



# SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

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Part 1 - Participants' reports in English

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

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## Foreword

*We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 71 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).*

*This conference was a result of the serious interest of the world academic community, the state authorities of China and the Chinese Communist Party to preserve and strengthen international cooperation in the field of science. We also thank our Russian partner Infinity Publishing House for assistance in organizing the conference, preparing and publishing the conference proceedings in Chinese Part and English Part.*

*I hope that the collection of this conference will be useful to a wide range of readers. It will help to consider issues, that would interest the public, under a new point of view. It will also allow to find contacts among scientists of common interests.*

**Fan Fukuan,**

*Chairman of the organizing committee of the conference*

*"Scientific research of the SCO countries: synergy and integration"*

*Full Professor, Doctor of Economic Sciences*

## 前言

我们感谢所有参加本次会议的“上海合作组织国家的科学研究：协同作用和整合”，感谢您的演讲和报告。代表所有上海合作组织成员国的广泛参与者都谈到此次活动的必要性和重要性。参与者的报告涵盖了广泛的主题性科学问题，我们的联合互动将有助于不同国家的科学家进一步发展理论和应用的现代科学研究。会议结果是来自7个国家（中国，俄罗斯，乌兹别克斯坦，哈萨克斯坦，阿塞拜疆，塔吉克斯坦，吉尔吉斯斯坦）的83位作者的参与。

这次会议的召开，是学术界，中国国家权力机关和中国共产党对维护和加强科学领域国际合作的高度重视的结果。我们还要感谢我们的俄罗斯合作伙伴无限出版社协助组织会议，准备和发布中英文会议文集。

我希望会议的收集对广大读者有用，将有助于在新的观点下为读者提供有趣的问题，并且还将允许在共同利益的科学家中寻找联系。

范福宽，  
教授，经济科学博士，中国科学院院士，会议组委会主席“上合组织国家科学研究：协同与融合”

在经济停滞的情况下确保合作创业的经济安全  
**ENSURING ECONOMIC SECURITY FOR COOPERATIVE  
ENTREPRENEURSHIP UNDER CONDITIONS OF ECONOMIC  
STAGNATION**

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恢复。文章显示了消费者合作在该地区经济中的作用和地位。考虑了评估消费者合作企业经济安全性的主要标准和指标。建立了消费者合作的获利企业集群组的概况。消费者合作组织的现代运作发生在地缘政治和地缘经济不稳定的背景下。在这方面,加强经济安全是执行旨在提高合作组织效率的反危机措施的组成部分。

关键词: 区域经济, 经济安全, 消费者合作, 集群, 创新发展, 进口替代。

**Resume.** *The article shows the role and place of consumer cooperation in the economy of the region. The main criteria and indicators for assessing the economic security of consumer cooperation enterprises are considered. The profile of clustered groups of profitable enterprises of consumer cooperation is built. The modern functioning of consumer cooperation organizations takes place in the context of geopolitical and geo-economic instability. In this regard, strengthening economic security is an integral element in the implementation of anti-crisis measures aimed at improving the efficiency of cooperative organizations.*

**Keywords:** *regional economy, economic security, consumer cooperation, clusters, innovative development, import substitution.*

The vector of state socio-economic development is predetermined by fulfillment of strategic tasks for the coming period and for the perspective. Geopolitical environment, internal problems in management decisions make adjustments in the economic policy that promotes the welfare of all citizens and economic security of the country.

Monitoring the social and economic indicators of the country has demonstrated some growth in selected areas and deceleration in those industries which involve learning to use innovative technologies, technological advances, and consequently investments required to overcome the economic stagnation and provide a sustainable level of economic security.

In order to overcome a crisis situation in the economy, both Russian and foreign top scientists and analysts consider promotion of entrepreneurship activities of small and medium enterprises in forming the competitive environment as powerful area for the country development.

The Russian consumer cooperation in the market-oriented economy of rural regions is a key segment in the small business development in view of specific characteristics organizational and legal forms [1].

Russian cooperative entrepreneurship has a years-long history confirming that this trend is not only promising for recovery in economy and socio-economic development of vast rural areas but also provides means of taking complex decisions on the challenges of the national economic policy in total including the economic security.

Cooperative organizations as subjects of small and medium businesses occupy their own niche in the market sector and ensure socio-economic processes in rural regions. They are represented in the sphere of agricultural products procurement, trading, public catering, and services. The cooperative entrepreneurship is characterized by a possibility of considering climatic, geographical, national, and religious features of each region when shaping and implementing its policy of economic security [2].

Social infrastructure of rural areas is considered as the combination of economic ties and relationship with the economic entities being, on the one part, under the influence of macroeconomic factors, and on the other part, - a specific area-based agricultural structure that takes into account objective requirements of the regional development [3]. Social infrastructure is an integral part of the development of productive forces in a rural area. With the participation of consumer cooperative societies, it ensures proper functioning of agricultural producers and reproduction of labor-power. As the cooperative entrepreneurship is the most developed in rural regions of the country and to the great extent associated with agricultural production in agribusiness, an issue of the structure of economic security is the most relevant.

Due to diversified activities of cooperative societies, organization of economic security requires a special approach and indicators that reflect features, nature of existing threats including clashes of various public interests.

Research of ensuring economic security with respect to consumer cooperation activity by industrial trends is of particular interest as threats are of different

nature, scope, and rate of intensity. Currently, approx. 90% of all poor in Russia live in the country [4]. Rural population, especially in remote countryside, has no modern living conditions. Level of wages in rural areas is lower than average in the countryside. Some rural workers live below a minimum subsistence income. One of the ways towards welfare improvement of rural population is agricultural produce by smallholdings (private plots).

Small countryside farms form a base for the development of agricultural consumer cooperatives and cooperative societies of the Central Union of Consumer Cooperatives of RF. So, according to the preliminary agricultural census report of 2016, in the Russian Federation in private farm holdings there are registered 18.0 mln people in total, from which commercial farms – 2.8 mln items, peasant farms – 174 thousand items, agricultural organizations - 36 thousand items including micro-enterprises - 17 thousand items, agricultural consumer cooperatives – 6,293 items, from which working enterprises – 3,239 items or 51.5% [5].

Every year the working experience of agricultural consumer cooperatives is a subject of discussion at All-Russian Cooperative Congresses. The cooperative entrepreneurship is appreciated as the main mechanism to increase income and provide agricultural producers with the access to sales markets of agricultural produce and food products with the purpose of improving the quality of life in rural areas and ensuring the economic security.

Consumer cooperatives engaged in procurement, storage, processing, and distribution of agricultural produce ensure effective work of agricultural producers related to increasing output of agricultural products, revenue, and income.

Expanding services of consumer cooperatives, enhancing their material and technical base and strengthening productive capacities along with increasing the food production give a possibility to create new jobs, thereby reducing threats to the economic security.

The cooperative entrepreneurship in agribusiness represents a seamless system with a definite structure that unites agricultural producers as cooperatives members, or a consumer society having the respective level of competence and managerial accountability for making management decisions including the economic security of corresponding level.

For successful development of the consumer cooperation the state provides support to agricultural consumer cooperatives. In 2015-2019, agricultural consumer cooperatives were supported under the scheme when for every 40% of cooperative owned resources 60% of state budget resources in the form of grants. Provided grants were used for construction, upgrading, modernization of production facilities, purchase of machinery, equipment, and specialized transport as well as for paying off partial contribution under machinery and equipment leasing agreements. In response to these supportive measures, agricultural producers have

increased production of milk, cattle and poultry meat, fish and seafood as well as potatoes, mushrooms, vegetables, fruit, and berries including wild ones. Data on the level of procurement of main agricultural products of customer cooperation of Central Union of Consumer Cooperatives of RF (Centrosoyuz RF) inter alia by federal districts for the year 2015 are shown in Table 2 and Figure 1.

*Table 1 - Dynamics in the procurement of agricultural products and raw materials by procurement organizations of the consumers' association cooperative societies of Krasnodar territory*

Indicators	Years					2019 in % as against 2015
	2015	2016	2017	2018	2019	
Meat purchases, t	1,077	876	1,010	941	843	78.3
In percentage as against the previous year	100	81.3	115.3	93.2	89.6	x
Milk purchases, t	304	221	173	206	120	39.5
In percentage as against the previous year	100	72.7	78.3	119.1	58.3	x
Potato purchases, t	3,770	4,212	4,180	4,248	4,427	117.4
In percentage as against the previous year	100	111.7	99.2	101.6	104.2	x
Vegetables purchases, t	4,971	5,118	5,172	5,159	5,105	102.7
In percentage as against the previous year	100	103.0	101.1	99.7	99.0	x
Fruit purchases, t	1,389	1,534	1,527	1,547	1,624	116.9
In percentage as against the previous year	100	110.4	99.5	101.3	105.0	x

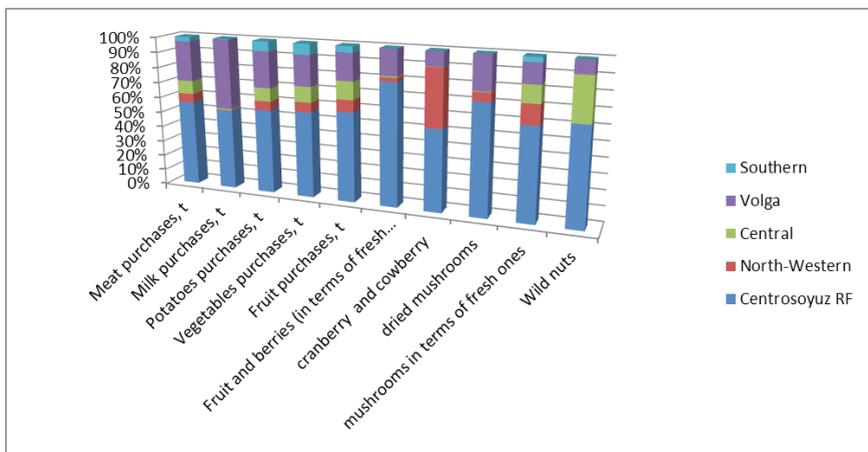
*Table 2 - Purchases of main agricultural products of customer cooperation of Central Union of Consumer Cooperatives RF for the year 2019*

Indicators	Centrosoyuz RF	Including the following Federal Districts of Russian Federation			
		North - Western	Central	Volga	Southern
Meat purchases, t	64,717	6,729	10,056	30,330	3,415
In % as against 2014	97.2	106.1	92.4	98.0	93.0
Milk purchases	221,898	1,748	3,810	191,853	1,570
In % as against 2014	88.8	112.0	90.6	89.4	86.2
Potatoes purchases	52,604	5,779	8,308	22,584	6,128
In % as against 2014	87.2	58.6	89.7	86.5	102.1
Vegetables purchases, t	57,828	6,491	10,479	20,667	7,263

## Scientific research of the SCO countries: synergy and integration

In % as against 2014	87.0	86.8	90.5	82.9	95.6
Fruit purchases, t	39,080	5,032	7,869	11,770	2,657
In % as against 2014	91.1	132.7	83.7	85.0	102.2
Purchases of wild-growing produce, t					
-fruit and berries (in terms of fresh products)	331.13	10.90	3.43	69.50	0.20
- cranberry and cowberry	490.79	343.82	2.40	85.75	-
-dried mushrooms	7.96	0.66	0.05	2.44	-
-mushrooms in terms of fresh ones	136.15	29.02	25.20	28.83	7.0
Wild nuts	63.85	-	28.20	8.37	-

Cooperative societies in agribusiness represent cooperation not only with respect to searching market for agricultural produce but with respect to solving problems with investments, renovation of equipment and facilities, searching for new technologies.



**Figure 1** - Purchases of main agricultural products of customer cooperation of Central Union of Consumer Cooperatives RF for the year 2019

Gaps in cooperative legislation, underestimation of advantages and necessity of development of the agricultural consumer cooperation, insufficient use of motivating factors ensuring economic interest of small farms and encouraging to organize themselves in agricultural consumer cooperatives as well as the

lack of mutual trust between agricultural producers affecting their integration into cooperatives shall be referred to the main problems, factors and reasons which hinder the development of the agricultural consumer cooperation. While researching peculiarities of the structure of economic security of cooperative entrepreneurship as a whole and in agribusiness in particular, the following functional elements need to be emphasized: financial, intellectual and personnel, technical and technological, legal and political, environmental, and information [6].

Economic security of cooperative entrepreneurship activity is structured to ensure sustainable financial development and to mitigate security risks incorporating the influence of internal and external factors.

Classification of financial risks shown on Figure 2 defines the characteristic features that reflect economic objects, phenomena, and processes. Financial risks management in agribusiness cooperative societies is based on the identification of key indicators that reflect profitability, benefits and losses.

To ensure a financial component of the economic security of cooperative societies means to prevent damages from negative impact at all stages, processes, and operations of financial and economic activity.

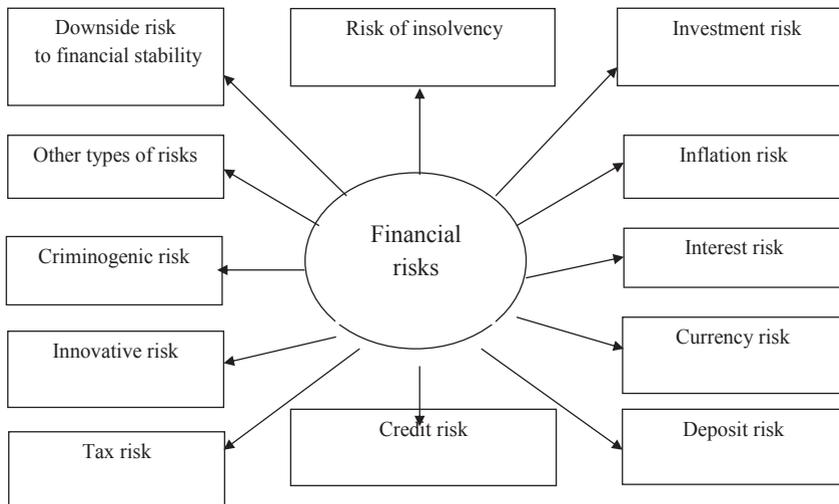
Public-private partnership regulating the private entrepreneurship is an important aspect and component of the economic security of cooperative societies in agribusiness [7].

One of competitive advantages of the cooperative entrepreneurship in market economies is a possibility of participating in various forums, exhibitions, trade fairs for cooperative societies offering them a good opportunity to share experiences, find partners, and define new trends of business activity with the reduced level of threats to economic security [8].

For successful financial and economic activity of consumer cooperatives it is necessary to take measures in order to ensure economic security at all levels including cooperative shareholders, management, personnel, financial, accounting, and fiscal politics, structure of business-processes, level of analyses, evaluation, planning, forecasting, and control [9].

Structure of economic security in the cooperative entrepreneurship has some characteristic features due to the fact that events of each level of financial and economic activities are connected not only with the events inside this level but also with the processes of the other levels [10].

Economic security and competitiveness of consumer cooperatives is an indispensable condition of the social and economic development of rural areas. In market environment through the public-private partnership the cooperative entrepreneurship will receive a boost by improving effectiveness of work and fulfilling its social mission in rural areas.



**Figure 2 - Major financial risks of the cooperative entrepreneurship**

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远程银行业务对俄罗斯联邦银行业发展的影响  
**THE IMPACT OF REMOTE BANKING ON THE DEVELOPMENT  
OF THE BANKING SECTOR IN THE RUSSIAN FEDERATION**

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抽象。作者在本文中考虑了远程银行服务的重要性。指出了主要目标和功能，并对外部环境进行了PEST分析。结论是，银行服务需要维护和发展。

关键词：银行，银行服务，远程银行服务，信贷组织，经济。

**Abstract.** *The authors consider the importance of remote banking services in the article. The main goal and functions are indicated, PEST analysis of the external environment is carried out. It is concluded that banking services need to be maintained and developed.*

**Keywords:** *bank, banking service, remote banking service, credit organization, economy.*

The banking sector in the Russian Federation is developing rapidly. Moreover, successes in its development are often noted at the international level, the investment rating is constantly increasing, and successes in the banking sector affect the economic situation in the country as a whole [1].

In many ways, this development contributes to the maintenance of remote banking service in the financial sector. Improvement and modernization of banking service in general are possible due to the stabilization of the economic situation in the Russian Federation. Taking into account data on the internal and external environment, we will conduct a PEST analysis of the banking sector in Russia, which allows us to easily and conveniently analyze the macro environment of Russian banking sector enterprises.

We distinguish the following categories:

1. Political sphere: the state is a mixed form of the republic, the government is stable, the freedom of speech is enshrined in law and is not limited to the situation of banking sector employees in the Russian Federation. There is a tendency towards legal regulation, however, there is a high level of corruption and bureaucracy, so political changes may be observed in the next 3-5 years, but they may be not significant.

