microorganisms of various types during the formation of biofilms [2, 3]. The formation of cell associations of bifidobacteria in the culture liquid is accompanied by depletion of nutrients, accumulation of metabolic "poisons", an increase in active acidity, an increase in viscosity, etc.



**Fig. 1 - Agglomerates of cells of bifidobacteria strain *B. Longum* B379 in a nutrient medium [1]**

A number of authors have attempted to reduce the viscosity in microbial cultures of bifidobacteria by destroying the extracellular matrix by enzymatic hydrolysis with macerobacillin G20x or celoviridin, which have a polysaccharide hydrolyzing effect, as well as sonication at a frequency of 10 W/cm for 20 min at 37 °C. To destroy the intercellular matrix and thereby increase the yield of free colony-forming cells, we have proposed a method based on mechanical destruction of conglomerates of bifidobacteria when processing the culture liquid in the working chamber of an electromagnetic disperser (EMD) based on a flat two-sided inductor (TSI) [4,5].

**The purpose of the study** Assessment of the possibility of increasing

the yield of bifidobacterial cells after cultivation in a liquid nutrient medium by processing the culture liquid in an electromagnetic disperser.

Materials and research methods At the first stage of the research, obligate aerobic bacteria *Serratia marcescens* VKM-851 from the All-Union Collection of Microorganisms (Pushchino) were used as a model microorganism. The choice of this strain as a model microorganism was due to the ease of its identification, low demand for nutrient media, and the study of its main properties. The temperature and duration of the cultivation process of *S. marcescens* in mattresses with meat-peptone agar (MPA) were  $(29 \pm 1)^\circ\text{C}$  and 24-30 hours, respectively. A liquid culture was prepared by washing off microorganisms from the agar surface with physiological saline with 10% glycerol. Tubes with 5 ml of the thus obtained liquid culture were placed in the center of the TSI gap and kept, varying the magnetic field strength of the apparatus and the duration of exposure. The biological concentration of living microorganisms in the samples before and after treatment with the EMD magnetic field was determined by the Pasteur-Koch method by plating material samples onto Petri dishes with MPA. The accumulation of cells of various strains of bifidobacteria from the state collection of normal microflora (SCNM) of the G.N. Gabrichevsky Research Institute for Epidemiology and Microbiology was carried out in casein-yeast (CY-5) and thioglycolic (TG) media [6]. The studies used cultures of the third generation (3-fold sequential passage on an appropriate nutrient medium). A predetermined volume of culture fluid (CF) was loaded into the working chamber of the disperser and exposed for the required time to the action of ferromagnetic bodies (FMB) moving under the action of a rotating electromagnetic field created by a two-sided inductor of the apparatus. The volume of the working chamber of the disperser was 220 ml, and the volume of the processed suspension was 100 ml. The loading of ferromagnetic bodies into the EMD chamber did not exceed 10 g. The processing was carried out with a cylindrical FMB with a diameter of 0.15 to 0.75 mm. After processing, the biosuspension was removed from the working chamber and analyzed. The biological concentration of bifidobacteria in biosuspensions was determined by the method of limiting dilutions in liquid nutrient media [1].

**Research results and their discussion** At the first stage of the study, the possible effect on microorganisms of the magnetic field created by the double-sided EMD inductor was assessed, for which the tubes with the *S. marcescens* liquid culture were placed instead of the working chamber in the center of the gap between the sides of the inductor of the apparatus. A voltage was applied to the inductor and the test tubes were kept at a

certain value of the field strength for a specified time. The working range of the current strength in the inductor windings 3 - 5 A corresponded to the magnitude of the electromagnetic field strength 38.4 - 64.0 kA×m<sup>-1</sup>. Then, the number of living microorganisms in cell suspensions was determined immediately after exposure to the field and after 20-day storage at various temperatures. The results of the experiments are presented in tables 1 and 2.

**Table 1 – The content of living cells in suspensions of *S. marcescens* after treatment in an electromagnetic field EMD of various intensities**

Intensity of the field, kA×m <sup>-1</sup>	Cell concentration (10 <sup>9</sup> CFU/ml) when exposed to the field, min					Significance criterion	
	0	0,5	1,0	1,5	2,0	estimated $F_p$	tabular $F_m$ at $p=0,05$
38,4	14,7	13,9	14,5	12,4	11,6	1,38 0,23	2,77
51,2	14,7	14,2	13,5	16,7	15,7		
64,0	14,7	18,0	14,0	12,0	14,5		

Note – Due to the specificity of the method, the confidence intervals of the means are not given [6].

**Table 2 - The content of living cells in suspensions of *S. marcescens* after treatment in an electromagnetic field of EMD and storage at various temperatures for 20 days**

Storage temperature, °C	Intensity of the field, kA×m <sup>-1</sup>	Cell concentration (10 <sup>9</sup> CFU/ml) when exposed to the field, min					Significance criterion	
		0	0,5	1,0	1,5	2,0	estimated $F_p$	tabular $F_m$ at $p=0,05$
4±2	38,4	6,5	4,7	6,8	8,4	7,2	0,98	2,77
	51,2	6,5	5,0	6,1	6,3	7,5	0,25	
	64,0	6,5	5,3	6,3	7,4	6,2		
minus (12±3)	38,4	6,5	6,7	6,2	7,8	6,6	0,89	
	51,2	6,5	7,1	6,5	6,8	5,4	0,58	
	64,0	6,5	7,1	8,6	5,7	5,9		

Note - See tab. 1

Statistical processing of the experimental results (Tables 1 and 2) by the method of pairwise comparisons of conjugate variants ( $F_p < F_m$  [7]) indicates with a probability of 95% the absence of the influence of

the electromagnetic field EMD in the range of strength values from 38.4 to 64.0 kA×m<sup>-1</sup> on the viability of the investigated microorganisms both immediately after treatment and after storage in the studied temperature and time regimes. The absence of the influence of the magnetic field of the apparatus on other types of microorganisms was confirmed in a series of experiments with the exposure of bifidobacteria *B. adolescentis* GO-13 in casein-yeast medium at the maximum value of the field (64.0 kA×m<sup>-1</sup>) for specified time intervals. With the duration of the exposure of the samples in the center of the gap of the sides of the inductor 0, 1, 3, and 5 minutes, the concentration of bifidobacterial cells in the samples was (CFU/ml) 1.4×10<sup>9</sup>, 1.6×10<sup>9</sup>, 1.5×10<sup>9</sup> and 1.7×10<sup>9</sup> respectively. Proceeding from this, in further experiments the effect of the device's electromagnetic field on microorganisms was not taken into account.

At the next stage, the process of dispersion of bifidobacterial conglomerates was studied. The results of determining the content of cells of the *B. adolescentis* GO-13 strain (in thioglycolic medium) in biosuspensions treated for 3 min with ferromagnetic bodies of various sizes, as well as the results of short-term storage of the treated suspensions are presented in tab. 3.

**Table 3 – Influence of the diameter of ferromagnetic bodies on the concentration of bifidobacterial cells and their retention in suspensions treated with EMD**

Diameter of ferromagnetic bodies, mm	Cell count in CL, CFU/ml	Number of <i>B. adolescentis</i> GO-13 cells (CF / ml) in CL stored at 6 °C, days		
		4	6	8
0 (no processing)	3×10 <sup>7</sup>	1×10 <sup>7</sup>	7×10 <sup>6</sup>	2×10 <sup>6</sup>
0,15	2×10 <sup>8</sup>	1×10 <sup>8</sup>	1×10 <sup>8</sup>	9×10 <sup>7</sup>
0,25	2×10 <sup>8</sup>	1×10 <sup>8</sup>	9×10 <sup>7</sup>	6×10 <sup>7</sup>
0,50	1×10 <sup>8</sup>	7×10 <sup>7</sup>	6×10 <sup>7</sup>	1×10 <sup>7</sup>
0,75	3×10 <sup>7</sup>	1×10 <sup>7</sup>	7×10 <sup>6</sup>	2×10 <sup>6</sup>

As can be seen from the data tab. 3, ferromagnetic bodies with a diameter of 0.15 and 0.25 mm have practically the same dispersing ability, which is expressed in the identical and maximum experimentally achieved concentration of bifidobacterial cells, almost an order of magnitude higher than that in untreated CL after cultivation (3 × 10<sup>7</sup> CFU/ml) ... In the suspensions treated with these ferromagnetic bodies, the greatest retention of cells is also observed after exposure to CL for 8 days at a low positive temperature. Using a similar methodological technique, such technological

parameters of the dispersion process as the mass of ferromagnetic bodies and the volume of biosuspension processed in the working chamber of the dispersant were optimized.

The effect of the duration of EMD treatment on the release of free cells from conglomerates in various nutrient media is presented in tab. 4, and for different strains - in tab. 5.