2. Economic sphere: the business structure is developing, the economy is growing, but growth rates are not high. The unemployment rate is low, but many work illegally and do not pay taxes. The economy does not have a high degree of globalization, but on the contrary, it is gradually being closed from some states due to sanctions. The population does not have high income levels. The banks development degree is high, banks use Internet technology. Great economic changes will not be observed in the next 3-5 years, but a recession and a new wave of crisis due to COVID19 are possible.

3. Socio-cultural sphere: the population is approximately 146 million people who enjoy all the basic social benefits - medicine, education and others. The nature of the attitude towards work is generally positive and diligent; public opinion is secular, with free norms of behavior, but with a rejection of non-traditional orientation of sexual morality. There will be no significant changes in the next 3-5 years

4. Technological sphere: the contribution of Russian developers to the market share is not high however; the market is developing actively through the use of foreign technologies. The Internet and mobile technologies are actively developed, more than 80% of citizens actively use the Internet; scientific and technical research is being actively developed, technologies are being introduced and used. A high growth of technologies in the economic sphere is possible in the next 3-5 years,.

In the current conditions, remote banking services will receive a new round of development. All types of banking services that are provided to the client today must be accessible remotely and successfully implemented outside of bank branches. This can only be done using telecommunications and computer technologies.

Recently, two areas of remote banking service have received special development:

1. Internet banking is a set of banking services that are provided to a client remotely outside a bank branch via a website on the Internet;

2. Mobile banking is a set of banking services that are provided to a client remotely outside a bank branch via a mobile device (pad, phone). In this type of remote banking, two subspecies can be distinguished:

- the provision of banking services through the application on a mobile phone with an operating system without visual contact;

- receiving banking services of the application on a mobile phone through voice communication or sending SMS messages.

At the moment all major banks of the Russian Federation and regions of the Russian Federation are more or less represented in all these types of remote banking services.

Of course, remote banking has both strengths and some disadvantages.

We will conduct a SWOT analysis for the remote banking sector. This is method of strategic planning, which consists in identifying factors of the internal and external environment of the organization and dividing them into four categories

- Strengths
- Weaknesses,
- Opportunities
- Threats.

Below is a summary table of the SWOT analysis of external and internal factors of the remote banking sector.

**Table 1.**

*SWOT analysis of the remote banking sector*

<b>Strengths:</b>	<b>Opportunities:</b>
sufficient material and technical equipment, high qualification of employees, sufficient budget, which can be increased or decreased depending on the needs of the remote banking sector	high rate of technology development and their implementation, extensive distribution of the Internet, stable political and social situation in the state
<b>Weaknesses:</b>	<b>Threats:</b>
lack of personnel, a high level of excess working among the entire staff of the organization, as well as a high level of bureaucracy and corruption, which has its manifestations in government	in the next 3-5 years, a serious economic recession and a new wave of crisis, as well as sanctions that hinder the growth of the economy and adversely affect the globalization process

Among the organization's strengths are sufficient material and technical equipment, highly qualified employees, and a sufficient budget, which can be increased or decreased depending on the needs of the remote banking sector.

Weaknesses include a lack of personnel, a large level of excess working among the entire staff of the organization, as well as a high level of bureaucracy and corruption, which has its manifestations in government.

The threats are that in the next 3-5 years, a serious economic recession and a new wave of crisis, as well as sanctions that impede economic growth and adversely affect the globalization process, are possible. This can contribute to the growth of economic crime, and this, in turn, threatens economic security. On the other hand, the crisis also affects the financing of the remote banking sector, since the budget may not receive the necessary funds to cover the expenses of the organization

Opportunities are a high rate of development of technologies and their implementation, the extensive spread of the Internet, a stable political and social situation in the state.

Despite the possible difficulties of using or staffing, remote banking serves the development of the banking sector, as it:

- makes banks more accessible in any conditions;
- helps to relieve bank operators by means of electronic payment processing;
- helps bank customers to complete operations almost around the clock;
- develops the credit sector by submitting online applications

Some banks have gone much further in this direction, completely abandoning the use of the usual banking format and providing only remote services. An example is Tinkoff Bank JSC, which is recognized as the largest remote bank in the world, according to the publication of the international journal on banks and finance *Global Finance* as part of the Best Digital Bank Award [2]

Some forms of remote banking should continue to develop continuously. In particular, development may be necessary in the field of monitoring economic security. Monitoring of economic security involves a comprehensive study of the organization from different sides in order to identify problematic factors in the organization's activities from the point of view of economic security, as well as the study of these factors and the extent of their influence on important processes within the organization [3].

One of the effective ways to monitor economic security is to conduct analytics on topical issues in relation to external and internal threats. For example, to monitor remote banking services, it is important to conduct an SNW analysis (Strength, Neutral, and Weakness), compiling a table and noting certain advantages and disadvantages.

SNW analysis is an analysis of the strengths, neutrals, and weaknesses of an organization. As practice has shown, in a situation of strategic analysis of the internal environment of the organization, it is better to fix the average state for a given situation as a neutral position (Strength - strengths, Neutral - neutrals, Weakness - weaknesses) [4].

The analysis below is displayed using the table.

**Table 2.**  
*SNW – is remote banking analysis*

<b>Test characteristic</b>	<b>Strength</b>	<b>Neutral</b>	<b>Weakness</b>
Degree of vertical integration	+		
Strategic partnerships (interagency collaboration)	+		
Public reputation			+
Information Technology	+		

Budget	+		
Material and technical equipment	+		
The prevalence of the Internet	+		
Organizational structure	+		
General development strategy	+		
personnel resource			+
Leadership within the organization		+	
Relationship with authorities	+		
labor efficiency		+	
Innovations		+	
Employee loyalty	+		
Stable political environment	+		
Stable social environment		+	

There is an established system of evaluation criteria. For example, one of the indicators is a high degree of vertical integration, which is a strong point of remote banking services. Strategic partnerships and government relations are strengths of remote banking

But the reputation among the population, largely due to security problems, is a weakness of remote banking. At the same time, information technology is a strength, due to the availability of many resources.

Material and technical equipment is also a strong point, as it meets all the main advanced technologies and is funded by the budget.

Human resources are a pronounced weakness due to the lack of high-quality employees is always obvious. However, it should be noted that the loyalty of existing employees and a stable political environment are strengths, advantages of remote banking services [5].

The neutral parties can also be called innovations that are applied and implemented regularly, employee productivity and a stable social environment.

In addition, current problems in this area are regulatory control and supervision by regulatory authorities, verification of activities and issues of economic security.

Remote banking services need further support and development, improvement of human resources, maintaining healthy competition, as it ensures the development of the banking system and the Russian economy as a whole.

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俄罗斯教育的数字化转型

**DIGITAL TRANSFORMATION OF RUSSIAN EDUCATION**

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抽象。在这篇文章中，俄罗斯教育的数字化转型被认为是一个机会，可以接受一个人所要求的教育内容，这是一个充满多样性的空间。描述了与大规模过渡到远程学习相关的问题和风险。

关键字。 远程学习，教学个性化，教育空间，教学个性化，教育数字化。

**Abstract.** *In the article, the digital transformation of Russian education is considered as an opportunity to receive educational content demanded by a person, as a space saturated with diversity. The problems and risks associated with the massive transition to distance learning are described.*

**Keywords.** *Distance learning, individualization of instruction, educational space, personification of instruction, digitalization of education.*

In the Address of the President of the Russian Federation to the Federal Assembly dated 15.01.2020, Vladimir Putin said: “Now almost all schools in Russia are connected to the Internet. In 2021, they should no longer just have access to the network, but high-speed Internet, which will enable them to fully embark on the digital transformation of the domestic school, provide teachers and students with access to advanced educational programs, and introduce individual approaches to learning aimed at revealing the abilities of each child” (Address of the President of the Russian Federation).

Thus, at the state level, it was proposed to begin actively and, obviously, in a planned manner, carry out the digital transformation of Russian education in 2021. However, the reality of the first quarter of the two thousand and twentieth year, we can say, simultaneously transformed Russian educational reality and almost the entire population of the country was involved in this process. As is known, from

April 6, 2020, the Russian school switched to distance learning, this also applies to vocational education. “The world of education was divided into two parts: until April 6 and after” (A. Kondakov).

In fact, we all turned out to be witnesses and participants in the greatest large-scale force majeure pedagogical experiment. It is not yet clear whether it has ended or will continue, although some conclusions can already be drawn.

Analyzing the heated discussions of Russians in social networks and relying on the assessments made by the press and forums of teachers, students and their parents, we can conclude that there are two opposing positions: productive learning is only “eye to eye” and there is a great future for the digital transformation of education, which will become more preferable in comparison with traditional forms of education. We are of the opinion that the truth lies somewhere in between.

It is safe to say that the digital educational environment is a modern reality. In which the traditional centers of gravity in the syllogism “the teacher teaches, and the student learns” move to “the teacher does not teach, and the student learns” (Shperkh A.): the teacher is not a relay of knowledge, but acts as a navigator, while the student learns more by himself. At the same time, the responsibility regulator moves towards the student, his responsibility for the result of training is greatly enhanced, and the training itself takes on personalized forms. “Event-related eventuality” (G. Blinov) becomes the communicative essence of the content of education and determines the development vector for each student.

However, at present, there are no regulations for the development of individual educational programs; such regulation is not present in legal acts. Moreover, it should be expected that the result of an all-encompassing digital transformation of the educational space will result in demonopolization in the field of education management.

We should not forget that the digital economy is an economy of services and consumption. In this sense, the digitalization of education cannot directly be associated with learning: the digitalization of education is the widest range of opportunities for obtaining educational content that is demanded by a particular person, which, depending on motivation, can be transformed, for example, into a person’s social or professional competencies.

In order to take full advantage of the wide range of opportunities that digital education provides us with, it is necessary for all students to have equal socio-economic opportunities. The latter means that each teacher and each student must have high-quality devices and the Internet. Just having a smartphone is not enough, you need a tablet, and preferably a laptop. Moreover, a smartphone, a tablet, and a laptop become personal items, i.e. each member of the family should have them. Moreover, in the context of the remote organization of work and study, it becomes necessary to organize personal space for each family member, that is, have a separate room (Yardaeva M.).

It is clear that to realize all of the above requirements is a pipe dream for a significant part of the Russian population at the present stage of economic development. If on the fifth of April this year, only in the second largest city in Russia, St. Petersburg, about 17 thousand schoolchildren did not have computers (Monakhova L.Yu.), what can we say about other, less socially secured and distant from the center regions of our country.

Force-experimental functioning in a digital educational environment, in addition to problems of an economic nature, has also revealed a number of other pain points. First of all, this is the unavailability of platforms on the basis of which it is possible to carry out educational activities to mass users. In the early days of contacting them, almost all of them “collapsed”.

Undoubtedly, the situation stabilized somewhat when the participants in the educational process decided on their preferences in the field of a line of existing, as a rule, free offers.

Another painful point of the rapid digital transformation was the unpreparedness of senior personnel at all levels for the loss of “visual control over management objects”. As a result, requirements began to appear to provide new reporting forms, which increased the already considerable amount of reporting documentation [8]. For example, in some scientific organizations they began to demand reports for the week on the work done, similarly for the month, which essentially repeats the weekly, while before leaving and the remote mode of operation, only one quarterly report was required.

What risks are associated with the forced transition of the educational process to the remote mode? We list some of them (Teachers):

- a drop in student motivation to learn;

- the underdevelopment of the volitional abilities of modern students in the purposeful regulation of their behavior in order to overcome difficulties that stand in the way of independent cognitive activity;

- increased load on the teacher, student and their parents;

- the actual absence in the current model of anonymized general education of an individual approach;

- limitations in the technological capabilities of students arising from differences in their material condition and region of residence;

- formal construction of the educational process, standardization requirements for template, unified algorithms, with a total focus on the USE;

- increasing unstable emotional states of both students and teachers.

Special attention should be paid to the risk associated with breaking out of the pandemic and the return to full-time organization of training (reverse transition from online to offline). It may turn out that some students do not find it acceptable for themselves. Students should be given the right to choose whether to study full-time, remotely, or prefer mixed learning.

An understanding of the complexity of the situation and the way out of it is reflected in the draft federal law introduced May 15, 2020 “On Amending Article 16 of the Federal Law “ On Education in the Russian Federation ” regarding the determination of powers to establish the procedure for the use of e-learning, distance learning technologies in the implementation of educational programs ”, the project was prepared by the Members of the Profile Committee on Education and Science of the Federation Council I. M.-S. Umakhanov, JI.C. Gumerova, D.Yu. Vasilenko and G.B. Karasin.

The initiative group notes that in the current legislation there are a number of gaps regarding the separation of powers between the Ministry of Enlightenment of the Russian Federation and Ministry of Science and Higher Education of the Russian Federation in terms of coordinating the implementation of distance learning technologies, which will require “adjusting by-laws and regulations in terms of regulating the roles and responsibilities of teachers, determining the list of teachers this format of subjects, homework, the duration of the lesson, the conduct of final certification, etc. ” (Project passport).

Summing up, we note that the digital transformation of the educational space is not so much a transition to distance educational technologies as the opportunity for students to receive digital rights to technical means and various resources. The digital educational environment is an environment saturated with a variety of popular content, while the school ceases to be the only aggregate for transferring cultural heritage to new generations. At the same time, there is a great danger that the digital divide will develop into an educational one.

We also understand this in the Address of the President of this year to the Federal Assembly of the Russian Federation: “High Internet access should become a competitive advantage for Russia and our citizens, create a wide space for education and creativity, for communication, for the implementation of social and cultural projects” (Address of the President of the Russian Federation).

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学前教育组织言语治疗师专业能力发展的研究  
**STUDY OF THE DEVELOPMENT OF PROFESSIONAL  
COMPETENCE IN SPEECH THERAPISTS OF PRESCHOOL  
EDUCATIONAL ORGANIZATIONS**

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抽象。 本文介绍了组织高级培训的经验,这些经验有助于学前教育组织的言语治疗师之间的专业能力发展。 本文的作者提出了条件,这些条件的引入有效地影响了PEO言语治疗师的专业能力的形成。 这组作者认为,这些条件有助于在指定的专家组中发展专业能力的系统过程,并以丰富而可靠的实验数据证实其结论。

关键词: 言语治疗师的心理和教学能力,专业自我发展,言语治疗师的专业和教学文化,沟通能力。

**Abstract.** *The article presents the experience of organizing advanced training, contributing to the development of professional competencies among speech therapists of preschool educational organizations. The authors of the article proposed conditions, the introduction of which effectively influence the formation of professional competence of PEO speech therapists. According to the authors, these conditions contribute to the systematic process of developing professional competencies in the designated group of specialists and substantiate their conclusions with authentic and reliable experimental data.*

**Keywords:** *psychological and pedagogical competence of speech therapists, professional self-development, professional and pedagogical culture of a speech therapist, communicative competence.*

Analysis of modern scientific research (B.S. Gershunsky, O.E. Dokuchaeva, L.I. Zvavich, T.G. Kalugina, V.A. Karakovsky, A.E. Kopto, A.V. Lorensova, A.N. Lonshakova, D.Sh. Matrosa, L.I. Markusheva, A.M. Moiseev, I.V. Pavlova, M.M. Potashnik, I. B. Sennovsky, P. I. Tretyakov and others) gives reason to believe, that in the considered works, attention is focused mainly on the problems of basic and

vocational education. Studies aimed at developing the professional psychological and pedagogical competence of speech therapists in PEO are not enough. Today, there are forms and ways of continuing education for employees of the educational system, but they are not united at the goal-setting level, and are not subordinate to the tasks of ensuring professional competence to the modern requirements for school education [1; 6].

An analysis of the continuing education programs offered by the continuing professional education system for speech therapists at PEO showed that educators are offered advanced training programs. This fact indicates an underestimation of the active role of speech therapists in PEO in the development of educational programs that do not have special education, are not provided with optimal conditions for retraining.

The study was conducted in order to determine the possibilities of educational work on the development of professional competence of speech therapists in PEO of Khabarovsk. The experiment was attended by 20 speech therapists at PEO.

The experimental work was carried out in three stages, namely, ascertaining, formative, control.

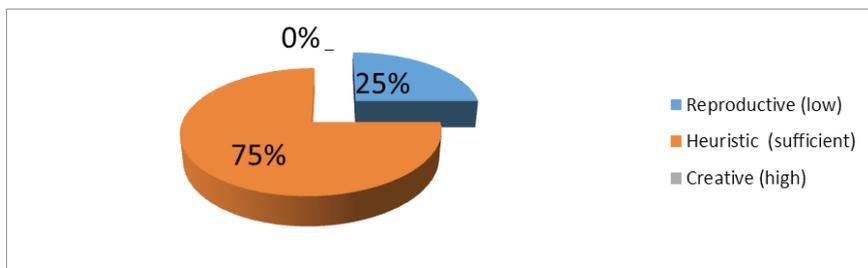
The ascertaining stage of the experiment.

To determine the level of formation of the psychological and pedagogical competence of teachers, we used a diagnostic map compiled by Professor I.P. Rachenko.

Speech therapists were offered questionnaires evaluating the components of the psychological and pedagogical competence of teachers.

After that, the teachers got acquainted and filled in the diagnostic cards, we summarized the data obtained for each component and divided by the number of ratings. The obtained result allowed us to determine the levels of formation of psychological and pedagogical competence.

Thus, the obtained data on the initial state of the formation of psychological and pedagogical competence of the participants in the experiment are reflected in the following figure.



**Fig. 1.** The level of formation of the psychological and pedagogical competence of speech therapists in PEO

Through a survey of speech therapists in PEO, it was determined that only 75% of respondents identify the characteristics and components of the psychological and pedagogical competence of teachers working in PEO speech therapy centers. They also know how to clearly determine the content of psychological and pedagogical competence. The remaining 25% of respondents believe that the formation of psychological and pedagogical competence does not have a strong impact on the effectiveness of the pedagogical process.

In addition, it was determined that most of the group of respondents did not have their own system for enhancing professional psychological and pedagogical competence. They randomly approach issues of its improvement, do not take into account best practices and do not apply innovative methods. Of the entire experimental group, only 16% of speech therapists in PEO have developed a specific system that they apply, tailored to the increasing complexity of pedagogical and creative activities.

Some speech therapists consider the formation of psychological and pedagogical competence one of the important conditions for increasing the success of the pedagogical process. So, they put forward the opinion that the lack of the necessary level of professional, normative, personal and communication skills among speech therapists can cause difficulties in planning classes with preschoolers, revealing their relevance by the fact that, in turn, affects the assimilation of the educational material, and also interferes with the rapid and quality development of the personality of preschoolers.

To ensure a creative approach to solving problems, teachers at speech therapy classes use different methods of education, taking into account the level of their psychological and pedagogical competence.

However, some teachers do not pay the necessary attention to the further development of their psychological and pedagogical competence, which makes it impossible to effectively develop the creative thinking and cognitive activity of schoolchildren, which leads to a weak level of development and the formation of necessary processes for students.

Next, the educational status, age indicator and the level of psychological and pedagogical qualifications of speech therapists were analyzed. This analysis made it possible to determine that some teachers have an outdated view on the tasks of preschool education and speech therapy, the role and place of a teacher in it, are characterized by uniformity in the use of the methodological arsenal, as well as an insufficient level of knowledge about the psychological and pedagogical patterns of child development at different age stages.

As indicators of the willingness of speech therapists to develop their professional competence, we distinguished:

- a high level of motivation to transform professional teaching activities;

- adaptability to changes in the professional pedagogical environment (restructuring its activities in connection with the appearance of changes in general education and the expansion of the variability of educational services);

- the ability to learn new professional competencies, update the forms and methods of speech therapy activities;

- the ability to analyze their own professional pedagogical activity and rebuild it based on the development of new educational and scientific information;

- the ability to solve professional pedagogical problems not according to a stereotypical model, but on the basis of a reflective analysis of the situation.

In the course of our study, it turned out that 52% of teachers have a need for continuing education.

Teachers with a long experience are often oriented towards classes as the main form of work with children, underestimate the partnership in joint and independent activities of children. Beginning speech therapists are theoretically better prepared, know the requirements of modern programs, but have no experience in using various forms of work and are not sufficiently applying new educational technologies.

Available data indicate that teachers are most in need of the development of such psychological and pedagogical competencies as: solving problematic situations, working with professional information, implementing professional self-development, implementing an integral pedagogical process in accordance with the specifics of an educational institution (70%) of the total number of respondents.

For a fairly significant part of teachers, it is necessary to develop the ability for professional communications, designing an object of pedagogical activity, organizing interaction with family and other social partners (30%).

Some feel the need to develop the ability to assess the effectiveness of the object of pedagogical activity, the choice of forms, methods and means of education of children (25%). In addition, the survey participants need skills in developing methodological support (15%), in designing a professional career (14%) and in managing various types of children's activities for a preschooler (46%).

Next, we went on to study the level of communicative competence of speech therapists PEO, which is one of the most important for them. For this, relying on the research of A.A. Bobrova, L.N. Trubina and A.V. Usova, three levels of formation of communicative competence were identified - low, medium and high.

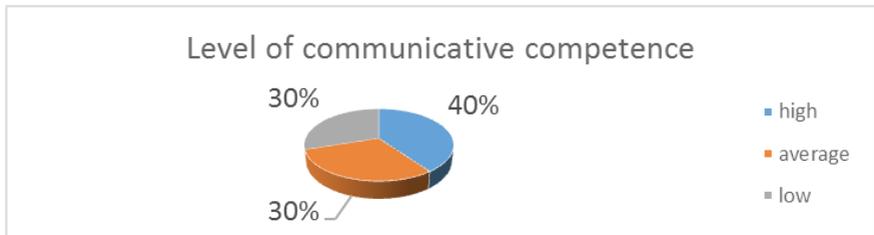
The results obtained by the level of formation of communicative competence among speech therapists were distributed as follows:

30% of respondents have a low level of communicative competence, they are characterized by the presence of superficial knowledge of professional communication, the lack of effective listening skills, competent dialogue and empathy in relation to the participants in the dialogue.

Also, 30% of speech therapists found an average level of formation of communicative competence. These teachers are characterized by the presence of some knowledge on building professional communication with others, they can recognize the behavior of another person and find the most optimal way to communicate. Their ability to set up benevolent relationships is average.

40% of speech therapists showed a high level of communicative competence. They have a systematic and holistic knowledge in the field of professional communication, can easily build a communicative process, possess the skills of effective listening and establishing productive communication.

For a visual presentation of the obtained data, we will draw up the following diagram reflecting the level of communicative competence of speech therapists working in preschool organizations in the city of Khabarovsk.



**Fig. 2.** *The level of formation of communicative competence of speech therapists*

In this regard, it was decided to increase the level of professional psychological and pedagogical competence of speech therapists, aimed at developing the identified problems in order to ensure high-quality work with preschool children, which are characterized by speech disorders.

The purpose of the forming part of the experiment was to increase the level of development of psychological and pedagogical competence of the participants in the experimental group - speech therapists.

The main objective of this stage is to introduce conditions conducive to the effective formation of the professional competence of PEO speech therapists.

To guide the work of teachers, a program was created, the subject of which was built in accordance with the requests of teachers.

The program is reflected in the planning of work for the school year.

As incentives that support the activity of speech therapists with an undeveloped position of self-development, external measures were used: training in courses, attending various seminars, methodological associations, acquaintance with the experience of other teachers, etc. The opportunity to participate in innovation helped to stimulate interest in work.

For teachers with an active position of self-development, a great incentive is to work on trust, the opportunity to exchange experience with colleagues, the offer to work in depth in a particular area of educational work within the framework of a general educational institution. Only a system of measures that implies an active form of training and the interaction of teachers - seminars, workshops, trainings, consultations, conversations can minimize such obstacles as one's own inertia and inability to allocate one's time. We believe that it is difficult to overestimate the importance of self-education for improving the professional psychological and pedagogical competence of speech therapists.

The self-development of speech therapists is the central link in the successful development of a general educational institution, the educational system as a whole and the teacher himself, his level of professional and technological competence.

Among the variety of forms of improving the skill of teachers that were used in a general educational institution, one can single out contests of various subjects. The tasks of the competitions were: identification of talented teachers, their support and encouragement. In the process of the contest, interesting experience with children and new pedagogical technologies are revealed. The participation of the teacher in the competition, and even more so the victory, increases his rating, gives him the right to material incentives, and ensures the development of qualifications.

We have noticed that the competition becomes a learning moment in the preparation of the contestant: you need to comprehend your own experience, analyze, generalize. And how much special literature is read during preparation - both in psychology and in pedagogy. The number of requests for help and consultation with specialists is increasing. All this becomes a step in self-development and increasing the professional psychological and pedagogical competence of the teacher.

Having examined the process of formation of professional competence of teachers in the educational process, we came to the conclusion that traditional forms and methods of forming professional competence of teachers are not effective enough. This is due to the frontal nature of professional teacher training, the low level of implementation of the fundamental achievements of the theory of education in the correction process, the scientific basis for the formation of competence that is not sufficiently developed, the lack of a consensus on the nature and structure of professional competence of speech therapists, and the random nature of the formation of teachers' competence. All this affects the analyzed phenomenon.

Speech therapists can be encouraged to participate positively in the development of their competencies with the help of a competency development plan that can:

- be based on a clear model of teacher competency with a sound theoretical basis on which consensus can be reached;
- promote self-reflection of speech therapists;
- respect the various starting points and levels of interest of individual speech therapists, offering a combination of options, incentives and requirements;
- leave room for preschool autonomy in the implementation of plans for continuing professional development.

The key question is: “How to inspire speech therapists to be active, experienced professionals who take responsibility for their own professional development?” Teachers vary in style of learning, level of involvement and understanding of the benefits of acquiring and developing their competencies. Therefore, their orientation to internal or external incentives for participation in professional development will be different.

The participation of speech therapists in the development of competencies can be encouraged by offering a combination of opportunities, incentives and requirements. Opportunities for developing competencies must satisfy the following conditions:

- matching needs at all levels
- building a bridge between the needs of the teacher and the needs of PEO (and the education system);
- accessibility, relevance and diversity of the offered opportunities;
- proper coordination between the content of the educational process and the recipients of educational services at each stage;
- be based on dialogue with stakeholders (teachers and unions, PEO leaders and employers, school administrations and national ministries, educators and universities) at all levels to ensure commitment and common understanding.

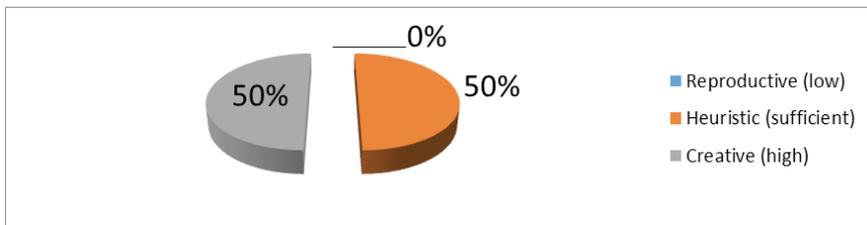
The purpose of the forming part of the experiment was also to increase the level of professional-pedagogical culture of the participants in the experimental group, speech therapists, and to establish the relationship between the level of professional-pedagogical culture and the effectiveness of the pedagogical process. The main objective of this stage is the introduction of conditions conducive to the effective formation of a professional and pedagogical culture of speech therapists.

In conclusion, recommendations were developed for teachers on the effective formation of communicative competence in the framework of professional courses for the development of professional competencies [5]:

1. Watch movies simulating communication skills in class.
2. Use modern technology.
3. Strengthen active listening.
4. Use group presentations and activities.
5. Ask open-ended questions.

6. Use tasks and actions that contribute to the development of critical thinking.
7. Use reflective learning opportunities.
8. Use training moments.

At the last stage of the study, the data obtained during the ascertaining and formative stages were compared and analyzed.



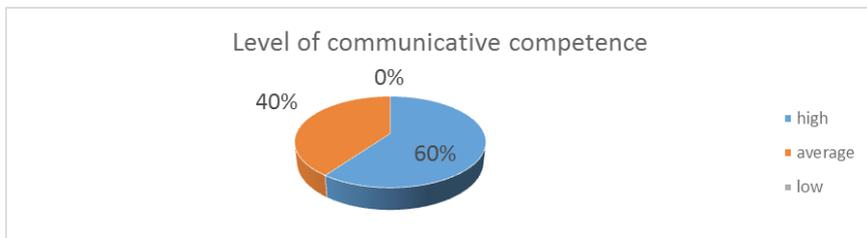
**Fig. 3.** *The level of formation of psychological and pedagogical competence at the control stage*

An analysis of the results showed that there have been significant changes in the levels of psychological and pedagogical competence: the number of teachers with a low level has decreased (from 25% to 0%), the average level has decreased (from 75% to 50%), the number of teachers has increased, which belong to a high level (from 0% to 50%). From a conversation with each of them it followed that this proposed program provided them with the key competencies necessary for a specialist living in a multicultural world.

Next, we went on to study the dynamics of the development of the level of formation of communicative competence among teachers participating in the study.

These results show that the majority of teachers - 12 people participating in the study, have a high level of communication competence. The remaining teachers show an average level. Low indicators were not found.

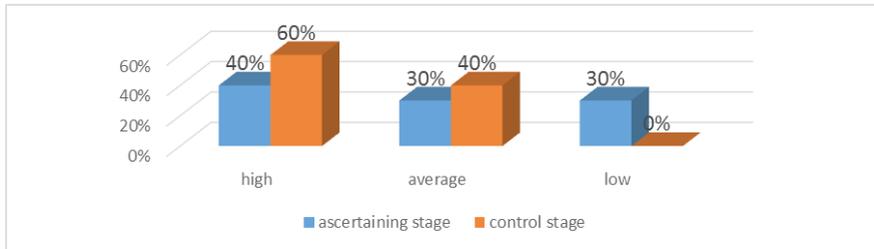
For clarity of the data obtained, we present it in the form of the following diagram.



**Fig. 4.** *The level of formation of communicative competence of teachers (control stage)*

In Figure 4, you can see that 60% of respondents have a high level of formation of communicative competence at the control stage of the study, and 40% have an average level.

In order to trace the dynamics of the development of the level of communicative competence among teachers, we draw up the data obtained during the control and ascertaining stage of the study in the form of the following diagram.



*Fig. 5. Dynamics of development of the level of formation of communicative competence among teachers*

In Figure 5 we see the positive dynamics of the development of communicative competence of teachers. So, low indicators were not found, while at a ascertaining stage, 30% of students with a low level of communicative competence were identified.

An important indicator of the growth of communicative competence among teachers is a high level indicator, which grew by 20% during the control phase of the study.

The results obtained indicate that the introduction of a systematic and focused work on the formation of psychological and pedagogical competence using the capabilities of educational institutions and special courses allows us to achieve a tangible increase in the levels of its formation among teachers of a general educational institution.

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在运动学训练中保持学生心理工作能力的方法的特点  
**FEATURES OF THE METHOD OF PRESERVING THE MENTAL  
WORKING ABILITY OF STUDENTS AT THE EDUCATION OF  
KINESIOLOGICAL TRAINING**

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抽象。本文介绍了使用该技术在运动学技术基础上的训练中保持学生心理表现的技术成果，这反过来又使我们能够有效地形成健康生活方式的动机。

关键字：培训课程，学生的心理表现，运动机能学技术，维持学生心理表现的技术。

**Abstract.** *The article presents the results of applying the technology to preserve the mental performance of students in a training session based on the use of kinesiological techniques, which in turn allowed us to effectively form a motivation for a healthy lifestyle.*

**Keywords:** *training session, students' mental performance, kinesiology techniques, technology for maintaining students' mental performance.*

The presence of an unacceptably low level of mental performance of students is due to the prevailing, high-cost methods of teaching in the high school mass practice, and insufficient consideration by teachers of higher educational institutions for the needs of boys and girls in motor activity. This, in turn, leads to a decrease in the quality characteristics of graduates of Russian universities, the effectiveness of their professional and pedagogical preparedness. One of the reasons for this phenomenon lies in the lack of development of technology for maintaining the mental performance of students in the classroom using kinesiology tools.

The widespread in recent years in the world educational system of kinesiological ideas and principles that have proved their effectiveness in maintaining the mental performance of students, determines the need to create and mass use in Russian universities the technology of maintaining mental performance in the classroom using kinesiology tools. The analysis of the genesis of kinesiological ideas carried out in the study shows that they originate in the era of antiquity, incorporating at the present stage the physical culture traditions of the peoples of the world and the achievement of advanced educational ideas in the field of theory and methods of physical education.

The theoretical basis for the use of kinesiology tools in the process of preserving the students' mental performance in a training lesson is the provisions and principles of educational kinesiology (V.K. Balsevich, P. and G. Dennison), based on natural physical movements and the physiological interdependence of motor and speech-mental activity.

The study of the concept of "preserving the mental performance of students in the classroom using kinesiology tools" in the context of systemic, activity, valueology, personality-oriented approaches, ideas and principles of educational kinesiology, allowed us to identify and describe the essential characteristics of the phenomenon under study. The main components of the process under consideration are targeted, substantive, operational and effective. With the correct use of the experimental technology that we created, which involves the gradual development by students of knowledge, skills to maintain mental performance in the classroom (learning in the study of academic discipline of choice) and extracurricular (independent work of students, classes in the "Health Club") activities with using kinesiology tools, a set of specific functions of a specially built educational process at the university is implemented: socialization, cultural, preventive, correctional and rehabilitation, health strengthening.

The experimental substantiation of the technology to preserve the mental performance of students in the classroom using kinesiology tools was carried out at the ascertaining and formative stages of the experiment. During the experiment, the level of students' mental performance was diagnosed; the possibilities of various kinesiological tools were determined to awaken positive emotional states, productivity, stability of attention, and attention switching based on the activation of the relationship of the motor and psychological spheres in the conditions of the educational process of the university. The experiment was attended by 320 students of pedagogical faculties of the Belgorod State National Research University (NRU "BelSU").