**Table 4 - Dynamics of changes in the concentration of cells of the strain *B. adolescentis* GO-13 in casein-yeast and thioglycol nutrient media**

Growth medium type	Concentration (CFU/ml) of <i>B. adolescentis</i> GO-13 in CL depending on the duration of treatment in EMD, min					
	0	1	2	3	4	5
CY-5	$1 \times 10^8$	$3 \times 10^8$	$4 \times 10^8$	$5 \times 10^8$	$5 \times 10^8$	$3 \times 10^8$
TG	$4 \times 10^8$	$7 \times 10^8$	$6 \times 10^8$	$2 \times 10^9$	$1 \times 10^9$	$1 \times 10^9$

**Table 5 - The influence of the strain belonging of bifidobacteria on the yield of free cells in thioglycolic nutrient medium**

Strain	Concentration (CFU/ml) of bifidobacteria in CL depending on the duration of treatment in EMD, min					
	0	1	2	3	4	5
<i>B. longum</i> B379M	$2,4 \times 10^7$	$3,0 \times 10^7$	$1,7 \times 10^7$	$1,3 \times 10^7$	$1,1 \times 10^7$	$1,0 \times 10^7$
<i>B. adolescentis</i> GO-13	$4,0 \times 10^8$	$7,0 \times 10^8$	$6,0 \times 10^8$	$2,0 \times 10^9$	$1,1 \times 10^9$	$1,0 \times 10^9$
<i>B. bifidum</i> 791	$1,3 \times 10^7$	$7,0 \times 10^7$	$2,1 \times 10^8$	$2,2 \times 10^8$	$2,6 \times 10^8$	$2,0 \times 10^8$

As follows from the data tab. 4, the maximum increase in the concentration of *B. adolescentis* GO-13 cells on both media used in this series of experiments was 5 times. The next series of experiments (Table 5) showed that the type of the cultivated strain of bifidobacteria, apparently due to the formation of cell conglomerates different in their rheological properties, significantly affects the yield of free cells. Thus, the number of *B. longum* B379M cells in thioglycolic medium practically did not increase, and the content of *B. bifidum* 791 bifidobacteria increased after 3-4 minutes of CL treatment by 17-20 times compared to the initial value of  $1.3 \times 10^7$  CFU/ml.

**Conclusion** Thus, on the basis of the conducted research, the following has been established. The electromagnetic field created by the double-sided EMD inductor, even at its maximum value of  $64.0 \text{ kA} \times \text{m}^{-1}$  does not affect the viability of various types of microorganisms both immediately

after exposure for up to 5 min, and after storage of treated samples at low positive temperatures for 20 days. When dispersing biosuspensions by ferromagnetic bodies, the maximum concentration of bifidobacteria as a result of CL treatment is achieved with a process duration of 3-5 minutes. The greatest content of cells in the culture liquid subjected to dispersion is provided, other things being equal, by using FMB with a diameter of 0.15 - 0.25 mm. At the same time, FMBs with a diameter of 0.15 mm contribute to better preservation of disaggregated cells during short-term storage of treated biosuspensions at low positive temperatures. Another important factor that has a significant effect on the release of free cells during disaggregation of bifidoplast is the bifidobacterial strain. If in thioglycolic medium the number of *B. longum* B379M cells practically did not increase, and *B. adolescentis* GO-13 exceeded the initial one by 5 times, then the content of bifidobacteria *B. Bifidum* 791 increased after 3-4 min of CL treatment by 17-20 times compared with an initial value of  $1.3 \times 10^7$  CFU/ml.

In general, the results of the studies performed show that the processing of bifidobacteria suspensions in an electromagnetic disperser after cultivation provides two advantages. First, due to the better survival of bifidobacterial cells during short-term storage at a low positive temperature, the flexibility of the entire technology for preparing dry preparations increases by eliminating the need for immediate freeze drying of grown microorganisms. Second, due to a significant increase (up to 20 times) in the content of viable cells in the culture liquid, the economic efficiency of the production of bifid-containing probiotic and prebiotic dry preparations increases, since proportionally increases the number of doses of the drug, which can be obtained from the unit of mass (g, kg) of the dried biomaterial of the used strain of bifidobacteria.

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## SOLVING TECHNOLOGICAL PROBLEMS USING KNOWLEDGE BASES

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**Abstract.** The proposed approach to the creation of a new generation CAPP system for the design of technological processes is based on the creation of a multi-user system, in which one of the components is a system for calculating cutting conditions, a component of which is a knowledge base. The possibility of increasing the level of automation of this system by automating the input of initial information and the output of the results of calculating cutting conditions is shown. It is demonstrated that the system has formed parametric models of parts and operational workpieces. The main attention is paid to finding search parameters for choosing the necessary block of knowledge from the catalog and preparing input data for making decisions using the found block. When implementing this approach, a number of difficulties arise, the ways to eliminate are devoted to the work.

**Keywords:** CAPP, CAD, calculation cutting conditions, knowledge base, tabular processor, automation of information input and output

### **Introduction**

Computer-Aided Process Planning (CAPP) is an important stage in the life cycle of industrial products, significantly affecting their cost and labor intensity. The transition to digitalization of production requires a radical and very complex transformation of the CAPP. The work [1] considers the principles of creating an automated system for Computer-Aided Process Planning in the context of the transition to expanded enterprises. The necessity of organizing a web-oriented structure of the CAPP is shown, in

which functional components solving technological problems are located, for example, in a private cloud and make it possible to provide a multi-user mode of work of technologists regardless of their location.

Of the directions for improving CAPP indicated in the work, we will consider only the calculations of cutting conditions (CC) and methods of their automation. In this task, a large amount of various regulatory and reference information is used for decision-making, which is mainly contained in technological reference books and standards, and also includes various correspondence tables (tabular algorithms). The CC calculation module is available in all modern CAPP. In most of these systems, input of initial data and recording of calculation results is done manually. For this reason, the task was set to automate the input and output of information for the system for calculating cutting conditions.

### **General approach to the automation of information input into the CC calculation system**

ITMO University has developed the TIS (Technological Integrated System) platform for designing technological processes. This CAPP is an experimental multi-user web-based system, the components of which are designed to solve technological problems associated with the design of technological processes. One of these components is the “TIS — TAP” tabular processor designed for calculating cutting conditions [2]. It consists of the following parts:

1. knowledge base (a set of knowledge blocks);
2. database directory (MongoDB);
3. components of decision making;
4. components of the maintenance of the knowledge base.

The catalog and knowledge base are organized on the basis of the MongoDB document-oriented DBMS, which allows storing information about objects with a variable structure. Having called the processor, the technologist enters the initial data and, after calculating the results, enters the model of the technological process. The knowledge base is organized on the basis of the reference book [3], which contains more than two hundred tables oriented to CNC equipment.

Let us consider a specific example. Let us take the technological chart from the reference book on cutting data for CNC machines (Fig. 1).

<b>СКОРОСТЬ <math>v_c</math> (м/мин) И МОЩНОСТЬ <math>N_c</math> (кВт) РЕЗАНИЯ.</b> Медные и алюминиевые сплавы. Фрезы дисковые прорезные (шлицевые) и лезвиевые быстрорежущие				<b>Фрезерование дисковыми фрезами</b> Карта 102							
№ поз.	Диаметр фрезы $D$ , мм, до	Ширина фрезерования $B$ , мм	Глубина резания $t$ , мм, до	Подача на зуб $S_z$ , мм/зуб, до							
				0,012		0,028		0,070		0,15	
				$v_c$	$N_c$	$v_c$	$N_c$	$v_c$	$N_c$	$v_c$	$N_c$
1	50	4	5	184	0,78	155	1,21	129	1,94	111	2,89
2			10	150	1,15	126	1,78	105	2,87	90	4,26
3	63	4	5	195	0,68	165	1,05	137	1,69	118	2,51
4			10	158	1,00	134	1,55	111	2,49	96	3,70
5	80	8	5	180	1,02	152	1,58	127	2,54	109	3,78
6			10	146	1,50	124	2,33	103	3,75	88	5,57
7	100	8	15	130	1,88	109	2,92	91	4,70	78	6,99
8			10	155	1,31	131	2,03	109	3,27	93	4,86
9	125	16	15	137	1,64	116	2,55	96	4,10	83	6,10
10			20	126	1,93	106	2,99	88	4,82	76	7,17
11	160	16	15	126	2,49	107	3,87	89	6,24	76	9,27
12			20	116	2,93	98	4,55	81	7,33	70	10,9
13	200	16	30	102	3,68	87	5,71	72	9,19	62	13,7
14			20	123	2,52	104	3,91	87	6,30	74	9,37
15	160	16	30	109	3,16	92	4,91	77	7,91	66	11,8
16			40	100	3,71	84	5,77	70	9,29	60	13,8
17	200	16	30	115	2,76	97	4,29	81	6,90	70	10,3
18			40	106	3,24	89	5,04	74	8,11	64	12,1
19	160	16	60	94	4,07	79	6,32	66	10,18	56	15,1

Figure 1. Technological map from the reference book by V. I. Guzeev.