The initial level of the formation of students' mental performance in the classroom using kinesiology tools revealed during the ascertaining experiment allowed us to conclude that insufficient attention is paid to this issue in universities. It is

impossible to group students by the level of their mental capacity for work, as well as to outline ways to solve the problem in question using kinesiology tools.

During the formative stage of the experimental work, a search was carried out for methods of introducing kinesiology tools into the educational process of the university, the technology for maintaining the students' mental performance in the classroom using kinesiology tools was verified for accuracy, and experimental substantiation of the hypothetically identified pedagogical conditions for the effectiveness of the process under consideration was carried out.

The technology of preserving the mental performance of students in the classroom using kinesiological tools was carried out on the basis of the diagnostic, constructive, activity, and assessment stages, which ensure the transition of dynamic activity of students' behavior, orientation of their actions to satisfy their intellectual needs to a higher level. As the results of the formative experiment showed, such kinesiological tools as motivational kinesiological complexes, role-playing games, sketching exercises, outdoor psychotechnical games, contributed to the activation of emotions, productivity, stability of attention and attention switching, as well as the growth of their knowledge of maintaining mental performance through the inclusion of a mechanism the relationship of the motor and intellectual spheres of the student's personality.

The study of the initial level of students' mental performance in the classroom revealed the prevalence of a rather low (critical - 51% and unacceptable - 5%) level of development of their mental activity and a positive attitude towards learning. Only 8% of the studied students were at the optimal level and 36% - at a sufficient level. At the same time, many students manifest emotional states during training associated with avoiding negative situations, with dissatisfaction with themselves. Most students are characterized by difficulty in the correct and long-term organization of mental activity, and the presence of not deep and fragmented knowledge. The preliminary results obtained were not significantly different, which indicated the homogeneity of the experimental and control groups.

Preservation of students' mental performance in the classroom using kinesiology tools with the correct use of the experimental technology that we have created, involves the gradual development of students' knowledge, skills and preservation of mental performance in the classroom (training as part of a special course) and extracurricular (independent work of students, classes in " Health Club ") activities using kinesiology tools.

In the course of the experimental work, it turned out that motivational kinesiological complexes (a set of kinesiological exercises that affect different types of emotional states), role-playing games, sketching exercises, moving psychotechnical games (exercises based on performing various motor actions with objects, exercises using gestures, dance fragments). The listed kinesiology tools contributed

to the activation of positive emotional states, productivity, stability of attention, and switching attention, as well as the growth of their knowledge to maintain mental performance in the classroom.

A comparison of the results of the study conducted in the experimental and control groups of students, as well as the results obtained at the beginning of the experiment and at the end of it, allowed us to conclude that the emotional state as a criterion for the formed level of mental performance is more pronounced in the group of students with a predominance of girls, which is explained by the increased emotionality of the "fair sex".

As for the process of productivity, sustainability of attention, and switching attention, the study did not reveal any differences that allow us to conclude that in certain groups of students the use of kinesiology tools is "faster, better." This is because the use of kinesiology tools is not the only and indispensable condition for increasing the level of mental performance in a training session. A whole complex of mental actions is "directed" to the effectiveness of such a process, both in motion and in static. At the same time, kinesiological agents contribute to these processes, which our study confirmed.

The study identified four levels of students' mental performance: optimal, acceptable, critical, and unacceptable.

The optimal level is characterized by stable internal positive emotional states for educational activity; their positive, active, effective attitude towards her; students' theoretical knowledge is systemic, deep and informed; learning objectives are socially significant; observed selective personality-tinged emotions, confidence in their capabilities, productive, sustained attention.

At an acceptable level, a positive cognitive, conscious positive emotional state for educational activity is traced; theoretical knowledge is deep, but not complete, not always conscious; goal setting for student learning takes into account the subjective likelihood of success; there are positive emotions from the search for different ways to solve the problem, productivity and stability of attention are not long-term.

The critical level is manifested, as a rule, in a neutral (passive) emotional state for educational activity; their knowledge is superficial, unsystematic, not personally aware; boys and girls find it difficult to set learning goals, unsustainable attention with low productivity.

Students who are at an unacceptable level of mental performance, there is a lack of awareness of the importance of learning and maintaining mental performance for personal self-improvement and professional-pedagogical formation; emotional state is manifested in a negative and neutral (passive) attitude towards learning; their knowledge is minimal, fragmentary; quite often negative emotions of avoidance, resentment, dissatisfaction with oneself are manifested.

Thus, at the end of the experimental work, we found out that the students of the experimental groups had the optimal and acceptable levels of mental performance. This was manifested in productive mental activity and sustained attention when performing intellectual tasks in the classroom. Also, students of this group in the class were involved in mental activity in a positive emotional state, ready to learn and analyze the information received. During the training session, students were able to correctly and appropriately distribute and switch attention from intellectual activity to motor activity, thereby preserving the optimal level of mental performance throughout the entire training session and school day.

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年轻音乐家的创造潜能及其在职业能力发展中的作用

**THE CREATIVE POTENTIAL OF A YOUNG MUSICIAN AND HIS  
ROLE IN THE DEVELOPMENT OF PROFESSIONAL ABILITIES.**

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**摘要。** 本文致力于在青年音乐家准备奥林匹克运动会, 创意比赛和音乐会表演的过程中, 青年音乐家的创造能力的形成和发展问题。 研究材料是作者多年从事各种专业和业余团体的老师和创意比赛评委的经验综合。

**关键字:** 创造力, 创造力竞争, 奥林匹克, 专业发展, 适应性方法和技术。

**Abstract.** *This article is devoted to the problem of the formation and development of the creative abilities of young musicians in the context of their preparation for olympiads, creative contests and concert performances. The research material is a synthesis of the author's many years of experience as a teacher and a jury member of creative competitions at various levels of children's professional and amateur groups.*

**Keywords:** *creativity, creative competition, olympiads, professional development, acmeological approaches and technologies.*

## **I. Introduction**

Currently, the preparation of children for participation in various competitions, creative dialogues and appointment is included in the mandatory program of work with children of the first stage of music education. In the domestic tradition, it is a music school with its curricula, principles, teaching methods, fixed for many decades. In all music schools, children are taught to play one or two musical instruments, and to sing in a choir. The ability to play in the ensemble, accompany, compose and improvise is instilled. Theoretical disciplines such as solfeggio and musical literature are taught. Additionally, musical modeling, the basics of computer arranging, and notation of musical text can be taught. The instructor conducts lessons on playing the instrument («by specialty») with each student individually.

Musical circles, salons and various creative organizations of a mixed type practically follow the same path, often significantly reducing and schematizing the program of musical instruction.

However, despite the wide availability of music education in our country, its scientific, methodological and didactic potential requires the development of new methods that contribute to the activation of students' creative abilities, manifestations not only of musicality and performing talent, but also of qualities such as endurance, responsibility, communication and aspiration to success.

## **II. Materials and discussion**

Over the long history of fundamental scientific research in the field of deep Russian psychology, the problem of the formation and development of a person's creative abilities, starting from his early age, has attracted and continues to attract the attention of researchers from different schools and areas. So, cognitive processes have been studied in the past and are now being studied by scientists L. Vygotsky, B. Teplov, S. Rubinshtein, V. Druzhinin, A. Petrovsky, D. Epiphany, V. Kudryavtsev, A. Toropova, etc. A significant contribution to the study of this problem is made by teachers, among whom we will name the names of Yu. Ponomarev, L. Stolyarenko.

The scientific works of E. Abdullin, L. Bezborodov, M. Ozenev, P. Sweet, G. Tarasov, M. Silver, G. Abdullin, M. Kartavtsev, B. Solomon, M. Kaluga, P. Halabuzar, I. Morikh formed modern schools and directions in the field of musical psychology of creativity. The material for the study was also the long-term experience of the author of this article in various competitions of music schools and creative groups in the cities of Crimea - Yalta, Belgorod, Sevastopol, Simferopol, Feodosiya, Yevpatoriya, Kerch, etc. To study the problems of the formation and development of creative abilities of children and adolescents used methods of observation, survey and theoretical generalization of the research results. Taking into account the specifics of musical art, the author offers modern acmeological approaches and working methods for preparing for creative competitions.

## **III. Results**

The XXI century, with its rapid growth in scientific and technological progress, has put forward important tasks for music education - the formation of a creative person who is able to learn new ideas and be competitive in new social conditions. Under these conditions, one of the challenges facing society and modern education is the formation of a professional creative elite of the country based on the development of the most gifted children with great creative potential. In the resolution of the Government of the Russian Federation on the implementation of the national educational Initiative «Our new school» said: «It is necessary to develop a creative environment to identify particularly gifted children in each secondary school. To do this, it is necessary to develop a system of competitions and

public organizations for children and youth. Modern society requires a person's ability to develop independently throughout life, readiness to make decisions, the ability to function normally in a complex and demanding society. The higher the level of education, the higher the professional and social stability. Identification, support, development and socialization of gifted children becomes one of the priorities of modern education» [9, p. 12]. To date, the organization of creative competitions has stepped over its 80-th anniversary. Starting from the end of the 30-s of the last century, two types of assignments were offered – «school» general educational and developing. Thus, they were originally intended to attract as many participants as possible. Currently, this movement is gaining momentum thanks to new Internet technologies. An example is the international academic competitions «Scrabble», which are held annually for schools and teachers [5]. Currently, this movement is gaining momentum due to new Internet technologies. An example is the international subject olympiad «Scrabble», which is held annually for school-children and teachers [11].

No less vivid phenomena of today, undoubtedly, are television vocal contests and vocal shows in Russia: «Voice Show», «Voice Children», «Main Stage», «Live Sound», «New Star», «You are Super!», «Out loud Main Stage», which cover different age and social audiences, starting from pupils of orphanages, boarding schools and ending with professional soloists and vocal groups of creative studios and music schools.

Preparation for them is often the basis of various extracurricular activities: circles, lectures, electives, thematic conferences. Their tasks help to identify the most gifted students who are able to solve non-standard tasks. In addition, they help strengthen the relationship of educational institutions with state and public organizations, creating the necessary conditions to support gifted children, attracting the most capable of them to various circles, studios and creative organizations. The purpose of olympics, competitions and public initiatives is to give impetus to knowledge, self-development and creative search, in which the true interest of every child is born. Participation in these forms plays an important role in the formation of the child's personality, educates responsibility for the started business, commitment, hard work, helps professional self-determination.

However, the high result of the achievements of a talented student, obtained by him in practical work with a professional mentor and producer, was also largely prepared by the activities of many teachers of the previous period, each of whom invested his share of labor in the formation and development of the creative abilities of his pupil.

The attraction of ideas and provisions of acmeological approaches and technologies expands the possibilities of studying the essential aspects of pedagogical phenomena and situations, reveals the interaction of methodological, pedagogical

and psychological reserves in the organization of musical upbringing and education, which will undoubtedly contribute to a deep understanding of the characteristics of the personality development process in achieving the heights of professionalism and mastery, as well as self-realization in the profession and life. «Modern pedagogical education is based on the process of assimilation of traditions, norms, canons leading to the formation of a professional in their field. In this regard, the ascent to excellence is «moving from the starting point of development to the point of highest achievement of the result (top) of AKME as the embodiment of the best qualities of a specialist's personality» [4, p. 8]. Studying the theoretical principles of acmeological science allows you to significantly update and expand the scientific base of education and training of young musicians. It is this area of modern science that aims at the comprehensive development of man, the central element of which is the development of his creative abilities and creative thinking and, as a result, a significant increase in the productivity of activities.

The professionalism of the musician's artistic and creative activity corresponds to versatile and productively realized professional skills and abilities that contribute to the achievement of creative results in solving tasks. From the position of acmeological science, the professionalism of a musician's personality is its qualitative characteristic, which reflects a high level of formation of professionally important personal qualities, primarily creativity, professionally-oriented motivation and a value attitude to self-improvement and creative self-realization in the profession.

The essence of the introduction of acmeological approaches in professional music education is their focus on updating the development of students' creative potential, increasing the motivation for achieving success in creative activity. We note the most popular forms of work with gifted children in preparation for a creative performance in various forms thanks to new approaches and technologies:

➤ The introduction of integrated approaches in the study of disciplines within the educational process, which allows to stimulate the desire of learners to expand and deepen their knowledge in selected areas, as well as the search for innovative solutions at the «joint» of different types of interdisciplinary knowledge of disciplines of educational and musical cycles (literature, history, individual instrument, etc.).

➤ Stimulating the development of critical thinking of students through problem situations, overcoming existing types of stereotypes of thinking, the search for new alternative positions and interpretations. Conducting open dialogues, discussions on various problems of musical art, based on the experience of understanding reading books and research, received information on TV and the Internet, their own visits to concerts.

➤ Organization of creative workshops and master classes for gifted children. This strategy takes into account the needs and opportunities of gifted children seeking creative expression in the learning process.

➤ Creation and conducting of concerts with the purpose of the meetings and communication, exchange of opinions, execution of works, the poetry reading, viewing, creative sketches.

➤ We note the most popular forms of working with gifted children in preparation for solving the most difficult tasks of commerce, thanks to new approaches and technologies: The introduction of integrated approaches in the study of disciplines within the educational process, which allows to stimulate the desire of learners to expand and deepen their knowledge in selected areas, as well as the search for innovative solutions at the «joint» of different types of interdisciplinary knowledge of disciplines of educational and musical cycles (literature, history, individual instrument, etc.).

➤ Stimulating the development of critical thinking of students through problem situations, overcoming existing types of stereotypes of thinking, the search for new alternative positions and interpretations. Conducting open dialogues, discussions on various problems of musical art, based on the experience of understanding reading books and research, received information on TV and the Internet, their own visits to concerts, etc.

➤ Organization of creative workshops and master classes for gifted children. This strategy takes into account the needs and opportunities of gifted children seeking creative expression in the learning process.

➤ The creation of the concerts and contests with the purpose of execution of works, meetings and communication, exchange of opinions, free speech, the poetry reading, viewing, creative sketches, etc..

### **Conclusions**

Thus, the organization and conduct of creative competitions of various types: within the framework of the activities of professional musical institutions, salons, production centers, television programs and other modern creative forms, organizations have great potential for identifying the most talented children and teenagers who are passionate about music, stimulating their activity and independence in search work, in the formation of his creative world. They test knowledge, skills, and abilities not only in the field of performing skills, but also interaction with the team, flexible and correct relations with the opponent. The pleasure of completing tasks and the joy of a participant's victory can create the potential for expanding intellectual and creative self-realization - personality traits that are so necessary for a modern person.

### **Acknowledgements**

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苏联的生产方式  
**THE MODE OF PRODUCTION IN THE USSR**

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抽象。分析了马克思列宁主义经典的错误。使用政治经济学的类别可以证明苏联存在资本主义。解释了十月革命的社会主义性质。

关键词: 财产, 价值, 劳动。

**Abstract.** *The errors of the classics of Marxism-Leninism are analyzed. Using the categories of political economy it is proved that there was capitalism in the USSR. The socialist nature of the October Revolution is explained.*

**Keywords:** *property, value, labor.*

**Introduction**

Based on the version that the USSR had a socialist system, many unsolvable questions arise within the framework of historical materialism.

Why did classes not disappear in the USSR, and the class structure developed in exactly the same way as in the capitalist countries: the working class grew in number, the number of peasantry decreased, then the service sector and the growth in the number of people engaged in mental labor began to increase.

Why the state in the USSR did not die off, but, on the contrary, strengthened, although Marxism claims that the socialist state begins to die from the moment of the fust of occurrence, as it approaches communism. This is not about the protective external function of the army and navy in a capitalist environment, but about the internal function of suppression: the preservation of the police, special departments in state security agencies, courts, and prosecutors.

Why the principles of Soviet power, the principles of the Paris Commune, did not take place in the USSR.

Why did they decide on accelerated collectivization, on dispossession of the middle peasant? After all, this led to a decrease in labor productivity in agriculture for many years.

Why was the agrarian policy of the USSR leadership such that in the late 1920s and early 1930s peasants sharply reduced their crops, began slaughtering livestock, and the number of peasant uprisings was measured in thousands.

With what purpose the repressions were carried out, almost the entire party elite, formed under Lenin, was destroyed during the periods of the revolution, the Civil War, the entire army elite, how they could be accused of treason. Why in 1937 - 1938 repressions were carried out according to orders (limits).

For what reasons did the slide to pre-Marxian history take place, so that gigantic historical changes are attributed to the account of one and then two personalities. Why the leadership of the USSR, armed with advanced philosophy, impeded the development of genetics, microbiology, quantum mechanics, and cybernetics in the 1950s. Marx claimed that the level of development of production is determined by how much science has become a productive force. Why in the USSR over 40 thousand leading scientists were destroyed, tens of thousands were sent to camps, for a huge number of scientists the work was not free. Why, under the social system, which is superior in level to the capitalist one, labor productivity was significantly lower than in developed capitalist countries.