The following parts are highlighted in this table:

1. Number and name of the table;
2. Scope of the table;
3. Input parameters (1 input);
4. Input parameters (2 input);
5. Output parameters.

For this example, the input is performed using the following form, and the results of calculations are recorded in the same form (Fig. 2).

Parameter name	Designation	Value	Dimension
Mill diameter	D	100	[MM]
Milling width	B	4	[MM]
Milling depth	t	5	[MM]
Feed per tooth	Sz	0.012	[MM/ftooth]
Tool life period	To	120	[min]
Surface condition	Pov	no crust	[ ]
Cooling	freeze	no cooling	[ ]

Calculation result

Parameter name	Desig.	Value	Dimension
Cutting speed	$V_T$	131	[M/min]
Power	$N_T$	0.31	[kW]

**Figure 2. Forms for input and output of results in the “TIS — TAP” system**

The solution to the problem of automating data entry is based on the use of the current database, which contains:

1. electronic geometric model of the part (EGM), containing a full set of attributes (GOST);
2. electronic geometric models of operating workpieces;
3. parametric model of the part;
4. parametric models of operational workpieces;
5. parametric model of the technological process.

Fundamentally important for searching through the catalog is the presence of parametric models of operating blanks, which are generated automatically when designing operating blanks in a CAD system [4]. This approach opens up an easy way to select, using appropriate procedures, the desired parameters from parametric models of operational workpieces.

A data schema is a tuple containing only parameter notations. The data tuple names the designations of the parameters together with their values.

We use JSON notation to write a tuple. This syntax was chosen based on the fact that such a notation is one of the possible forms of data representation in MongoDB.

A tuple of data required to find the required block of knowledge in the table processor catalog, which is formed based on the number and name of the table, as well as from the scope of the table, could be represented in the following form:

```
ISK = ("Map" = 102, "Operation" = "Milling", "Cutting conditions" = "v, N", "Material group" = "Copper alloys, Aluminum alloys", "Cutting tool" = "High speed disk mills, High-speed slot mills ", High-speed slot mills, High-speed slot mills ").
```

However, this form of record can be changed to make it more convenient to work with it as follows:

1. Assign codes to the parameter values according to the corresponding classifiers;
2. Each parameter can be expressed in the form of a subdocument with setting the parameters' attributes;
3. If the parameter value is specified by a list of admissible values, then this list is written as a set of admissible values.

The sub-document expressing the attributes of the parameter is named "Sub-document-parameter", it can be written as follows:

1. The parameter is specified with an exact value:

```
{"Par": <parameter designation> ", "nom ": <exact parameter value>}
```

An example of setting the milling width: {"Par": "B", "nom": 4}.

2. The parameter is set by the minimum value:

```
{"Par": <parameter designation> ", " min ": <minimum parameter value>}
```

3. The parameter is set by the maximum value:

```
{"Par": <parameter designation> ", " max ": <maximum parameter value>}
```

An example of setting the maximum allowable cutting depth: {"Par": "t", "max": 10}.

4. The parameter is set by the range of values:

```
{Par ": <parameter designation>", "min": <minimum parameter value>, "max": <maximum parameter value>}
```

5. The parameter is specified by a list of possible values:

```
{"Par": <parameter designation> ", " sp ": [<list of parameter values>]}
```

Example of setting material groups: {"Par": <gm> ", " sp ": [<copper alloys>, <aluminum alloys>]}.

Using a subdocument-parameter, you can set any attributes related to

the given parameter. For example, the accuracy of the parameter values, including the upper and lower deviations, quality, etc.

In accordance with the standard [5], the required technological operation code is selected, consisting of 4 digits. The last digit, the fifth, is put down so that each code is personal. If the operation is repeated, but has a different name, the last digit is changed in numerical order. An example of an extended classifier is presented in Table 1.

**Table 1. Extended classifier of technological operations.**

Operation	Code
Turning longitudinal and undercutting	<b>41101</b>
Boring	<b>42201</b>
Turning, boring	<b>41101, 42201</b>
Cutting threads with rough and fine cutters	<b>41052</b>
Rough and fine thread cutting for short threads	<b>41053</b>
Cutting with chisels	<b>41051</b>
Hole drilling	<b>42101</b>
Hole reaming	<b>42102</b>
Countersinking holes	<b>42103</b>
Reaming holes	<b>42104</b>
Hole tapping	<b>42154</b>
Milling planes	<b>42601</b>
Milling planes, shoulders, contours	<b>42602</b>
Milling grooves	<b>42603</b>
Milling complex surfaces	<b>42604</b>
Milling with disc mills	<b>42605</b>

TIS has a vocabulary system that contains:

- classifiers for encoding parameter values;
- many possible parameters with their own attributes;
- lists of possible parameter values for different situations.

The vocabulary system is used at the stage of forming a block of knowledge, as well as to check the current source data for consistency with the parameters used in the block of knowledge.

Let us write the entire tuple of search parameters in JSON format as a sub-document:

**"ISK": {"karta": 102, "oper": 42605, "rr": [vt, Nt], "gm": [12, 13], "instr": [1234, 1235]},**

Where:

**karta** is the number of the knowledge block that must be used to calculate the specified cutting conditions;

**rr** — a list of cutting parameters to be defined;

**instr** is a list of cutter codes that can be used for a given type of ma-

ching.

It should be noted that a tuple of search parameters can be written without using parameter subdocuments, since parameter values are specified either as an exact value or as a list of possible values.

### **Interaction with a tabular processor and how it is used for TP**

In the presence of parametric models of a part, operational workpieces and a technological process, it becomes possible to automate the input of information instead of its interactive input by a technologist into a tabular processor. The process of calculating cutting conditions in this case is carried out according to the following scheme:

**Z → Kbz → Cd → Vd → R.**

Based on the task Z created by the technologist and transferred to the system for calculating CC, first of all, a search is performed in the Kbz catalog of the table processor to find the necessary block of knowledge responsible for the task of calculating CC.

An important feature of knowledge blocks is the variety of search parameters required to select a block from the catalog. In addition, a search parameter can contain several valid values for it. For example, a block for calculating cutting conditions for machining holes may have a search parameter “processing methods”, the value of which is a variety of methods: drilling, countersinking, reaming. The database used has the ability to store many values assigned to the search parameter, which greatly facilitates the search for knowledge blocks. An important feature of knowledge blocks is the presence of a different composition of input parameters for each block, which greatly complicates the search for the required block.

These features complicate the search for knowledge blocks and make it necessary to search in two stages. At the first stage, a search is performed by the main (identification) parameters: the operation being performed, the grade of the material, the type of the machined surface, the calculated parameter of the cutting mode (for example: cutting speed). Each catalog document describes a specific block of the knowledge base. At the second stage, a tuple of search data is sequentially selected from the selected catalog documents, which forms the second specifying part of the list of search parameters. This part “redefines” the parameter search scheme, since it allows you to determine by what additional parameters you need to check the possibility of using the selected blocks of knowledge. For this example, you need to check which cutting tool is used in the transition for which the cutting speed is calculated. This check is performed by analyzing the current database using the “Prepare initial parameters” functional component. If the check is successful, then the selected block of knowledge is

used by the tabular processor to calculate the selected parameter of the cutting mode. When checking, there may be cases of lack of consistency (correctness) between the checked parameters and the parameters specified in the current database. In this case, the current database is set to the “material grade”, and in the catalog for the checked knowledge block — the related parameter “material group”. The grouping of marks in each block of knowledge can be different, therefore templates are stored in the dictionary system to determine the code of a group of materials in which the mark of the blank material falls. Transcoding is also performed using the Prepare Initial Parameters component when analyzing the current database.

The problem is solved by creating look-up tables for related parameters. The conversion table is organized in such a way that a group of parameters corresponds to individual parameters. In the case of the parameter “processed material”, the group of materials, for example, “Alloyed, structural steels”, will be assigned all the corresponding steel grades, that is, «СТ0, СТ1кп, СТ4кп» etc [6].

**Table 2. Array of related parameters**

Card number (karta)	Designation	Group name (Naimgr)	Row number (Nom)	Material grade group [7]
102	Gr.matr	Copper and aluminum alloys	1	AK12(ФЛ2), AK13, AK9, AK9с, AK9ч, AK9ч, AK9чп, AK8л, AK7, AK7ч, AK7пч, AK10Cy, AK5M, Л96, Л90, Л85, Л80, Л70, Л68, Л63, Л60

Injecting string related parameters into MongoDB:

```
{"karta": "102", "Nom": "1", "Naimgr": "Copper and aluminum alloys", "Gr.matr": ["AK12(ФЛ2)", "AK13", "AK9", "AK9с", "AK9ч", "AK9ч", "AK9чп", "AK8л", "AK7", "AK7ч", "AK7пч", "AK10Cy", "AK5M", "Л96", "Л90", "Л85", "Л80", "Л70", "Л68", "Л63", "Л60"]}
```

When a block of knowledge is found, the stage of preparing the input data necessary for calculating cutting conditions begins. For this, a schema (list) of input data Cd is selected from the catalog document for the found block, which is passed to the “Search for input parameters” functional component to search the current base for the values of the parameters specified in the schema. As a result of the search, the input data tuple Vd

is formed, which is passed to the table processor.

However, the search for source data does not always end with finding the value of the input parameter. A situation similar to the one shown above is possible, when there is no consistency between the parameters required for calculating the CC and the parameters specified in the parametric models of the current base. For example, the cutter diameter can be specified by the range of permissible values, and in the parametric model of the technological process — by the exact value. In this case, you want the value to fall within the appropriate range of values. To do this, you need to re-code the ranges by assigning positions to them, and then enter the position number into the source data table. In this case, the codifiers will be in the vocabulary system.

The component “Search for input parameters” includes the implementation of the recognition of discrepancies and the achievement of the required consistency between the parameters. The component uses templates of the vocabulary system and, in addition, additionally checks the attributes of the transmitted parameters to exclude possible errors. The tuple of the found input parameters is passed to the table processor to calculate the given CC parameter. The results of calculating cutting conditions are automatically entered into the current base in the specified transition model. These results can be viewed and, if necessary, corrected by the technologist.

### Conclusion

Despite the relative complexity of automating data entry into a tabular processor, removing the technologist from data entry allows an order of magnitude to speed up the process of calculating cutting conditions. This approach can also be applied to solve other technological problems: search for a range of materials, search for plans for surface treatment, selection of technological equipment, etc.

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## REFACTORING AS A SOLUTION TO THE PROBLEM OF SOFTWARE QUALITY MANAGEMENT

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*Abstract.* The article discusses refactoring as one of the ways to improve the quality of software. An algorithm for applying algebraic structures in refactoring is deduced, its mathematical basis is shown, and the possibility of its combination with methods of refactoring program models based on design patterns is given.

*Keywords:* software quality, algebraic structures, refactoring, design patterns.

It's no secret that at this time, the software market is developing at a rapid pace. More and more programs appear, each of which has been developing over months and even years, each time acquiring more and more new functions. Naturally, the complexity of their internal structure also grows; in the process of the software life cycle, developers change, each of whom brings his own code style, and possibly his own mistakes. Following this, a situation arises in which programmers stop navigating the structure of the code of such a program, or do it with great effort. The refactoring process helps to combat this phenomenon.

Refactoring of program code is the process of changing its structure so that the external behavior of the source code is not affected [1].

The main objectives of this process are:

- facilitating human understanding of the program code
- optimization of program performance
- improving the structure of the program

It is clear that among the existing development environments at the moment it is difficult to imagine products that do not have functionality to improve the quality of the code and its internal structure. Tools for the analysis of source code and its refactoring, tools for measuring the numerical quality characteristics of the code have become a necessity. Therefore, the creation of tools to improve the quality of the code at the moment is one

of the main tasks in the field of software development.

Changes to the code are necessary not only to improve its appearance, but also to improve its structure. As an example, consider one such problem as duplication. It can arise, for example, due to the fact that in subclasses of the class hierarchy some method is implemented in the same way. In this case, code refactoring can be to transfer the implementation of the method to the base class.

Currently, there are several software tools that implement various types of transformations from one model to another. So, it is logical that before you create your own software tool, you need to find out if there are tools for solving this problem or part of it, and how convenient these tools are.

I have analyzed various tools for refactoring models. Among them were:

- QVT (Query / View / Transformation);
- ATL (the Atlas Transformation Language);
- Henshin;
- IBM Rational Software Architect.

These tools have the ability to describe refactorings, apply them to models, use design patterns, and evaluate model characteristics. However, their disadvantage is that the description of the combination of refactorings in the above tools is either not provided, or is carried out using text, rather than graphic notations. Creation of descriptions of composite refactorings in the considered tools is either impossible or very time consuming:

- QVT / ATL notation is low-level and not graphical;
- Henshin is prone to bugs at work due to the complexity of the description structure of even simple refactorings. The diagram describing the compound refactoring in it will contain all the elements and connections from the diagrams of the original refactorings, as well as additional connections. Because of this, the description of the composite refactoring will be difficult and inconvenient for the designer to work with.
- The IBM Rational Software Architect tool does not allow separating the description of the new refactoring from its application, therefore, it cannot be considered as a ready-made solution to the problem.

As a result of the analysis, the problem arises of finding new refactoring techniques for software models based on various methods, such as algebraic structures and design patterns. It highlights the following steps:

- analysis of algebraic structures and the possibilities of their application in refactoring together with design patterns
- defining a set of basic refactorings based on algebraic structures combined using design patterns;

- specify a way to describe combined refactorings that consist of several basic ones;

It is customary to call an algebraic system a certain set  $G$  (called a carrier) with a set of various operations and relations given on this set (called as a signature).

On the one hand, the concept of a lattice means the algebraic system  $(L, \cap, \cup)$  with two operations satisfying the following properties:

- $x \cup y = y \cup x, x \cap y = y \cap x$   
(commutability of operations)
- $x \cap (y \cap z) = (x \cap y) \cap z, x \cup (y \cup z) = (x \cup y) \cup z$   
(associativity of operations)
- $x \cap (x \cup y) = x, x \cup (x \cap y) = x$   
(absorption laws)

But in addition, a lattice is a set  $(L, \leq)$  with a given partial ordering relation on it; moreover, for each pair of elements  $\{x, y\} \subseteq L$ , there must be exact upper and lower bounds ( $\sup \{x, y\}$  and  $\inf \{x, y\}$ ).

LP-structure is a lattice on which some binary relation with logical-production (Logical Produce, hence the name) properties is specified. These include:

- 1) reflexivity ( $\forall x \in M: (xRx)$ ),
- 2) transitivity ( $\forall x, y, z \in M: (xRy \cap yRz \rightarrow xRz)$ ),
- 3) distributivity, where  $M$  is some set.

The last property implies that with the help of the operations of union and intersection  $\cup$  and  $\cap$ , inherent in lattices as structures, there is a possibility of logical inference in parts and the subsequent combination of its results.

LP-structure gives [2] the ability to carry out automated studies of type hierarchies, including:

- verification (the use of formal methods to prove the correctness or incorrectness of a program by a formal description of its properties),
- equivalent transformations (the result of the program output should not change after various transformations),
- minimization (the number of links should be reduced to the minimum limit that does not affect the main functionality of the program).

An equally important role in software development is also played by design patterns - descriptions of solutions to common problems that arise in the design of systems that can be reused.

The book by J. Kerievsky [3] is devoted to refactoring code using design patterns. Refactoring of the code from the point of view of application of algebraic structures was considered in his papers [4] [5] by S.D. Makhortov.

UML-model  $M$  is a representation of the source code of a program in the form of a collection of a set of elements and relationships. This set will be finite, since the set of links and elements in the code is also finite.

Refactoring based on the design pattern  $P(r_1, r_2, \dots, r_n)$  – we will call the following transform  $PR(p_1, p_2, \dots, p_s, v_1, v_2, \dots, v_m, q_1, q_2, \dots, q_k): M \rightarrow M'$ , which is a refactoring that transforms a model  $M$  into model  $M'$ , where the refactoring parameters are associated with the roles of the template in a certain way. Each of the parameters  $p_i, 1 \leq i \leq s$  и  $q_j, 1 \leq j \leq k$  corresponds to one of the roles  $r_t, 1 \leq t \leq n$  of the template  $P$  of the same type. Each role corresponds to either one of the input parameters  $p_i, 1 \leq i \leq s$ , or one of the output parameters  $q_j, 1 \leq j \leq k$  of refactoring, or one of the input  $p_i, 1 \leq i \leq s$  and one of the output  $q_j, 1 \leq j \leq k$  parameters. The latter is possible only if the model element corresponds to both the input and output parameters of the refactoring, i.e. this element changes during refactoring.

When the  $PR$  refactoring is applied to the  $M$  model, the resulting model  $M'$  finds an instance of the template  $P$ , the meaning of which is completely determined by the actual values of the parameters of the applied refactoring.

As a result, the following refactoring algorithm was derived, which allows the combined use of LP-structures and design patterns in refactoring.