Why in bourgeois Japan in the 80s there was only 3% of manual labor, while in the USSR - 50%.

How did it happen that the leaders of the CPSU literally in weeks formed the bourgeois class in Russia.

How the change of ideology literally in weeks changed the mode of production and threw the USSR from socialism to capitalism. Why did the working class, which according to all canons owned the means of production, at one moment leave these means of production and form an army of the unemployed, for what reasons the Comintern was abolished, etc. The purpose of the work - clarifying these questions.

### **Phenomenology**

#### 1) Labor productivity

“Labor productivity,” Lenin argued in "The Great Initiative", “is, ultimately, the most important, most important thing for the victory of the new social system. Capitalism created labor productivity unprecedented in serfdom. Capitalism can be finally defeated and will be finally defeated by the fact that socialism creates a new, much higher labor productivity”[1].

The directives of the XX Congress of the CPSU on the sixth five-year plan for the development of the national economy of the USSR for 1956-1960 envisaged an increase in labor productivity in industry by at least 50%, in construction by at least 52%, in railway transport by about 34%, in state farms and in state subsidiary agricultural enterprises by 70%, on collective farms, about twice. That is, in 1956, labor productivity in the USSR, despite growth, was still extremely low. The CPSU program, adopted in 1961, set the task of achieving and exceeding the volume of industrial production in the USA within 10-20 years. To do this, it was necessary “to raise labor productivity in industry more than twice within 10

years, and in 4–4.5 times in 20 years”. In reality, by the time Khrushchev resigned in 1964, agricultural production increased by only 6%, the USSR began to buy food abroad. In 1961, 181 million people lived in the USA, and 214 million in the USSR I.e. the lag in labor productivity during these years was more than 4 times. In 1960, labor productivity in Soviet agriculture was 3.5 times less than in the United States. In 1980 per unit of labor (but not per hour) - 2.3 times less. During the reign of Khrushchev, the growth of labor productivity in the USSR was noticeably ahead of growth in developed countries. In 1989, labor productivity in the industry of the USSR was 2.1 times higher than in 1970. However, a giant gap in 20 years could not be overcome.

In the early 80s in the GDR, labor productivity was not lower than in the USSR, while factor productivity was 40% of FRG productivity. If we consider that labor productivity in Japan and the FRG was higher than in the USA, then labor productivity in the USSR during these years was not higher than 55-60% of labor productivity in the USA.

You can approximately estimate the level of labor productivity and GDP. So, in 1991, the RSFSR GDP was about half of the USA GDP [2]. The population of the United States in 1991 was 220 million people, in the USSR - 280 million, in Russia - about 140 million, i.e. per capita (but not per hour) labor productivity in the RSFSR amounted to approximately 78.6% of labor productivity in the United States. Productivity per hour of sales is even less, because in the USSR, overtime, “Black Saturdays,” “Black Sundays,” and communist subbotniks were practiced in factories. Thus, according to the main criterion, labor productivity, there was no socialism in the USSR.

## 2) The basic principles of Soviet power.

Lenin put the principle of the Paris Commune as the principle of Soviet power - control over power from below, control of ordinary workers, control of a government official. It was in this that Lenin saw the fundamental difference between the power of the capitalists and proletarian power. “We will reduce the role of government officials,” writes Lenin, “to the role of simple executors of the will of the working people!” [3]. Instead, control of government officials over workers was implemented in the USSR. Another principle is the modest pay of a government official, at the level of a skilled worker. But this principle was not fulfilled either: as a rule, government officials were party members, for whom the party maximum was introduced by Lenin. However, in view of the disease, Lenin could not counteract the elimination of the party maximum. If Lenin reprimanded Antonov-Ovseenko for raising his salary for him, Lenin, Stalin repeatedly raised it for himself.

Finally, the third principle is the requirement of constant change of government officials, from top to bottom, that is, including Stalin, Molotov, Kaganovich and others. This is not about moving an official from one leading place to another leading place, but returning him to a work machine.

Formally, the population had the right to recall deputies, but during the reign of Stalin, recall (turnover) was less than a percent. By 1985, 0.06% of deputies in the Supreme Soviets of the Union Republics were withdrawn from the Supreme Soviet of the USSR, 0.03% of the total number of deputies a year from the USSR Supreme Council, 8000 deputies were recalled from local councils in 24 years - 0.02% of the total number of deputies per year [4]. There was no legal recall of the party government officials, they were appointed and removed by the higher leadership.

3) Class struggle. 1925-1929. In the Middle Volga 1925 alone, 11 strikes took place, in 1926 - 15, 1927 - 16, 1928 - 30, 1929 - 56 [5].

12.5.1 1927 - a one-day strike of workers at the open-hearth shop of the Verkh-Isetsky Metallurgical Plant, the largest enterprise in Sverdlovsk. The reason is "insensitivity of business leaders to the needs of workers." Strike leaders fired.

In the summer of 1927, according to the JSPD summary of industrial enterprises in the country, an average of more than 3 strikes per day took place. Almost all spontaneous, 75% of them, as in any capitalist country, were associated with the requirement to increase the wage rates.

03.22.1928 - a peasant uprising in the Zyryansky district of the Tomsk Oblast, November 1 - a peasant uprising in the village of Udelynye Uty of the Vyunichesky volost of the Bryansk district against the organization of a collective farm (in April, the organizers of the speech, the brothers Kizikovs received 10 years in prison). Compare:

for 1900-1917: 17560, 975 per year. Information: "JSPD recorded more than 13,000 riots and mass protests in the villages from January 1928 to December 1929," for 6500 each.

In 1929, 244,000 peasants took part in the performances.

From 12.17.1929 to 02.14.1930, 38 peasant riots took place in the Central Black Earth Oblast, in which more than 15,000 people took part.

1930. In the summer of JSPD INFO, a "Report on Salary Issues at State-Owned Enterprises" was prepared for senior management of the USSR, containing generalized data on the number of strikes and the number of participants in strike actions in the country from January 1929 to August 1930. From January to August 1929 174 collective protests were recorded, in which 15 707 people took part. In January-August 1930 there was a decrease in the number of strikes to 147 cases, as well as the number of participants to 11,833 people. During the year, about 2.5 million peasants took part in 13.754 uprisings, riots and demonstrations against the regime, of which 3712 were "female revolts". 176 riots were rebel. Large peasant demonstrations (up to 1000 participants) were in the Volga region, Ukraine, Siberia, the North Caucasus, and Kazakhstan. According to JSPD, about 20,200 people were sentenced to death.

In April, a strike at the Teleginsky weaving mill in the Shuy district of the Ivanovo-Voznesensk industrial region. According to JSPD INFO, in January-April there were 6,117 anti-collective farm actions, in which 1,755,300 people participated. 800 rebellions crushed using weapons.

In May, workers at the Revdinsky Metal Processing Plant (Ural Oblast) went on strike due to non-payment of wages for 2 months. In June - mass absenteeism at work of miners in the coal trust "Luganskugol".

In July, workers went on strike for 7 coal mines of the "Stalinugol" Trust (Donbass).

618 anti-collective farm actions throughout the country. From July 6 to August 1, the Chumakov Uprising was a major peasant uprising against the dispossession of the middle peasants.

1932. Uprising of the Vichug weavers on April 5-12. Reason: On April 1, card standards for bread delivery were reduced. Weavers also went on strike in Teykov, Lezhnev, Yuzh and other industrial centers of the Ivanovo Oblast.

1933. According to JSPD, for 6 months (July-December), unrest occurred in 10 cities of the Urals, at the enterprises of Donbass, 8 plants in Leningrad, in the cities of Serpukhov, Novosibirsk, Sormovo, Balakhna, Odessa, Kherson, Nikolaev.

1934. According to JSPD, for the period from March 1 to June 20 at enterprises and construction sites of the USSR, the total number of strikes and "AWOLs" among workers in industry and construction amounted to 185 cases, in which 8707 people took part. September 13 - USSR Prosecutor V.M. Bochkov sends a memorandum to the chairman of the Council of People's Commissars V.M. Molotov. It cites individual cases of collective protests at industrial enterprises and construction sites in the country: at the Kirovo-Chepetsk Thermal Power Plant, at the construction of a military facility in Sevastopol, at the building trust of the Stalingrad Region, at a confectionery factory in the Byelorussian SSR.

During the years of the 1st five-year plan, workers went on strike at the Stalin plant, the plant named after Voroshilov, the Shostensky factory, the Krasnoye Sormovo factory near Nizhny Novgorod, the Hammer and Sickle Hammer Plant in Moscow, the Chelyabinsk Tractor Construction and other enterprises.

07.21.1945, from the speech of the writer M. S. Shaginyan at the party meeting of the Union of Soviet Writers: "I was in the Urals, there 15,000 workers of the Kirov plant rebelled, the riot is real, because the conditions are bad." 1946. September - workers at the construction of the "Elfa" electrical plant (Vilnius) announced a strike: earlier this month, rations of food prices were significantly increased by the "decision of the party and government". At the end of the month, there was unrest at the Abrau-Durso grape-winery (Krasnodar Krai) after the authorities decided to remove from the card supply a large number of categories of workers, employees and dependents.

Strikes and uprisings continued after the change of power in 1953.

### **Historical and theoretical background**

#### 1) The immaturity of Russia for the socialist revolution

Marx in the introduction to the "Criticism of political economy" writes: "Not a single social formation dies before all productive forces develop, for which it gives ample room, and new higher production relations never appear before their material conditions mature existence in the bowels of the oldest society ... the task itself arises only when the material conditions for its solution already exist or, at least, are in the process of establishment "[6]. One of the most important laws of the development of society, revealed by Marx, is that revolutions occur when the productive forces develop so much that they will be hindered by outdated production relations.

In Russia, feudal relations were obsolete by 1917, capitalist relations could not survive, they were only emerging. Because productive forces could not come into conflict with them, therefore, a socialist revolution was impossible. According to Marx, more developed countries show less developed their future. Since capitalism is in these more developed countries, social democracy in its programs must limit itself to a bourgeois-democratic revolution. The Mensheviks (see "The Creed" of Kuskova, etc.) opposed the Bolsheviks's focus on the socialist revolution precisely with these provisions of Marxism.

Lenin, polemicizing with Sukhanov and other Mensheviks, agreed: indeed, the materialistic approach in history obliges us to believe that the basis determines the superstructure, the productive forces determine production relations. But which textbook says that it cannot be done the other way around? That is, Lenin, referring to dialectics, assumed that a revolutionary transformed superstructure would grow into a base and "lift" it.

Lenin understood that in a dialectical pair, materialists should always choose the material for the primary: sooner or later, backward productive forces will bring secondary production relations into line with themselves. But. In many countries, Lenin reasoned, revolutionary fermentation began. The revolutionary center has moved to Russia. Russia can become a weak link in the chain of imperialism, if this link is broken, it will push the revolution around the world. And then the victorious proletariat of the developed countries will come to the aid of the backward Russian proletariat. However, the revolution in Germany and Hungary was defeated. The world revolution did not take place. The Leninist scheme did not work. And Lenin no longer expects help from the workers, but from the governments of developed countries — concludes agreements with them, over the heads of the Communist Parties and the entire world proletariat. There are joint ventures, concessions. As for the revolutionary transformed superstructure, it was destroyed in the 30s, people came to power who had nothing to do with the revolution, nor the Civil War, nor Marxism-Leninism.

2) Socialism in a single country?

Socialism is an obligatory transitional period between capitalism and communism.

Marx writes: "... the dictatorship itself is only a transition to the destruction of all classes and to a society without classes" [7] Lenin agrees: "The domination of the vanguard of all working and exploited, that is, of the proletariat, it is necessary for this transitional time to completely destroy the classes" [8].

In the "Draft Program of the RSDLP" in 1902, Lenin writes: "This revolution of the proletariat will completely destroy the division of society into classes, and, consequently, any social and political inequality arising from this division" [9]. "A society," he repeats, "in which there remains the class difference between the worker and the peasant, is not ... a socialist society" [10]. "... I met," writes Lenin, "a poster with the inscription: "There will be no end to the kingdom of workers and peasants" ... if there were no end to the kingdom of workers and peasants, it would mean that there would never be socialism ..." [11] " "We are waging a class struggle," Lenin recalled, "and our goal is to destroy the classes." As long as the workers and peasants remain, socialism remains unrealized" [12].

Stalin spoke from opposing positions: "The class character of society has been preserved," he describes the situation in the USSR. "But the nature of the classes has become different" [13]. He writes the same thing in *The Economic Problems of Socialism*. What does the term "character" mean, which has fundamentally changed in the working class and the intelligentsia, Stalin does not specify, only indicates the absence of hostility between them. Thus, the contradiction between mental and physical labor is replaced by the moods of workers and intellectuals.

Lenin believed that in the course of the revolution it was enough for the working class to pick up the basic means of production in order to cease to be the working class. If there is no need to sell labor, workers cease to be a hired proletariat. But this is a mistake. Engels made the same mistake: "The proletariat takes state power and turns the means of production primarily into state property ... thereby it destroys itself as a proletariat ..., all class differences ..." [14] The same in the Draft and 2nd Program of the RCP 1919 mistake: "By replacing private ownership with the means of production ... by the public ... the revolution of the proletariat will destroy the division of society into classes" [15].

Society divides into classes the old social division of labor. Marx describes the work of a worker: heavy, monotonous, depersonalizing ("*Economic and Philosophical Manuscripts of 1848*"). In his *Critique of the Gotha Program*, Marx points out that the dictatorship of the proletariat (i.e. socialism) is called upon to eliminate, first and foremost, the opposition between physical and mental labor. Taking up the means of production, but staying at the machine tool, the working class did not cease to be a working class - due to the content of labor.

In 1917, capitalism in Russia was still poorly developed, the Soviet working class still had to grow in number. But even in the 80s there was no talk of overcoming the opposition between physical and mental labor in the USSR. After a hard shift, science is not perceived, it is not used by the worker during the labor process. Therefore, the worker will increasingly entrust both control over a government official and the disposal of means of production to employees of mental labor.

“The proletariat of Russia,” writes Skvortsov-Stepanov in the book “Electrification,” “never thought of creating an isolated socialist state. A self-sufficient “socialist” state is a petty-bourgeois ideal. A well-known approximation to it is conceivable with economic and political predominance; in isolation from the outside world, she is looking for a way to consolidate her economic forms, which have been turned into the most unstable forms by new technology and the new economy.” In the preface to his book, Lenin praises this fragment [16].

Trotsky believed that in one country a socialist revolution cannot win - in view of the international division of labor; therefore, the capitalist world will simply strangle a separate state. But the thing is different: in a single Russia, the socialist revolution could not win - in view of its backwardness, in view of the need for assistance from the proletariat of developed countries.

In March 1918, at the VII emergency congress of the CPSU, Lenin stated: “... there can be no doubt that the final victory of our revolution, if it remained lonely ... would be unreliable” [17]. “The complete victory of the socialist revolution,” said Lenin on November 8, 1918 at the VI Extraordinary Congress of Soviets, “is unthinkable in one country, and requires the most active cooperation of at least several advanced countries to which we cannot rank Russia” [18]. However, in 1936, Stalin proclaimed the victory of socialism in the USSR.

Those who hold the version of the possibility of the victory of socialism in one country usually refer to Lenin's article "On the slogan" The United States of Europe " : " The unevenness of economic and political development is the unconditional law of capitalism. It follows that the victory of socialism is possible initially in a few or even in one, single, capitalist country ” [19]. The keyword is "originally." That is, for a short time. In decades, victory will inevitably be replaced by defeat.

Stalin did not contradict Lenin's position even in May 1924, after Lenin's death, in a lecture “On the Foundations of Leninism”, he states: “Having strengthened his power ... the proletariat of a victorious country can and must build a socialist society. But does this mean that he will thereby achieve the complete, final victory of socialism ...? No ... This requires the victory of the revolution in at least a few countries. Therefore, the development and support of the revolution in other countries is an essential task of the victorious revolution. Therefore, the revolution of the victorious country should not be considered as a self-sufficient

value, but as an aid, as a means to accelerate the victory of the proletariat in other countries ”[20]. This is not about Romania, Poland or Mongolia, but rather about several developed countries.

### **To the history of the issue**

#### 1) The pre-October period.

Initially, the concept of state socialism arose in social science theories; socialism was defined as state intervention in the economy and social relations. Engels writes that the concept of state socialism does not contain any true, socialist meaning [21]; it arose as a result of bourgeois falsification, calling “socialism” any attempts by the state to limit free competition, and, on the other hand, as the fruit of petty-bourgeois illusions of utopian socialists, expecting from the government and the ruling classes the "introduction" of socialism. Engels points to a system of state colonial exploitation created on the basis of the communal system by the Dutch government in Java [22].