- We compile a list of templates according to which changes will be made based on LP-structures.
- Create a UML diagram (model  $M$ ) from a snippet of source code
- We analyze it for the presence of "bad code smells" (the list of signs listed earlier, indicating the signs of such a code that needs refactoring.)
- We consistently apply to the model ( $M$ ) obtained at the first step, possible refactorings based on lattices (LP-structures), as well as a set of basic and combined refactorings based on design patterns.
- As a result of steps 1-3 we get the modified model  $M'$
- We calculate for the initial and resulting models ( $M$  and  $M'$ , respectively) some metrics by which it will be possible to evaluate how effective the performed transformations are.
- Comparison and output of metrics and displaying changes to the user, so that he can also see what exactly happened to the original model, compare it visually with the original one and cancel some of the transformations if necessary.

It was shown in the work that algebraic structures have a wide potential for application in software refactoring problems. The relationships that are set on them can have the properties of "lifting attributes along the hierarchy

of types", which is one of the important tasks of refactoring.

The presented algorithm describes the joint application of transformation groups both based on operations on algebraic structures and on design patterns, which confirms its reliability and opens up wide opportunities for further improvement and practical application.

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## THEORETICAL SUBSTANTIATION OF THE NONLINEAR LAW OF CONCRETE DEFORMATION

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**Abstract.** A method is developed for assessing the strength of bending concrete and reinforced concrete elements based on a nonlinear law of deformation, which describes the complete diagram of concrete deformation. A two-quadratic analytic dependence is selected that contains the Heaviside function and describes the ascending and descending branches of the  $\sigma - \varepsilon$  diagram.

**Keywords:** strength and deformability of concrete, nonlinear law of deformation, ascending and descending branches of the diagram, Heaviside function.

Currently, there are many different proposals for the creation of calculation methods based on clear physical assumptions using complete diagrams of concrete deformation. For the most part, the proposed methods do not make it possible to derive formulas for determining normal and tangential stresses, as well as to analyze the stress state in arbitrary sections of bending elements. Consequently, to improve the reliability of the elements of reinforced concrete structures and reduce their material consumption, further development and improvement of calculation methods based on clear physical prerequisites using analytical dependences  $\sigma - \varepsilon$  of concrete are required.

In the recommendations of EICC- IFP [1] for short-term compression, the relationship between stresses and deformations is recommended:

$$\frac{\sigma_c}{f_{cd}} = \frac{k \cdot (\varepsilon_c / \varepsilon_{cR}) - (\varepsilon_c / \varepsilon_{cR})^2}{1 + (k - 2) \cdot (\varepsilon_c / \varepsilon_{cR})}. \quad (1)$$

In US building codes [2], the dependence  $\sigma_c = f(\varepsilon_c)$  for concrete consists of two expressions that separately describe the ascending and descending branches of the deformation diagram, respectively, in the areas:

$$\sigma_{c,1} = f_{cd} \cdot \left[ 2 \cdot \frac{\varepsilon_c}{\varepsilon_{cR}} - \left( \frac{\varepsilon_c}{\varepsilon_{cR}} \right)^2 \right], \quad (2)$$

$$\sigma_{c,2} = f_{cd,max} \cdot \left[ 1 - 0,15 \cdot \frac{\varepsilon_c - \varepsilon_{cR}}{\varepsilon_{cu} - \varepsilon_{cR}} \right]. \quad (3)$$

The stresses in the compressed zone of concrete, corresponding to the ultimate relative compression for concretes of all classes, are 85% of the maximum value.

At the suggestion of M.L. Zak and Y.P. Gushcha [3, p.78], the dependence is presented in the form:

$$\frac{\sigma_c}{f_{cd}} = \frac{\gamma \cdot \eta_\varepsilon}{1 + (\gamma - 1) \cdot [\varphi(\eta_\varepsilon)]^c}. \quad (4)$$

The question arises about the possibility of a simpler representation of the deformation curve  $\sigma - \varepsilon$  of concrete. Let us consider some theoretical considerations that satisfy the combination of the conditions of the simplest form of its analytical description and a sufficiently high accuracy of the results obtained.

The research is based on a separate consideration of the ascending branch followed by analytical continuation to the descending branch using the Heaviside function. At the same time, we will take into account that the law of deformation during a one-time short-term loading must contain three constants-parameters of the physical state of concrete:  $E_0$ ,  $E_1$ ,  $E_2$ , where  $E_0$  - is the initial modulus of elasticity of concrete;  $E_1$  - is a constant that takes into account the nonlinear component of concrete deformations, which is formed due to the appearance and compaction of microcracks, as well as the plasticity of the cement gel that binds solid fractions of concrete;  $E_2$  - is a constant that takes into account the intensity of the loss of bearing capacity on the falling branch of the concrete deformation curve.

Let us analyze the representation of the ascending branch of the concrete deformation curve in the form of a two-term dependence:

$$\sigma_c = E_0 \cdot \varepsilon - E_m \cdot \varepsilon^{m+1}. \quad (5)$$

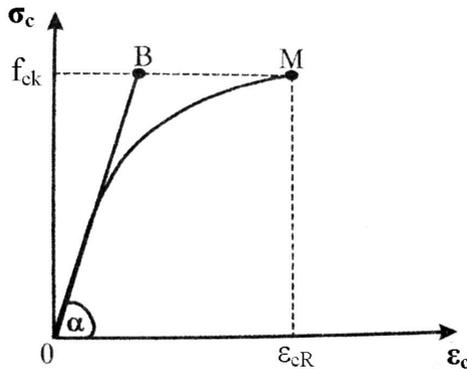
In this case, the following conditions must be met:

$$\left. \frac{d\sigma_c}{d\varepsilon} \right|_{\varepsilon=0} = E_0, \quad (6)$$

$$\left. \frac{d\sigma_c}{d\varepsilon} \right|_{\varepsilon=\varepsilon_{cR}} = 0, \quad (7)$$

$$\max \sigma_c = \sigma_c \Big|_{\varepsilon=\varepsilon_{cR}} = f_{ck}. \quad (8)$$

It is known that condition (6) numerically expresses the tangent of the angle of inclination of the tangent to the OM curve at the origin (Fig. 1) and represents the initial modulus of elasticity. Therefore, expression (7) means that the tangent to the curve OM at point M is horizontal, which corresponds to  $\max \sigma_c = f_{ck}$  in accordance with (8). Thus, curve (5) is drawn through two points: the origin and the extremum point. Depending on the exponent  $m$ , the OM curve is more or less tightly pressed against the sides of the OBM angle. The value of the index  $m$  should be determined as a result of the experiment.



**Fig. 1. Deformation curves  $\sigma - \varepsilon$  at different exponents  $m$ .**

Considering the derivative of the function  $\sigma_c(\varepsilon)$  in the form (5)

$$\frac{d\sigma_c}{d\varepsilon} = E_0 - (m+1) \cdot E_m \cdot \varepsilon^m \quad (9)$$

note that condition (6) is fulfilled automatically, and conditions (7) and (8)

lead to a system of linear equations for the unknown coefficients  $E_0$  and  $E_m$ :

$$\left. \begin{aligned} E_0 - (m+1) \cdot E_m \cdot \varepsilon_{cR}^m &= 0; \\ E_0 \cdot \varepsilon_{cR} - E_m \cdot \varepsilon_{cR}^{m+1} &= f_{ck}. \end{aligned} \right\} \quad (10)$$

The solution of this system of equations leads to the relations:

$$E_0 = \frac{m+1}{m} \cdot \frac{f_{ck}}{\varepsilon_{cR}}; \quad (11)$$

$$E_m = \frac{1}{m} \cdot \frac{f_{ck}}{\varepsilon_{cR}^{m+1}}. \quad (12)$$

Substituting (11) and (12) into equation (5), we get:

$$\sigma_c = \frac{f_{ck}}{m} \cdot \left[ (m+1) \cdot \frac{\varepsilon}{\varepsilon_{cR}} - \left( \frac{\varepsilon}{\varepsilon_{cR}} \right)^{m+1} \right]. \quad (13)$$

Consequently, there are two equivalent expressions for the law of concrete deformation on the ascending branch: the first - through the modules  $E_0$  and  $E_m$  and the second - through the ultimate deformation  $\varepsilon_{cR}$  and the standard concrete resistance  $f_{ck}$ .

In the first case,  $E_0$  and  $E_m$  can be obtained by least-squares processing of the  $\sigma_c$  and  $\varepsilon$  measurement data. In this case, one should simultaneously solve the problem with respect to the values of the indicator  $m$ . It is necessary to set a series of values of  $m$ , and for each of them perform processing of the experimental results, and then make appropriate estimates of the deviations of the experimental points from the theoretical ones. Analyzing these results, it can be concluded that the exponent  $m$  is stable for various concretes. In the second case, dependence (13) expresses the stress  $\sigma_c$  through the coordinates of the extremum point  $\varepsilon_{cR}$  and  $f_{ck}$  the stress curve  $\sigma_c - \varepsilon$ . However, the problem of determining the index  $m$  should be solved, as in the previous case, by processing a series of experiments and choosing the optimal value of the index  $m$ .

Considering (9) under condition (7), we can write:

$$\varepsilon_{cR} = \left[ \frac{E_0}{(m+1) \cdot E_m} \right]^{\frac{1}{m}}. \quad (14)$$

Substituting (14) into (5), we get:

$$\begin{aligned}
 \max \sigma_c &= E_0 \cdot \varepsilon_{cR} - E_m \cdot \varepsilon_{cR}^{m+1} = E_0 \cdot \left[ \frac{E_0}{(m+1) \cdot E_m} \right]^{\frac{1}{m}} - E_m \cdot \left[ \frac{E_0}{(m+1) \cdot E_m} \right]^{\frac{1}{m}+1} = \\
 &= \frac{E_0^{\frac{m+1}{m}}}{\left[ (m+1) \cdot E_m \right]^{\frac{1}{m}}} - \frac{E_0^{1-\frac{1}{m}}}{\left[ (m+1)^{\frac{m+1}{m}} \cdot E_m^{\frac{1}{m}} \right]} = \frac{E_0^{\frac{m+1}{m}}}{E_m^{\frac{1}{m}}} \cdot \left[ \frac{1}{(m+1)^{\frac{1}{m}}} - \frac{1}{(m+1)^{1+\frac{1}{m}}} \right] = \\
 &= \frac{m \cdot E_0^{\frac{m+1}{m}}}{\left[ (m+1)^{\frac{m+1}{m}} \cdot E_m^{\frac{1}{m}} \right]}.
 \end{aligned} \tag{15}$$

Considering (8), we can write:

$$f_{ck}^m = \frac{m^m}{(m+1)^{m+1}} \cdot \frac{E_0^{m+1}}{E_m} \tag{16}$$

or

$$E_m = \frac{m^m}{(m+1)^{m+1}} \cdot \frac{E_0^{m+1}}{f_{ck}^m}. \tag{17}$$

Dependence (17), linking the strength  $f_{ck}$  and the deformative characteristics of concrete  $E_0$  and  $E_m$  in view of its importance, will be called fundamental [4, p. 14]. Thus, from the main dependence (17), a new constant  $E_m$  can be determined from the values of sufficiently justified values of  $E_0$  and  $f_{ck}$ , which are given in the norms.

Consider a graphical analytical method for determining the exponent for the ascending branch.

Dependence (11) is presented in the form:

$$E_0 = \left( 1 + \frac{1}{m} \right) \cdot \frac{f_{ck}}{\varepsilon_{cR}}. \tag{18}$$

Taking into account that  $E_0 = \text{tg}\alpha_0$  we carry out the construction shown in Fig. 2.

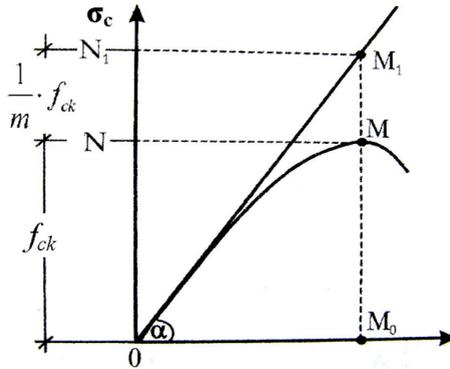


Fig. 2. Scheme of the graphic-analytical method.

To do this, draw a vertical through the point  $M_0$  and find the point of its intersection  $M_1$  with the tangent drawn to the curve  $OM$  at the origin. Then, according to (18), the point  $M_1$  has the coordinate  $\bar{M}_1\bar{M} = (1+1/m) \cdot f_{ck}$ . Note that  $\bar{M}\bar{M}_1 = 1/m \cdot f_{ck}$ . Comparing  $\bar{M}_1\bar{M}$  with  $\bar{M}_0\bar{M}$ , we find the value of the exponent  $m$ . An analysis of the  $\sigma - \varepsilon$  diagrams published in various sources indicates that for various concretes, a stable value of the index  $m = 1$  remains. Figure 3 shows an example of two experimental curves  $\sigma_c - \varepsilon_c$  and the corresponding constructions.

Let us write down the main dependencies for the square law of concrete deformation on the ascending branch at  $m = 1$ . Then dependencies (5), (13), (14), (17), (18), respectively, take the form:

$$\sigma_c = E_0 \cdot \varepsilon - E_1 \cdot \varepsilon^2; \tag{19}$$

$$\sigma_c = f_{ck} \cdot \left[ 2 \cdot \frac{\varepsilon}{\varepsilon_{cR}} - \left( \frac{\varepsilon}{\varepsilon_{cR}} \right)^2 \right]; \tag{20}$$

$$4 \cdot f_{ck} \cdot E_1 = E_0^2; \tag{21}$$

$$\sigma_{cR} = \frac{E_0}{2 \cdot E_1}; \tag{22}$$

$$\varepsilon_{cR} = 2 \cdot \frac{f_{ck}}{E_0}. \tag{23}$$

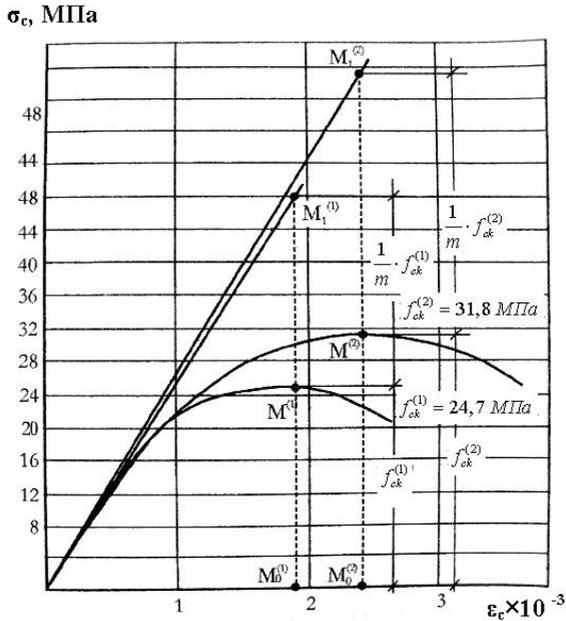


Fig. 3. Experimental curves  $\sigma_c - \varepsilon_c$  taking into account the degree  $m = 1$ .

Next, we write down the main dependences for the two-square law of concrete deformation on the falling branch of the  $\sigma - \varepsilon$  diagram of concrete.

On the descending branch  $\sigma - \varepsilon_{cR}$  of the  $\sigma - \varepsilon$  diagram, we represent the law of deformation in the form:

$$\sigma_c = E_0 \cdot \varepsilon - E_1 \cdot \varepsilon^2 + E_2 \cdot (\varepsilon - \varepsilon_{cR})^2. \quad (24)$$

The value of the modulus  $E_2$  is obtained from the condition that at  $\varepsilon = \varepsilon_{cu}$  the tensile  $\sigma_c^k = 0,85 \cdot f_{ck}$ , then:

$$0,85 \cdot f_{ck} = E_0 \cdot \varepsilon_{cu} - E_1 \cdot \varepsilon_{cu}^2 + E_2 \cdot (\varepsilon_{cu} - \varepsilon_{cR})^2. \quad (25)$$

From (25) we have:

$$E_2 = \frac{0,85 \cdot f_{ck} - (E_0 \cdot \varepsilon_{cu} - E_1 \cdot \varepsilon_{cu}^2)}{(\varepsilon_{cu} - \varepsilon_{cR})^2}. \quad (26)$$

Using the Heaviside function, which in this case can be thought of as a function breaker:

$$H(\varepsilon - \varepsilon_{cR}) = \Big|_{\varepsilon_{cR}} = \begin{cases} 0 & \varepsilon < \varepsilon_{cR}, \varepsilon_R \\ 1 & \varepsilon > \varepsilon_{cR}, \varepsilon_R \end{cases} \quad (27)$$