The concept of state socialism was put forward by L. Blanc, C. Rodbertus, F. Lassalle. According to their views, the creator of socialism is not the proletariat, but the bourgeois state. The views according to which any nationalization of the means of production, the strengthening of the economic role of the bourgeois state is already a denial of capitalism, its "socialist transformation", were reduced during catheter-socialism. State socialism of the Prussian government was, Engels writes, “... just a feudal reaction, on the one hand, and an excuse for extorting money, on the other, and its indirect goal is to turn the largest possible number of proletarians into state-dependent officials and pensioners and organize along with a disciplined army of soldiers and officials, a similar army of workers ”[23]. Lenin called this trend an instrument of apologetics of monopoly and state-monopoly capitalism [24], emphasized that “socialism is not created by orders from above. Bureaucratic automatism is alien to its spirit; living socialism, creative, is the creation of the masses themselves ”[25].

Whereas in September 1917, Lenin was convinced that socialism was a capitalist monopoly aimed at the benefit of the people [26], then after the October Revolution and especially after the defeat of the revolution in Germany, his position changed. The ground for these changes was identified already in the period when the discussion of the RSDLP program was going on. In view of the backwardness of Russia, Lenin expressed the idea that there can be no special socialist program for the Social Democrats, you just need to transfer to Russia everything advanced from developed capitalist countries.

#### 2) Bolsheviks in power

“There is no need to embark on the “ ridiculous task ” - teach the leaders of trusts and syndicates, there is nothing to teach them, but they need to be expropriated, subordinated,” Lenin said only in April 1918 at a meeting of the All-Russian

Central Executive Committee. In those same days, he writes: “It is good to draw from both sides from abroad: Soviet power + the Prussian order of railways + American equipment and organization of trusts + American public education etc. etc. ++ = sum = socialism” [27].

Having come to power in 1933, Hitler, in order to get the German economy out of the crisis, placed state banks and major concerns under state control and introduced the state monopoly on foreign trade necessary for weak economies. Before him, Bismarck, Mussolini acted in a similar way, after him - Peron and Fidel Castro. Lenin acted in the same vein, forcibly syndicating small enterprises, nationalizing large ones, introducing a state monopoly on foreign trade. It was these progressive bourgeois transformations that determined the rise of the USSR economy.

Bearing in mind the backwardness of Russia, its immaturity for the socialist revolution, in April-May 1917, Lenin wrote the draft Constitution, which contained exclusively bourgeois-democratic provisions and not a single socialist, political or economic part, while preserving the class of entrepreneurs (printed in June 1917 in the brochure "Materials on the revision of the party program." Publishing house. "Surf", Petrograd; PSS., 4th ed., V. 24, P. 434-440).

However, in November 1917, Lenin was not limited to progressive bourgeois reforms. At the ARCEC meeting on November 4 (17), he calls: “Let the workers take up the creation of workers' control in their factories and facilities ...” Here is how he defines socialism: “The lively creativity of the masses is the main factor of the new public” [25].

However, already in 1918, Lenin saw the unpreparedness of the workers. “One day,” writes Albert Rhys Williams, “a delegation of workers visited him ... could he not decree the nationalization of their enterprise (that is, drive the bourgeois away). “Of course,” said Lenin ... if everything depended on me, then everything would be decided very simply ... But ... I have to ask you some questions ... do you know where you can get raw materials for your enterprise? - Delegates reluctantly agreed that they did not know. - Do you know how to keep accounts? .. Have you developed ways to increase output? - Workers answered in the negative ... - Finally ... have you found a market for the sale of your products? “Again they said "no". - ... Don't you think that you are not ready to take control of the plant now?” Return home and begin to work on all this ... In a few months, come again, and then we can return to the question ...” [26]. At the ARCEC meeting on 04.29.1918, Lenin asserts: “The next generation, more developed, is hardly likely to make a complete transition to socialism” [27]. Not a single sane communist, says Lenin, would ever think of declaring the existing economic relations with socialism.

Lenin is accused of “building” state capitalism. At the end of April 1918, in a speech at an ARCEC meeting, Lenin, criticizing the instructions of the left Marxists (left communists) on the danger of moving toward state capitalism, said: “...

state capitalism would be a step forward for us. If we could implement state capitalism in Russia in a small amount of time, this would be a victory. How could they not see that petty owner, petty capital is our enemy? How could they consider state capitalism the main enemy? They must not forget that in the transition from capitalism to socialism our main enemy is the petty bourgeoisie, its habits and customs, its economic situation ... What is capitalism under Soviet power? To realize state capitalism today means to renew the accounting and control that the capitalist classes have maintained. We see an example of state capitalism in Germany. We know that Germany was stronger than us. But if you at least think a little about what it would mean to lay the foundations of such state capitalism in Russia, Soviet Russia, anyone who in his mind or didn't bother with scraps of book knowledge would have to say that state capitalism would be a salvation for us ... "[28].

In the pamphlet "On left childishness and petty-bourgeoisness", completed on 5.5.1918, he states: "State capitalism would be a giant step forward ... State capitalism is economically incomparably higher than our present economy ..." [29].

In a report at the XIV Party Congress in 1925, Stalin objected: "Can our state industry be called state capitalist? It is impossible ... Because state capitalism in the conditions of the dictatorship of the proletariat is such an organization of production, where two classes are represented: the exploiting class, which owns the means of production, and the class exploited ... Ilyich, when he analyzed state capitalism, had in mind primarily concessions. ... Take another type of enterprise - state-owned enterprises. Are they state capitalistic? No ... Because in them ... not two classes, but one class, the class of workers, which in the person of its state owns tools and means of production and which is not exploited, because the maximum of what is obtained ... beyond wages, goes to the further development of industry, i.e. to improve the situation of the entire working class as a whole "[30].

a) Stalin confuses: concessions in the USSR appeared only in 1922, while Lenin spoke of state capitalism in 1918. b) Stalin identifies the stratum of managers, government officials, with the working class, here it directly contradicts the "April theses of Lenin", where these two social strata are strictly distinguished. c) In any capitalist country, the owner of the means of production does not spend all the profits on luxury goods, its lion's share goes in the same way to expand production, to new technologies, through taxes - to social programs, schools, medicine, etc.

At the beginning of 1918, Lenin still hoped that the workers would at least begin to learn in order to take the entire economy into their own hands. In March-July 1918, in the work "The Immediate Tasks of the Soviet Government", Lenin emphasized: "Our goal is the free fulfillment of **state duties** by every worker, after leaving the 8-hour lesson of productive work ... **only in this transition** is the guarantee of the final consolidation of socialism" [31]. Every cook cannot rule the state, but every cook must learn to do it.

“Only the development of state capitalism,” he insists in the same work “Immediate Tasks of the Soviet Power,” “... only a careful formulation of the matter of accounting and control ... will lead us to socialism ... of any working delegation that I had to deal with when they came to they complained to me that the factories were stopping, I said: “Do you want your factory to be confiscated? .. we have maternity forms ready, we will sign in one minute. But you say: you managed to take production into your own hands and you calculated what you produce, do you know the connection of your production with the Russian and international markets?” [32].

In October 1918, Lenin in the pamphlet “The Proletarian Revolution and the Kneisky Renegade” [33] insistently explained that for socialism there is little capitalist monopoly that is for the benefit of the people (the slogan of the modern Trotskyists), it’s not a government that meets the proletariat, but the government of the proletariat, etc. e. subordinate to the proletariat. In May 1920, Lenin in his pamphlet The Order from the Service Station to Local Soviet Institutions [34] still calls for reducing the role of government officials to the role of simple executors of the will of the working people.

However, long before this, Lenin had a different meaning in the concept of state capitalism. This is already such state capitalism when the state is not in the hands of the workers. There is no dictatorship of the proletariat, there is no socialism. Because already in December 1920, at the Congress of Agricultural Communes, he asserts: “Now we can’t introduce the socialist order, God help us, that it should be established with our children, or even maybe grandchildren” [35].

In view of the obvious discrepancy between the social system in the USSR, not only with obvious attributes, but also with the essence of socialism, various social scientists tried to introduce certain terms that would explain this discrepancy.

Trotsky argued that in Russia there was a "reborn workers state."

### 3) Recent history

Voslensky believed that in the USSR there was "bureaucratic socialism." Milovan Jilas put forward the theory of a new owner in a socialist state - the Communist Party. The North American group of M. Shachtman recognized the bureaucracy as the ruling class. Then, American sociologist Barrington Moore returned to the term “state socialism” to characterize the centralized economy of the Soviet Union and the socialist states that emerged after World War II. In the 80s, the philosopher V.V. Orlov used the term “deformed socialism”; in the late 90s, the Moscow economist A. Buzgalin introduced the term “mutant socialism”. It is easy to see that the theories of Orlov and Buzgalin are reduced to the definition of Trotsky.

If the state is reborn, if socialism is deformed, mutated, then how much? If a little, then this is socialism, because there is no standard. If in essence, then this is no longer a workers' state and not socialism.

The Razlatsky group (70s) believed that in the USSR it was feudal capitalism, although feudalism is ownership of land of a narrow social stratum. In the USSR, all land, including collective farm, belonged to the state. Regional “feudal lords” played in the economy only the role of extras under branch ministries, which played the role of supermonopolies.

The publicist Alexander Tarasov coined the term “superethatism”. However, statism (and therefore super-statism) is not a mode of production, but merely an ideology.

Of course, all these innovations are in no way connected with the categorical apparatus of political economy.

Marx identifies the socialist state and the state of the dictatorship of the proletariat. The dictatorship of the proletariat, Lenin repeatedly asserts, is expressed in the form of Soviet power, the form found by the workers themselves. However, in 1923, at the XII Congress of the CPSU, which took place without Lenin, it was decided that the dictatorship of the proletariat is expressed in the form of a party dictatorship. But Plekhanov distinguishes: “The dictatorship of the class, like heaven from earth, differs from the dictatorship of revolutionaries-commoners” (“Socialism and Political Struggle”).

The Perm worker-Bolshevik Myasnikov, one of the leaders of the "Workers' Opposition", argued that in Russia there is no dictatorship of the proletariat, there is no Soviet power, since Soviet power exists only nominally, in the center, the Soviets are absent. Consequently, in the USSR there is no socialism, there is state capitalism.

Later, the Englishman Tony Cliff (Igael Gluckstein), the American Raya Dunayevskaya (Spiegel), the German O. Rule, and others who stood out from the Trotskyist IV International (the “trend” by Johnson-Forrest, ie James-Spiegel), collected voluminous material proving that in the USSR – there is state capitalism, the state itself acted as the aggregate capitalist. In the same position is the Italian group of Bordighi. However, all these groups, having compiled the factual material, were unable to provide evidence within the categories of Marxist political economy.

At the beginning of the 80s, it was concluded that there is state capitalism in the USSR, independently, based on the works of classics, came from informal Marxist groups, the Liberation of Labor group in Vladivostok, Alexander Khotsey’s Kazan-Perm group (Democratic Labor Party), and the All-Union Marxist Workers Party, Chelyabinsk "Workers' Union", the Russian "Extended Day Group" (later the "Union of Communists", the later political association "Worker") and many others. The Union of Communists introduced a new term - “unacapitalism” to distinguish state capitalism in the USSR from state capitalism in other countries, linking it with the Asian mode of production. The group proved that in the USSR – there is state capitalism, already in the categories of political economy.

The inducement of scientific research for the Union of Communists was their own production relations of group members; it turned out that production relations in the USSR had nothing to do with socialism.

During the recession of the labor movement, the ruling strata took advantage of the theory of state capitalism, as a result of political aberration in his book *State Capitalism in Russia* (1955), Cliff positively assessed the armies of Bandera and Vlasov [36].

Otto Rule in the 30s opposed the necessary progressive economic reforms related to the strengthening of the role of the state, in the confrontation between the USSR and Germany, supported Germany. Max Shachtman, along with James Burnham, the author of the theory of the managerial revolution, argued that after the Ribbentrop-Molotov Pact it was impossible to provide the Soviet Union even critical support. Shachtman further supported the USA war in Vietnam.

That is, Cliff and others ignored Lenin's distinction between wars of conquest and wars of liberation.

#### **Definition in categories**

To investigate the mode of production, which was established in a number of countries after 1917 and 1945, it is necessary to determine the concepts.

##### 1) Labor

In the classical definition, the proletariat is a class that, not owning the means of production, is forced to sell its labor power. It emphasizes the nature of the labor of the proletariat - hired. This character is derived from the social division of labor, which divides society into classes, from the content of labor. By the nature of labor, the intelligentsia, the working class, as well as factory directors, top managers, and ministers are hired, therefore, the intelligentsia (not having workers subordinate) also belongs to the proletariat.

**The working class is the class that is hired and in whose work, unlike in creative labor, abstract content dominates.**

The mercenary nature of labor is induced by its abstract content.

##### 2) Property

Locke understood property as the relationship of a person to the product of his labor, that labor itself already makes a person the owner. In a letter to Annenkov, Marx writes that people, unfortunately, understand property as a person's attitude to things, which is wrong. Property is a relationship between people about things [37].

Since Roman law, property has been subdivided into a) use (e.g. rent), b) possession, c) disposal (management). That is, the one who manages people, means of production (machines, trains, cranes, etc.), working conditions is the owner.

The manager does not need to have a bank account; he disposes of the bank itself.

### 3) State ownership

A common mistake is the identification of state property and socialism.

State ownership is private property. State ownership does not mean socialism at all: "Recently," Engels writes, "since Bismarck set out on the path of nationalization, a special kind of false socialism has emerged, which has degenerated in places into a kind of voluntary servility, declaring any governmentalization without socialism Bismarck. If the state tobacco monopoly is socialism, then Napoleon and Bismarck should undoubtedly be listed among the founders of socialism.

When the Belgian state itself, for the most common political and financial reasons, undertook the construction of the railroads, when Bismarck, without the slightest economic need, turned the major Prussian railways into state ownership, simply for the convenience of adapting and using them in case of war, to train railway officials .. - that all this was by no means a step towards socialism, either direct or indirect, either conscious or unconscious. Otherwise, royal Seehandlung, royal porcelain manufactory and even company trash in the army should be recognized by socialist institutions, or even the serious nationalization of ... houses of tolerance proposed by some clever man under Frederick William III. " ("The Development of Socialism from Utopia to Science") [38].

State ownership - is one of the types of private property.

Engels writes in Antiduring: "The modern state, whatever its form, is by its very nature a capitalist machine, a state of capitalists, an ideal collective capitalist. The more productive forces it takes into its ownership, the more complete will be its transformation into a joint capitalist, and the greater the number of citizens it will exploit. The workers will remain hired workers, proletarians "[39]. State property does not abolish private property; on the contrary, private property becomes absolute, in the words of Marx, private property in its universal form. Consequently, state property, which was in the USSR, was not publicly owned, common, or "as if in a draw."

Marx denies the legal, declarative "abolition of private property": "Communism," Marx objects to **egalitarian communism**, "at first ... acts as universal private property (state) ... communism in its first form is only a generalization and completion of private relations property. ... the dominance of material property over it is so great that it seeks to destroy what everyone cannot possess on the basis of private property. ... the category of the worker is not canceled, but applies to all people ... finally, **this is a movement striving to oppose private property to universal private property (state)**. Any private property ... feels, at least with respect to richer private property, envy and a thirst for leveling ... Crude communism is only the end of this envy and this leveling, proceeding from the idea of a certain minimum ... What is the abolition of private property is by no means a true development of it, it is clear ... from the return to the unnatural simplicity of a poor

and lacking human needs, which not only did not rise above the level of private property, but did not even reach it” (“Economic and Philosophical Manuscripts of 1844”) [40].

“The most widespread mistake,” Lenin notes in his work “The State and the Revolution,” is the bourgeois reformist assertion that monopoly or state-monopoly capitalism *is no longer* capitalism, it can already be called “state socialism” ...”[41] “... capitalist land ownership,” Lenin concretizes earlier, in 1912, “by no transfer of land from hand to hand and even no transfer of all land into the hands of the state (the so-called ...” nationalization “of the land) cannot be destroyed, in essence business. ... Land rental ... more convenient for ... capitalism ... private ownership of land makes it difficult for it to change hands ... if land were property of ... state? This would be an even more perfect, from the point of view of capitalism, agrarian system (on the example of modern Holland, where all the land is in state ownership, this is clearly visible, B. I.) ... the third Duma confirmed that among the Russian agricultural population it is extremely widespread ... ideas ... nationalization of the earth ... why they became widespread, what economic necessity caused them? ... the need to steeply break the old land tenure. ... its real significance ... in the maximum elimination of everything medieval in Russian land ownership ... ”[42].

So, the manager of the means of production is their owner. The capitalist is the owner of the means of production. Consequently, the government official in the USSR who manages the means of production is a capitalist.

The state that owns the means of production is the aggregate capitalist, see below. Under capitalism, the state is in the hands of the capitalist class.