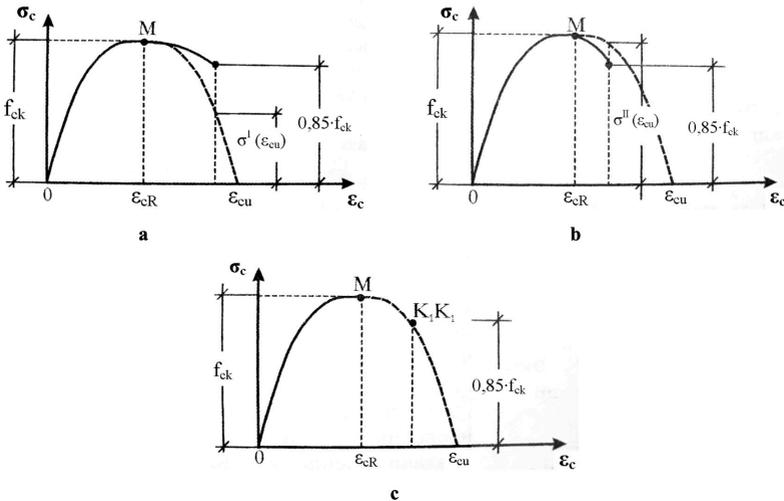
it is possible to write the universal formula for the deformation of concrete in the form of a two-square dependence

$$\sigma_c = E_0 \cdot \varepsilon - E_1 \cdot \varepsilon^2 + H(\varepsilon - \varepsilon_{cR}) \cdot E_2 \cdot (\varepsilon - \varepsilon_{cR})^2 \tag{28}$$

or

$$\sigma_c = E_0 \cdot \varepsilon - E_1 \cdot \varepsilon^2 + \parallel_{\varepsilon_{cR}} E_2 \cdot (\varepsilon - \varepsilon_{cR})^2 . \tag{29}$$

It should be borne in mind that the modulus  $E_2$  depending on the composition of the concrete, can have both positive and negative values, as well as take the values  $E_2=0$  (Fig.4).



**Fig. 4. Diagrams  $\sigma_c - \varepsilon$  for different values of the modulus  $E_2$ :**  
**a** –  $E_2 > 0$ ;  $0,85 \cdot f_{ck} > \sigma'(\varepsilon_{cu})$ ; **b** –  $E_2 < 0$ ;  $0,85 \cdot f_{ck} < \sigma''(\varepsilon_{cu})$ ; **c** –  $E_2 = 0$ .

The formula (28) includes the value of the final strain  $\varepsilon_{cR}$ , which can be found from the table in the EICC-IFP [1].

The value of the modulus  $E_2$  for different classes of concrete are given in Tab. 1.

**Table 1**

Concrete class	$f_{ck}$ , MPa	$E_0 \times 10^3$ , MPa	$E_1 \times 10^6$ , MPa	$\varepsilon_{cR} \times 10^5$ (BC 2.03.01-84*)	$\varepsilon_{cu} \times 10^5$	$E_2 \times 10^{-6}$ , MPa
C8/10	7,5	18,0	10,8	83	390	10,66
C12/15	11,0	23,0	12,02	96	385	11,85
C16/20	15,0	27,0	12,15	111	379	11,83
C20/25	18,5	30,0	12,16	123	378	11,70
C25/30	22,0	32,5	12,0	135	372	11,37
C30/35	25,5	34,5	11,67	147	362	10,75
C32/40	29,0	36,0	11,17	161	357	10,02
C35/45	32,0	37,5	10,98	171	350	9,51
C40/50	36,0	39,0	10,56	185	345	8,49
C45/55	39,5	39,5	9,87	200	339	6,78
C50/60	43,0	40,0	9,30	215	333	4,75

**Conclusions:**

1. The problem of choosing the law of concrete deformation is solved, combining the conditions of a simple form of its recording with sufficient accuracy of the results obtained. The law of concrete deformation is proposed and substantiated in the form of a two-quadratic dependence, which describes the relationship between stresses and strains both on the ascending and descending branches by the complete  $\sigma_c - \varepsilon_c$  diagram, and contains three physical constants.

2. As a result of the theoretical analysis of the proposed law of deformation, a fundamental relationship has been established that connects the strength and deformation characteristics of concrete.

3. The mechanical characteristics were determined for all classes of heavy concrete, contained in the two-square law of deformation, with the aim of their further use in calculations using the developed method.

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## PROVIDING INFORMATION SECURITY MEASURES FOR COMPUTING SYSTEMS

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**Annotation:** The paper presents an analysis and measures to ensure cybersecurity of computing system that allows users to get the ability to store files, host applications, and use the operating system. These measures are universal for most designed computer networks. The aim of the work is to improve the protection of the system from potential cyberattacks.

**Keywords:** information security, virtual server, computing system, prevention of cyber-attacks.

The problem of ensuring information security (IS) arises at the beginning of the design of each new computer system and is relevant in global practice. To solve it, new methods of diagnosing and scanning the developed software for vulnerabilities are being developed everywhere. In particular, a lot of work by V. V. Bondarev, A. A. Birukov, Gregory Boyce were devoted for the issues of measuring, monitoring, ensuring the reliability and quality of the program code and the security of the network infrastructure.

A review of literary sources allows us to conclude about the particular specification of the existing methods and algorithms for ensuring information security, i.e. their development occurs anew for each software complex or system.

In this paper, measures will be formulated to ensure information security in computing systems to increase the level of information security in these services. The principles outlined in the work can be applied in most computer networks.

The considered computing system (CS) is a hardware and software complex that provides its users with the following capabilities:

- creation of virtual machines with pre-installed operating systems

- (IaaS cloud computing delivery model);
- web hosting (shared hosting);
- using file storage and archiving;
- hosting your own applications (server and / or client part, the model of providing cloud computing PaaS).

The CS is provided with the ability to access via the Internet, at least on the basis of standard mechanisms, which ensures the use of heterogeneous client platforms (for example, mobile phones, laptops, PDAs) to access these services.

IS providing includes following stages:

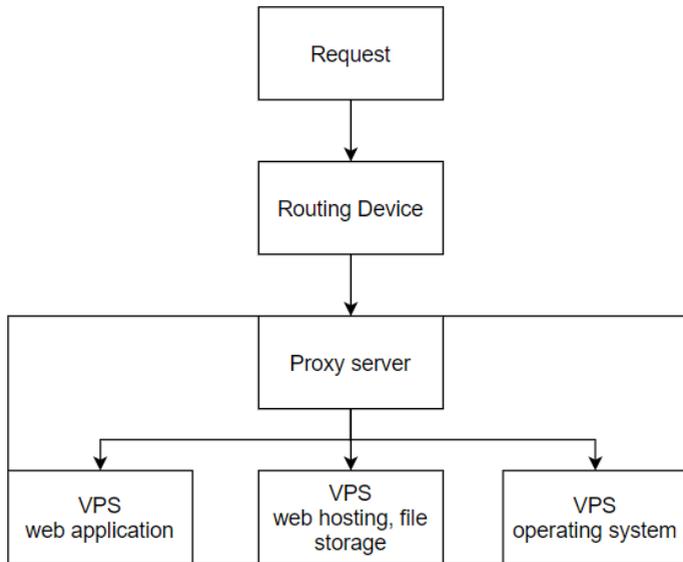
1. Setting the goal of ensuring information security - what the measures are needed for. Based on the goals and tasks performed in the computing system, various measures and degrees of protection will be developed [1]. During this stage, a conceptual IS model is built.

2. Audit of the current system. An independent assessment of the current state of the information security system establishes the level of its compliance with certain criteria, and provides the results in the form of recommendations. The audit is carried out by one or more specialists using various software aimed at finding system vulnerabilities - software scanners, programs to bypass cyber protection, analysis of installed software and search for vulnerabilities in it.

3. After the audit, the found vulnerabilities and problem areas of the system are eliminated. The achievement of the final result is due to the competent configuration of the software used in the computing system, the installation of specialized software, and the updating of the current software tools.

4. After applying the recommendations of the initial audit and eliminating the problems, a second security audit is performed. If the results obtained meet the set goals of ensuring information security, the work has been completed successfully, then the audit will be carried out at a certain frequency to maintain the status of information security of the computing system. If the result is lower than expected, a second attempt is made to eliminate the deficiencies and a second audit is started.

A typical computing system looks like this (Fig. 1):



**Fig. 1 - Block diagram of a computing system**

When accessing a site, service through the address bar of a web browser, console or specialized software, a request is made to the computer system. The request goes through a routing device (RD). If the computer system is located inside an enterprise network or in a home network, then the administrator has access to the RD and can configure the device, set certain rules that will block malicious requests at the network level.

Typically, solutions of this level are located in data centers or cloud service providers. In this case, the configuration of the RD becomes unavailable.

The bottom rectangle, which includes several other rectangles (Figure 1), is the physical server and is controlled by the operating system with the hypervisor. The elements of the schema that are inside the OS with the hypervisor are virtual machines (VM) that users can use (VPS in the figure).

In most cases, the first device to be improved in terms of information security is a proxy server. It is recommended to use a proxy as a reverse proxy, the advantages of the solution:

- a single point to manage settings for access to virtual machines;
- increasing the CS performance by caching static and dynamic con-

tent, interacting with SSL traffic only between the client and the proxy server, compressing outgoing traffic [2];

- hiding the network topology from the outside world.