### 3) Classes

Lenin in the article “The Great Initiative” defines the classes: these are “large groups of people who differ in their place in the historically defined system of social production, in their relation (mostly fixed and formalized in laws) to the means of production, and in their role in social organization labor, and, consequently, by the methods of obtaining and the size of the share of social wealth that they have. Classes are such groups of people from which one can appropriate the labor of another, due to the difference in their place in a certain way of social economy”[43]. The stratum of managers in the USSR completely corresponded to this definition: it occupied the highest position in the system of social production, in the organization of labor, it controlled the means of production and, accordingly, its representatives received higher wages, to which departmental hospitals, sanatoriums, cars, food special distributor, rest houses and summer cottages were added.

Consider the example of such an owner as the general director of a plant in the USSR. He is an employee himself, subordinate to the ministry. On the one hand, the general director in the USSR is not the same as the administrator or top manag-

er at the Chrysler or Renault factories, his position is much more stable, his powers are much wider, his authority over the workers and his means of production is much greater. But the same relationship is not only in the USSR. A co-owner of a company whose shareholding is less than that of another co-owner is also forced to execute other people's decisions. Owners of subsidiaries are also subordinates. On the other hand, for example, the Fords family in the 80s owned only 10% of the shares of their enterprises, while a controlling stake in the United States was determined at 22.5%. But they were the main managers.

They say that under capitalism they receive not by labor, but by capital. The claimants forget that capital is not just paper, metal, or factories. This is a certain set of social relations. Therefore, the place of the manager in the social hierarchy is also capital.

There is a tendency for the ownership and management functions to close, for example, the capitalist Chirac was the president of France, the capitalist Berlusconi was the president of Italy, the capitalists are the Kennedy family, the deputies of the Congress of Argentina are usually large landowners, deputies of the USA Congress are actively involved in commerce. The same in modern Russia, officials are usually businessmen.

So, the director of the plant is the owner. The head of the workshop is the owner. Any clerk is the owner. The Secretary General is the owner. All of them are managers, standing above workers in the production system and, accordingly, in the social hierarchy.

The aggregate of stewards, party economic state officials, is a class, and since disposition is a property relation, it is a class of capitalists.

#### 4) Mode of production

Method of production is the method of combining labor with the means of production. This is a combination of productive forces and production relations. There are 4 main methods of production - primitive communal, slaveholding, feudal and capitalist. Asian, Germanic, Slavic, etc. are added to them. The mode of production is a historically determined method of obtaining material wealth that people need for production and personal consumption, that is, social production at a certain stage of historical development, characterized by a certain level of development of productive forces and corresponding to this level type of production relationship. In other words, the mode of production is a historically defined dialectic unity of the productive forces and production relations - two sides of production, expressing the attitude of people to nature and to each other. Moreover, this is such a unity that steadily reproduces the prerequisites of its own existence, is an organic whole.

The two sides of the production method are in internal interaction; the leading role belongs to the productive forces, on the level of development of which

depends on the nature of production relations. Productive forces are a system of subjective (human) and material elements, means of labor, which carry out the “metabolism” between man and nature in the process of social production. “The first productive force of all mankind is a worker, a worker” [44]. Under the capitalist method, labor is combined with the means of production through an intermediary — the bourgeoisie, the owner of the means of production.

#### 5) Capitalism

Capitalism is a social system higher in level than feudalism. It arose as a result of the struggle of the classes. The struggle of opposites is allowed by the fact that a new quality arises in society. This quality was the emergence of a special product - labor. This is such a product, the sale of which creates additional, surplus value.

Consequently, capitalism is such a mode of production and, accordingly, such a social system in which labor becomes a commodity. Under capitalism, a special system arises - the institution of the recruitment of labor. Before Marx, political economy was not able to explain the occurrence of profit in an equivalent exchange, its contradiction explained a new product - labor. Therefore, this definition is the main one. The class of capitalists and bourgeois institutions serving capital, Marx called the total capitalist.

The main contradiction of capitalism is in the usurpation of management of a narrow social layer, expressed a) in the contradiction between the social nature of production and the private form of appropriation. This usurpation is caused, on the one hand, by the ownership of this stratum on the basic means of production, and on the other hand, by the social division of labor, primarily on managerial labor and managed labor. In turn, this division of labor is generated by the division of labor into mental and physical labor. Thus, the main contradiction of capitalism is also expressed b) in the form of a contradiction between labor and capital.

Since there was hiring of labor in the USSR, workers sold their labor for money 5 days a week, according to the basic definition, in the USSR there was capitalism. The middleman between labor and the means of production was the bourgeois class of managers.

#### 6) Socialism

By Lenin's definition, socialism is state ownership of the basic means of production under the political power of the working class.

The difference from the capitalist mode of production is that the hiring of labor is carried out from a state that is in the hands of the working class.

At an early stage, socialism performs the function of suppressing the resistance of the capitalist class. However, a social contradiction cannot be resolved by eliminating one of its parties, otherwise the other side will recreate the first side from itself, which became clear in the USSR and other CMEA countries in 1991. Thus, socialism is not only the liquidation of the bourgeoisie, but also the process of the

destruction of the working class. Namely: the process of destroying monotonous, depersonalizing labor, i.e. of such labor in which abstract labor dominates (not necessarily in time). Consequently, socialism is a mode of production in which the contradiction between mental and physical labor is eliminated (see K. Marx, Critique of the Gotha Program), and classes also disappear.

The social system in the USSR was not socialism, because instead of the power of the working class, power belonged to the party elite, the working class did not disappear, but grew in numbers.

On the other hand, socialism, Lenin repeated after Marx, is "the living creation of the masses." That is: if creativity, it cannot be guided by someone. This means that the economic plan is not set from above by a narrow social (class) group, but is formed from below, through the Soviets. In the work "Immediate Tasks of the Soviet Power", Lenin argued that socialism "is when everyone, after practicing his 8-hour lesson, begins to engage in government activities." In the USSR there were not even attempts to formulate a plan from below. The plan in the USSR was formed, as in any capitalist monopoly, from above, by a narrow group of people.

7) The law of value.

The value of the goods is created in the process of alienation of the product of labor from the manufacturer, in the sphere of exchange, where the labor of the worker manifests itself as abstract. Thus, value is created by abstract labor. Marx believed that it was enough to first restrict the monopoly and then completely eliminate the market so that the value, and with it the money, would disappear. However, the abstractness of labor in the sphere of exchange is generated by the abstract content of labor in the sphere of production. Consequently, as long as the working class exists, the product of labor cannot throw off the commodity form. Lenin, realizing in practice the error of Marx, introduced the NEP.

Under socialism, all products of work are goods, except labor. The hiring state is not alienated from the working class and is an instrument in the hands of the class. The contracting entity is not a manager, but a labor collective.

In the USSR, labor remained a commodity; hiring was carried out not by a labor collective, but by a government official. The assessment of the income of the worker was carried out not by living labor, but by materialized labor; the level of wages was established by the monopoly.

Stalin argued that in the USSR the law of value applies to a number of goods, but not to labor [45]. Practice has shown that the capitalist law of value operated in the USSR. With the introduction of new technologies, workers were trained, i.e. their consumptive labor increased. But prices were reduced, because the exchange labor force remained at the same level. Mass cases of breaking up by workers of new equipment were noted — they brought the use value of their labor force in accordance with the exchange rate [46].

#### 8) Revolution

Revolutions occur when obsolete relations of production interfere with the development of productive forces.

If exploitation is the alienation of surplus value from the producer, oppression consists not so much in low wages as in a) labor itself and, therefore, b) alienation from production management. The demand for a socialist revolution is not the most favorable conditions for the sale of labor, but the elimination of depersonalized labor [47, 48].

#### 9) Party

In the Leninist scheme of the revolutionary situation, objective factors include a sharp impoverishment of the masses beyond the usual, increased activity of the masses, the reluctance of the lower classes to live in the old way, and the inability of the upper classes to rule in the old way. The presence of a revolutionary party is a subjective factor. In the 30s, Soviet social scientists transferred the subjective factor to the category of objective, moreover, dominant [49]. In historical materialism, in the dialectical pair “class - party” the class is primary, determining, class is the main subject of history. In social science in the USSR they believed the opposite [50].

#### 10) Communism

In the third volume of *Capital*, Marx writes that under communism socially necessary labor, due to the development of productive forces, will take an insignificantly short time. This is not true; under communism, creative work that is not time-normalized becomes socially necessary, but this labor itself becomes a condition for the reproduction of labor power. Thus, the working class, which at the universal level will feel oppressed by labor, therefore, the need to eliminate itself as a class, will become a class-for-another, will become a hegemon. Because only this class will go all the way to such transformations that lead to communism, i.e. to a classless society.

#### **Key attributes**

1) In the United States, capitalist profits are spent on taxes, on depreciation of equipment, on R&D, on investments in the development of production, on new technologies, on the maintenance of the management apparatus, on staff training.

A tiny fraction of the profits - on the enrichment of the capitalist himself, luxury goods, etc.

In the USSR, the lion's share of profit went to taxes, to depreciation of equipment, R&D, to the factory Fund for the Development of Production, and to the maintenance of the management apparatus.

A tiny fraction of the profit went to the special distributor, special rations were mainly appropriated by state officials in kind: in the form of sanatoriums, special hospitals, etc.

2) It is alleged that in the USSR there were no unemployed. In fact, the problem of unemployment in the USSR was acute in the 20s, 30s, and 50s.

In 1986, unemployment in the USSR amounted to 1.7 million people ("National Economy of the USSR in 1986"), i.e. approximately 1.2%. This is significantly lower than the unemployment rate in Germany, say, in 2015 (4.4% - 4.7%) or in the USA in 2012 (7.7% - 8.2%).

However, it should be borne in mind that in the USSR in factories, the change was often half the norm, not 8, but 4 hours - due to incomplete loading.

Unemployed in the USSR existed at the expense of relatives or casual earnings. In the USA, before the collapse of the USSR, the unemployed existed due to welfare and free distribution of expired food products, which exists to this day.

On the other hand, in capitalist Germany in the late 1930s. unemployment, due to the implementation of the Strasser-Hitler party program, was absent. In capitalist Japan, before the collapse of the USSR, there was an institution of lifelong hiring; there was virtually no unemployment.

3) According to demographic estimates, the number of excess deaths in the 30s and 40s (except for the period of the war) is over 5 million, including 2 million who died of starvation in 1933.

In the USA, "dispossession" by farmers' banks (see Steinbeck, "The Bunches of Wrath") during the Great Depression led, according to similar demographic estimates, to the deaths of more than 8 million people.

Concentration camps were not the invention of Stalinism either, the first to create it were the British for the Boers, then the Americans for the Indians, then the White Guards (in Solovki).

Genocide is a phenomenon not only characteristic of feudalism, when, for example, on the "night of crystal knives" ordinary Parisians exterminated about 30 thousand Huguenots, but especially for capitalism. Only when transported from Africa, 8 million blacks died, in America, the British, along with the Spaniards, exterminated up to 120 million Indians (the calculation according to the Verhulst equation gives 103 million), the inhabitants of Ireland were exterminated. Australia, according to various sources, the economic and military expansion of England claimed, according to various sources, from 20 million to 90 million lives of Indians.

4) Stalin, speaking on 2.6.1937 at an expanded meeting of the Military Council under the NPO of the USSR, expressed dissatisfaction with the lack of revealing signals from the field, resolutely demanded that such signals (denunciations) continue to come in order to encourage even hesitant or not completely lost eventual conscience scammers, and formulated: "If there is truth at least 5%, then this is bread."

In the Criminal Code of the RSFSR of 1926 (it was valid for the entire 30s), non-information was classified as one of the 14 elements of counter-revolutionary crimes. Even the wives of the executed “enemies of the people” were tried for not informing.

In the USA, it is customary to report to the police. They convey everything, and disinterestedly. In the United States, the norm is when children report to parents.

Congressman Sansenbrenner’s Bill: “At the request of the government, you must collect and provide information about your neighbors, as well as wear listening devices. If you refuse, you will face imprisonment of 2 years or more.”

6) In the USSR there was no freedom of speech for journalists.

In the USA, there is no freedom of speech even for teachers. So, the teacher, when she told the children that Santa Claus does not exist, was fired. Journalists in the United States write only when they pay money - in full accordance with Lenin's article "Party Organization, Party Literature." Moreover, in the USA, if journalists deviate from the party line, they are either fired, arrested, or killed. Vivid examples are Snowden and Ossange, see also the murders of journalists in the United States in [51].

The difference between the USSR and the USA was only that freedom of speech was prohibited in the USSR, in the USA a useful signal was suppressed by the white noise of “pluralism of opinions”, through which only the word of the richest and therefore most powerful bourgeois press made its way.

7) In the USSR, pornography, drugs, miniskirts for schoolgirls were banned, early sexual relations condemned, etc.

In Western countries, there were also restrictions on freedoms, although in a different form. In the USA, police detained youth growing long hair and forcibly cut their hair. The ban on long hair existed in the UK, in colleges. In the Andersen film “If” in 1968, in addition to the ban on long hair in college, there were punishments for misconduct in the form of forced hard labor, as well as corporal punishment - the children were hit with a thin flexible stick to run.

8) The repressive apparatus of the USSR and the USA for different forms were identical. McCarthyism corresponds to the fight against cosmopolitanism of the late 40s and late 50s. The Soviet KGB and the MIA correspond to the American CIA and the FBI, these structures in the USA are sovereign, any ordinary US citizen has no rights to them. Police can kill black children and even whites only on suspicion of carrying weapons, resisting the police, etc. As a rule, the court takes the side of the police.

9) Education in the USSR was free, but in the UK there were free union training programs, in France, along with private schools, there were free public ones. In the USA, graduate school is free. Medicine in the USSR was free, but in the UK it was also free, with the exception of the services of dentists.

10) Pension in the USSR - about 50% of the salary, in developed capitalist countries - up to 70%.

Before perestroika, a worker in Perm received from 7% to 13.5% of the cost of a unit of production, plus 3% of the factory fund for socio-cultural development. In developed capitalist countries - 40% -70%.

11) In the USA, the capitalist, managers, and administrators of the enterprise have power over the worker, in the USSR the factory general director, shop manager, foreman, party bosses had power over the worker.

12) In both the USA and the USSR, the worker is engaged in heavy, monotonous, depersonalizing work, the worker becomes a man only after a shift.

But there is a difference. In the late 70s, a powerful wave of strikes swept the United States against conveyor depersonalization. As a result, the bourgeois given the task to engineers, and they created non-conveyor systems, with a greater variety of labor and greater productivity.

In the 70s Kuibyshev there were also strikes, but the workers agreed that the conveyor labor would make them monkeys, they only demanded additional payments for such labor.

13) In capitalist countries, the parliamentary system of stabilization of capitalism, the parliament has no power, the ruling class of the bourgeois has power. In the USSR, the Soviets played the role of a screen, the class of party government officials, the elite of the CPSU, the Politburo, the Secretariat, the Central Committee ruled.

14) Competition, consumerists.

They say that if the state in the USSR is “one” capitalist, then this cannot be, because capitalism is an essentially competitive environment. This is not true. Ricardo pointed out that monopoly limits competition and eliminates the supply-demand game. In the USA, in the 1990s, consumerists found that antitrust laws did not apply in the country, but it would not occur to anyone to dispute the fact that in the USA there is capitalism. Nevertheless, in the USSR there was competition, and very fierce - between KB Ilyushin, Lavochkin, Tupolev, Mil, Kamov, Korolev, Chalomey. Competed within all industries. And even laborers and temporary workers, and within these groups - for working on non-depreciated equipment, etc. Finally, the USSR as a whole competed with the developed capitalist countries. Conversely, in the early 90s, American consumerists found that antitrust laws in the USA did not apply.

15) Deconcentration of production.

Both in USSR, and in the USA, and in other leading countries of the world, related labor collectives were fragmented, divided by large territorial spaces. Costs increased, but the trade union struggle weakened, as a result, profits increased [52].

16) They said that Stalin was modest and left nothing after death. In fact, he left a rather large sum, but the thing is different: he lived like a sheikh, his own team of cooks, the best food, the team of the best doctors, several of the best cars with the best drivers, security, the best sanatoriums, a system of cottages, Kremlin chambers without any problems, water, heating, electricity - and no payment for housing and communal services, any films for services in their own cinema, etc.

On the contrary, one of the leading billionaires of the Carnegie's world was modest in everyday life: he always wore a worn-out, not fashionable suit, drove an old car.

17) They say that in the USSR, if there were capitalists, then there was no right to inherit capital. This statement ignores the fact that capital is not only things or money, it is a public relation. In countless ways the children of the Soviet elite acquired an elitist position in society. However, the right to inherit is not an indispensable attribute of capitalism; it existed both under slavery and under feudalism.

Trotsky was convinced that state capitalism in the USSR would become such a tidbit for the proletariat that the revolution would immediately take place. But beliefs are one thing, and reality is another. Trotsky could not imagine the capitalists without stocks, bonds, inheritance rights, etc. But someone, Trotsky, should have known that the right of inheritance, canceled by a decree of the Soviet government in April 1918 (property after the death of the owner, became the property of the state), was restored in 1922. At first, the total amount of the inheritance could not exceed 10 thousand gold rubles, later this restriction was canceled. Secondly, Trotsky sees only one form of capital - in stocks. However, capital in rubles or government bonds is a form no worse. On the other hand, Trotsky did not understand that ordering is also an attitude of property.