However, the use of a proxy server has a drawback - a single control point is at the same time a single point of failure, if the integrity of the proxy server is violated, all traffic can be intercepted and compromised [3].

For reducing the number of malicious requests that can penetrate your internal infrastructure, you can use specialized software to detect and block modern attacks on applications. Such software is WAF (Web Application Firewall).

The next element of protection is VMs used by users. To protect VMs that provide PaaS services, vulnerability analyzers are used for finding vulnerabilities in installed auxiliary development tools (libraries). Such systems are based on databases (DB) of vulnerabilities, which are updated daily and their reliability is checked by experts in the field of information security. Often, errors, and very critical ones (for example, remote code execution or denial of service), are found in libraries provided by large software vendors. Therefore, when developing software, a scanner of this kind is necessary.

A monitoring system is used to control the state of the VMs. In addition to obtaining general information about each VM, you can analyze information about the load on disk resources, network and identify abnormal behavior. The use of additional software allows you to compare the versions of the installed software and the database of vulnerabilities. If a vulnerable software solution is found, the administrator will be notified.

When working with data, you can use the Biba Model, which describes a set of access control rules designed to ensure data integrity. Data and subjects are grouped into ordered levels of integrity. The model is designed so that subjects may not corrupt data in a level ranked higher than the subject, or be corrupted by data from a lower level than the subject.

### **Conclusion**

The work considered various measures that can be taken to ensure the information security of the CS. Software tools that ensure system cybersecurity can be found in the public access and used free of charge for personal and commercial purposes. The use of the measures described in this paper significantly reduces the risk of system hacking, theft of personal and credentials, and also reduces the load on most of the CS elements.

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## GAS FORMATION PROCESS IN COMPOSITE AERATED CONCRETE SOLUTION<sup>1</sup>

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**Abstract.** The article is devoted to a comprehensive study of composite aerated concrete. Comparison, analysis and generalization of the experience of traditional and composite aerated concrete production are given. The article examines the pore structure, the process of its formation and the effect on all subsequent characteristics. The character and size distribution of pores in aerated concrete is described. A physical model of the porous structure of modified aerated concrete is proposed.

**Keywords:** structure formation, aerated concrete, gas formers, composite aerated concrete, water repellent.

Today the construction industry is saturated with various building materials, from materials based on cement binder to materials based on organic binder. Polymeric binders are widely used in the production of building materials; they have a low density and high acoustic and thermophysical properties, as well as low water absorption, which positively characterizes these materials. Despite a number of positive characteristics of a polymer binder, there are also disadvantages such as flammability and fragility.

The quality of the microstructure of aerated concrete affects not only its strength, but also such important characteristics as density, thermal conductivity, water absorption, capillary suction and others [1]. At the same time, the issues concerning the dependence of the strength of aerated concrete on its composition and pore structure indicators have not been

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<sup>1</sup> Within the framework of grant funding for research works on the topic: "New composite aerated concrete products based on complex modifiers and industrial waste"

sufficiently disclosed until now.

It has been established that the total porosity and macroporosity depend on the average density of concrete and the water-solid ratio. It is noted that an increase in the water-solid ratio leads to a significant increase in the uniformity of the pore distribution [2]. So, at  $W/S = 0.45$ , concrete was obtained with an average density of  $363 \text{ kg/m}^3$  with a total porosity of  $P = 0.84$  and macroporosity  $P_t = 0.68$ , at  $W/S = 0.65$ , the concrete density is  $350 \text{ kg/m}^3$ ,  $P = 0.86$ ,  $P_t = 0.68$ .

We have investigated the structure of composite aerated concrete made according to the proposed technology with a complex modifier at an increased concentration of a water repellent per unit volume of a cellular mass due to the use of a polymer emulsion and a complex modifier. The influence of a polymer emulsion and a complex modifier on the features of the formation of the structure of composite aerated concrete, which are of decisive importance for increasing its strength at a given average density and reducing its sorption moisture, has been revealed.

The test results are summarized in table 1.

**Table 1 – The nature and distribution of pores by size in aerated concrete**

Types of pores	Pore sizes, cm	The proportion of pores in the total porosity, %
Traditional aerated concrete		
Capillary	1 ?	10 – 12
Air entrained	8 ?	6 – 25
Gas	0,08 – 0,15	50 – 75
Composite aerated concrete with a complex modifier		
Capillary	1 ?	6 – 18
Air entrained	8 ?	4 – 12
Gas	0,05 – 0,10	53 – 75

Table 1 shows that composite aerated concrete differs from the traditional more developed and homogeneous fine-pored structure. Moreover, the diameter of even gas pores does not exceed 1 mm. The decrease in pore volume due to air entrainment into the cellular mass (almost two times) is quite noticeable, which can be explained by the positive effect of the complex modifier, which reduce the energy of air adsorption on the mineral components of the composite aerated concrete mixture. The spatial framework of aerated concrete is formed by successive filling of the concrete volume with relatively small pores (no more than 1 mm in diameter). The extremely dense packing of pores is achieved due to spontaneous spatial rearrangement of the lattice during mixing before the mass swelling,

that is, due to the manifestation of the effect of thixotropic liquefaction of the cellular concrete mixture. The proportion of capillary pores increases, which is explained by the acceleration of the process of gas formation due to the qualitative saponification of the gas former in the polymer emulsion.

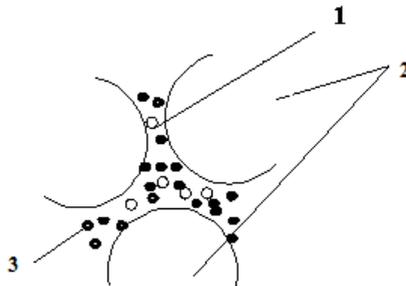
The maximum porosity of aerated concrete with a thickness of interpore partitions of 80-100 microns and a pore diameter of no more than 0.8-1.0 mm reaches 75-80%. This porous structure, formed by pores of various sizes with hydrophobic interpore septa, significantly reduces the likelihood of pore coalescence and provides increased system stability.

Thus, the proposed composition and method of preparing composite aerated concrete make it possible to obtain a material with an improved pore structure. The complex modifier and polymer emulsion allow you to control the gas evolution processes. This technology harmoniously combines the processes of gas release, liquefaction and plastic strength of the aerated concrete mixture.

The proposed physical model of the porous structure of modified aerated concrete is shown in Figure 1.

It should be noted that A.P. Merkin and A.N. Filatov also proposed a physical model of the structure of aerated concrete with a total porosity of more than 90%, formed by a combination of pores of four standard sizes: capillary, air entrained of two types and gas in a conditionally dense packing of cement stone [3].

This physical model does not take into account the influence of such factors as the formation of the pore structure of aerated concrete with the presence of a polymer emulsion that retains the cell structure, and non-hydrated particles of cement binder, thereby preserving the cell structure at the early and subsequent stages of hardening.



1 – gas pore; 2 – air entrained pore; 3 – capillary pore;

**Figure 1 – Physical model of the porous structure of composite aerated concrete**

Studies have shown that these factors make it possible to improve the quality of the pore structure of composite aerated concrete and cement stone in the interpore partition.

This approach makes it possible to improve the production of aerated concrete in the direction of reducing its density and obtaining effective products for modern wall structures: external multilayer walls of a building, ventilated external (facade) walls, external self-supporting walls with insulation, etc.

It is of scientific and practical interest to determine the influence of the water-solid ratio on the distribution of pores in composite aerated concrete.

According to the data obtained, in all investigated composite aerated concrete, the predominant volume is occupied by pores with a radius of ~ 100  $\mu\text{m}$ . The number of such pores increases with decreasing water-solid ratio and with hydrophobic modification of concrete.

The proportion of pores up to 100 microns in size of traditional aerated concrete with a density of 600 - 700  $\text{kg/m}^3$  was on average at  $W/S = 0.42$  and  $W/S = 0.32$ , respectively, 47.8 and 56.0% of the total porosity determined by complete water absorption, which indicates a highly developed microporous structure.

Complex modifiers have a more significant effect on the number of micropores in aerated concrete by an increase in its density. In composite aerated concrete with complex modifiers in the area of small pores (up to 10 microns), a shift towards an increase in pore size is observed, which is not as noticeable as in classical aerated concrete.

In our opinion, this is due to a general decrease in the number of microcapillaries as a result of the hydrophobization of the concrete mixture, as well as the technology of introducing a polymer emulsion with a blowing agent when forming aerated concrete with a reduced water-solid ratio. The presence of hydrophobic modifiers increases the number of small pores by 8-10%, which improves the quality of aerated concrete as an effective wall material.

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