### **Ways of revolution**

For many, it seems that private property can be ended by nationalizing the means of production. In the work "Economics and Politics in the Epoch of the Dictatorship of the Proletariat", Lenin writes: "Labor is communistically united in Russia because, firstly, private ownership of the means of production is abolished ..." [53] He claims that monopoly capitalism is rotten capitalism and dying, monopoly undermines the market, the foundations of capitalism. However, Marx and Engels declared the state a private owner, regardless of whether the state was socialist or capitalist. Socialism is the process of abolishing any private property by eliminating the old social division of labor. In the USSR, the reverse process was going on, the process of strengthening the state.

On the other hand, there was no question of any abolition of private property in the USSR, since the state is a private owner. Secondly, today we see that neither monopoly nor TNCs at all undermined capitalism.

Capitalism disappears as the product of labor casts off its commodity form. Commodity circulation is due to the fact that the sphere of exchange alienates the product of labor from the worker and makes the work of the worker abstract. Marx and after him the Bolsheviks believed that it was enough to liquidate the market, the abstract labor that generated value would disappear, therefore, money would disappear as an exchange form of value. However, there is a mistake: the abstractness of labor in the sphere of exchange is generated by the abstractness of the labor of the worker in the sphere of production. As long as there is an old social division of labor into mental and physical, as long as there is labor of a worker, no disappearance of capitalism is possible [54, 55].

Therefore, at the X Congress of the CPSU in 1921, Lenin introduced the NEP - not at all as a “concession”, but as a necessity for the capitalist mode of production. The NEP was designed for decades, but it began to be curtailed already in 1926, sharply curtailed in 1927, and by 1928 the NEP did not play any role. From this period begins the dispossession of the middle peasants, accelerated collectivization and industrialization due to the village of Trotsky, which contradicted Lenin’s Land Decree, Lenin’s speech about the middle peasant and the decisions of the XV AUCPb Congress.

In the work “What are friends of the people and how they fight against social democrats”, Lenin reiterates Marx's idea that socialism = the dictatorship of the proletariat is state ownership of the basic means of production under the political power of the working class [56].

The long-term for agrarian Russia political union of the working class and peasantry was destroyed. The socialist revolution in Russia was defeated.

### **The nature of the October Revolution**

If we evaluate the October Revolution by its driving forces (the working class) and tasks (suppressing the bourgeoisie, establishing the power of the workers) - it had a socialist character.

But the dictatorship of the proletariat did not take place. State capitalism was established in the USSR.

In 1991, the party elite was rebuilt into the already legal class of the bourgeois.

Fukuyama believes that in 1917 there was no socialist revolution in Russia, only the modernization carried out by the Bolsheviks was realized, bringing Asian Russia closer to the civilized world.

B. Kagarlitsky, A. Tarasov believe that the October Revolution as a whole was bourgeois-democratic. Mesaroche argued that not only the October, but also the subsequent social revolution would not be socialist, but anti-capitalist. The term means setting the direction to overcome the dictatorship of capital. Mesaroche considers post-capitalist societies as components of capitalism that have not completely overcome capital until the anti-capitalist movement spills over into the

world socialist revolution. Thus, Mesaros considers, including October, not as a one-time act, but as a process.

However, the concept of “anti-capitalist” is meaningless, the anti-capitalist movement has no specific goals [57]. On the other hand, the position of Mesaros would be close to the truth, if not for one “but”: in the anti-capitalist movement itself there is nothing socialist, but there is egalitarian communism and reformism. This movement broke with the ideals of the 60s, when workers seized factories (France), created the Council in factories (Italy), opposed conveyor depersonalization (USA). There is no basic socialist slogan of universal higher education as a step towards the mastery of the proletariat of the entire economy.

It would seem that those groups that hold "Goskap" positions should have come to the conclusion about the bourgeois-democratic character of the October Revolution. But this is not so.

The October Revolution is really not a one-time act, but in a completely different sense, not in the sense of "building."

The civil war in England in the middle of the XVII century is a bourgeois revolution. Oliver Cromwell did not know that there would be a reaction, that royal power would return to England, in 1660 the Stuart monarchy would be restored. The participants in the peasant Jacqueria, especially the “plebeian” uprisings of the Crocans, too, were not overwhelmed by the idea of freeing the bourgeoisie. The Fronde members could not think that the leading strata of the bourgeoisie, frightened by the rise of popular uprisings, would betray the revolution. Those who stormed the Bastille on July 14, 1789, executed Louis XVI, could not imagine that there would be Vendée, the 9th Thermidor of 1794, the Directory, the 18th Brumaire of 1799 and the rise of Napoleon.

After the rise of Napoleon there was the July Revolution of 1830, which finally overthrew the Bourbons, the Revolution of 1848 would break out. In 1852, Louis Bonaparte, Napoleon III, would bury the republic. A century and a half in France, bourgeois revolutions will take place, in which the socialists, Louis Blanc, Arago, Ledru Rollin, Flocon, Alexander Albert will take part.

Marx considered the Paris Commune of 1871 the first experience of the dictatorship of the proletariat. Although it was led by those whom he criticized: Proudhonists, surviving Jacobins, radical democrats, anarchists, blankists, socialists, the driving force was artisans, bakers, lamplighters, as well as the army (see, for example, Lavrov’s book “The Paris Commune of March 18, 1871 years ”), but not the industrial proletariat, which, unlike 1848, did not participate in the events.

The first capitalist country in the world, the Netherlands, occurred without a revolution at all, and during the war for independence from Spain at the turn of the XVI-XVII centuries. After gaining independence, it was already a developed capitalist country, and far from agrarian. At the same time, the country remained

virtually a monarchy, it was ruled by a staegalter, whose position was inherited in the Oran House. Its power was limited by the financier, the great pensioner, deputy state helter for the State Council, who headed the financial department.

That is - there is a variety of forms of qualitative transitions in social dynamics. Revolutions - and this rule - are committed not once and for all, but several times in the same country. Thus, the October Revolution is socialist - a legitimate defeat. The next socialist wave was the 60s.

### **Summarizing**

Since socialism cannot win in a single country, there was no socialism in a separate USSR.

Management work that puts people over is privileged. Social being determines social consciousness, the privileged work of managers formed their bourgeois consciousness.

In backward agrarian Russia, the working class was a minority; in the USSR, it grew in number, repeating the history of the development of the working class in capitalist countries ahead of Russia. Thus, there was no movement towards a classless society, communism, where the contradiction between mental and physical labor was overcome, towards the elimination of the old social division of labor, dividing society into classes. Consequently, there was no socialism in the USSR.

Instead of the slogan "land - to the peasants, factories - to the workers", which retained partial private property, another form was carried out - state private property. The system could be socialist if this private property belonged to the workers, that is, if the state were in the hands of the working class, in other words, if the dictatorship of the proletariat were expressed in the form of Soviets. However, since 1923, the dictatorship of the proletariat has been expressed in the dictatorship of a narrow party stratum, which corresponds to the capitalist mode of production with the formation of an economic plan from above.

Capitalism is a mode of production in which labor becomes a commodity at the universal level. In the USSR there was an institute of hiring, a worker sold his labor, therefore, in the USSR there was state capitalism.

Property is the relationship between people about things, property relations are divided into use, possession and disposal. Therefore, disposition (management) is the relation of ownership.

The owner of the means of production is called the capitalist. Consequently, the manager, manager of the means of production, people, working conditions is a capitalist.

In the USSR, people, means of production, and working conditions were controlled by the state party-economic nomenclature headed by Stalin. Thus, the state in the USSR acted as the aggregate capitalist. Consequently, Stalin is a capitalist.

This implies the agrarian policy of Stalin, repression, "mistakes" during the Great Patriotic War, oppression of genetics, quantum mechanics, microbiology, etc.

The mode of production is the category of political economy, social order, social and economic formation — the categories of historical materialism that belong to a particular country and historical era [47, 55]. In Marxism, the mode of production determines the social system. Thus, under the capitalist mode of production, the USSR had a capitalist system.

It was beneficial for Western countries to support the myth of socialism in the USSR, since this myth formed the image of an external enemy consolidating nations and groups of countries.

However, totalitarianism is not something outstanding, not characteristic in the general channel of the development of capitalism, which manifested itself only in a small number of countries: the USSR, Italy and Germany of the 30s, China, North Korea. On the contrary, totalitarianism is a necessary feature of the development of capitalism, it is an objective historical regularity reflecting the tendency of centralization of capital revealed by Marx [58], it is manifested both in the USA, in Israel, and in France.

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中东欧地区的“一带一路”倡议-机遇与挑战并存  
**BRI IN THE CEE REGION – INITIATIVE OF OPPORTUNITIES  
AND CHALLENGES**

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抽象。今天，中欧关系已成为决定整个国际合作体系发展的主要因素之一。特别是在中国与其他国家之间，尤其是在北京与布鲁塞尔之间的官方地缘政治联系：中欧，东欧，欧洲国家之间，可以追溯到加速的发展。

作为中亚之间的地缘政治桥梁，中东欧国家为中方提供了投资和发展贸易与经济合作的广阔平台。尽管有这些前景，但中欧和东欧国家也对向西方推广一带一路项目构成了巨大威胁。中东欧关系的研究不仅从中欧经济和政治关系的发展角度看，而且从加强非洲大陆国际安全的角度看都是有意义的。

关键词：“一带一路”，中国，中东欧，合作，欧盟，挑战

**Abstract.** *Today Sino – European relations are one of the primary factors determining the development of the entire system of international cooperation. Especially accelerated development can be traced between the PRC and the countries – geopolitical links of the official Beijing – Brussels chain : the Central – East – European countries (CEE).*

*Being a geopolitical bridge between Asia and Europe, the CEE countries provide the Chinese side with large platforms for investment and development of trade and economic collaboration. Despite these prospects, however, the CEE countries also pose as a considerable threat to the promoting of the OBOR project to the West. The study of the Sino – Eastern European relations is relevant not only from the point of view of the development of the Sino – European economic and political relations, but also from the point of view of strengthening international security on the continent.*

**Keywords:** *BRI, China, CEE, cooperation, EU, challenges*

The second decade of the 21st century put the geo – economic emphasis and cooperation within the framework of China's “Belt and Road Initiative” (BRI) into the China – East European (CEE) states relations.

Starting in 2013, the main content of the programs of each 16 + 1 summit is the development of tools for this regional format. Naturally, the format of China's cooperation with the CEE countries is closely connected with the implementation of the global concept of the "New Silk Road" proposed by the Chairman of the PRC Xi Jinping [8]. The concept consists of two parts: the land "Economic belt of the Silk Road" and the "Maritime Silk Road of the 21st Century" and potentially involves cooperation of at least 60 countries in Europe and Asia [9].

Analyzing the role of CEE countries in the implementation of the Chinese BRI, it can be emphasized some specifics of the region's countries – the potential for market development and geographical advantages. An important role is played by the implementation of projects to create continental and Maritime transport routes that can transport goods between China and Europe. In developing cooperation, first of all, it is necessary to focus on market requirements, follow the principle of "first simple – then complex", avoid political risks, give enterprises a guiding role and take into account the leading role of important projects.

It should also be noted that in the format of the initiative, there are equal partnerships between all countries, it does not have strict mechanisms, and its structure allows multi-level, multi-layered collaboration that covers all areas of cooperation, including politics, economy and humanitarian exchanges. This multi-functional format is useful for promoting bilateral relations between China and the CEE countries, and it can also play a stimulating role in the development of China – Europe relations. At the same time, the issue of improving ties between the 16+1 format and China – EU cooperation, raises a number of questions that cause concerns in the EU government circles about the role played by the PRC in the region.

In 2016, a Chinese expert presented a detailed analysis of the problems and prospects of China's cooperation with CEE countries in the implementation of the initiative [7]. The expert stressed that the CEE region is located at the junction of the "New Silk Road Economic Belt" and the "21st century Maritime Silk Road". Both routes are connecting the markets of Europe and Asia – sea and land-passes; they also play an important role of ensuring the passage of commodity flows. The CEE region has the advantage of location: overland shipments from Western China via Russia or Central Asia are routed to Western Europe. Thus, China gains a strategic advantage from redistributing some of its Maritime supplies, reducing the use of the Strait of Malacca. In addition, there are commercial considerations: 1) in terms of time, this overland route speeds up transportation twice as compared to the usual way of delivery by sea with reloading to the railway, and 2) in terms of price it is much more profitable than air transportation.

Nowadays the sea route from China to the Greek port of Piraeus for the delivery of goods to the Balkan Peninsula, which lies at the intersection of transit communications in Europe, Asia and Africa, has great prospects. Currently, 80%

of cargo from China to Europe goes through the Atlantic ocean to the ports of Northern Europe. The sea route through the Arabian sea and the Suez canal to the Balkans will reduce the transport time by 7 – 10 days: this is the shortest sea route from China to Europe. However, to do this, CEE needs to build transport infrastructure, which the region has a huge need for. This is especially true for the Balkan Peninsula, which has entered a period of stable development after riots and wars that caused serious damage to infrastructure.

It is worth noting that the membership of 11 of the 16 CEE countries in the EU is an advantage that provides “system guarantees”. EU members and candidates comply with European laws and standards, which reduces the risks for Chinese investment in infrastructure projects. According to the researcher, continuing economic growth and expanding market demand make the CEE region an ideal “target market”. Thus, political stability was fruitful, and in the first decade of the 21st century many CEE countries have gone from “transition countries” to European representatives of “new markets” [1]. Today this is not only a transport corridor on the way to the core of traditional Europe, but also an increasingly important investment and consumer market itself. It is attractive because the European law system is implemented there, but land and labor are cheaper than in Western Europe.

Based on the analysis of China – CEE relations, it was concluded that cooperation between China, the EU and CEE countries can also contribute to the balanced development of Europe. The bilateral ties between China and CEE for 70 years have laid a solid Foundation for cooperation in the 16 + 1 format. The relationship is now entering a new era of multilateral cooperation that is not focused only on a one European sub-region, but reflects trans-regional characteristics. Thus, when analyzing the relations between China and the countries of the region, we should not limit ourselves to the regional level, but we should go to the trans-regional and global scale.

Thus, the 16 + 1 initiative is an inter – regional cooperation in which China is focused on linking its efforts with those of Europe and considers rail links, ports and foreign direct investment as the basis for ensuring balanced development and social cohesion in European countries. For example, the construction of a railway between Hungary and Serbia was far more important for both countries than obtaining short-term economic benefits. It is part of an Express route connecting land and sea from the port of Piraeus across the Balkan Peninsula to the main corridor in Europe [5]. In the future, the Express route will be extended to cover new areas near the three seas that wash the coasts of the CEE countries.

However, research has also shown that economic relations between China and the CEE countries are still underdeveloped, but they have a great future due to the fact that China is one of the most important investors in Europe. It is worth

noting that before the start of cooperation in the 16 + 1 format, Chinese investment and trade were not spatially balanced and were concentrated in the North – Western part of Europe. Due to the poorly developed transport infrastructure, trade between China and the CEE countries was carried out through the ports and Railways of Germany, Holland and France [3].

More importantly, China has begun to develop cooperation with Central and Eastern European countries in the field of innovation. This is a very promising direction. At the summit in Dubrovnik in 2019, China and the CEE countries expressed the idea of building a bridge as a sign of strengthening cooperation between China and the EU, which would reflect the great potential of China and CEE countries as partners with the same level of development.

It should be clear that the projects that China is able to offer are thought out comprehensively and can be effectively implemented with the participation of state corporations. They will help countries like Croatia to achieve their goals faster and more effectively. In short, the 16 + 1 Initiative will help to transform this region from a marginal region of Europe to a strong link between Europe and China.

Cooperation in the 16 + 1 format is sub-regional in nature, but the IPP will help it to become a trans-regional way of developing connectivity on land, in the air, in the ocean, and on the Internet. Now even North Africa and the Middle East can become part of this connection. The results of it will be systematic.

The goal of China's cooperation with CEE countries is not to continue to use CEE countries as a trade route, but to combine the industrial development needs of these countries with China's large production capacity, using the potential of CEE countries in the Chinese market. If Chinese products are close to the Central European market, it is necessary to ensure the presence of high-tech products from CEE countries in the Chinese markets.

Cooperation between China and CEE countries should reflect the future development trends. The interface includes not only traditional modes of transport, energy, labor and capital, but also digital infrastructure and data flows based on new technologies. There are huge opportunities for expanding cooperation between China, the 5G industry and service businesses. Cooperation with China is also intended to contribute to the economic revival of the Balkan region, the implementation of Internet projects and smart cities projects. Small countries can play the role of connecting links between China and Europe.

Nevertheless, despite the positive aspect of the development of relations between China and CEE countries within the framework of the BRI, they also continue to face new challenges and problems.

The first challenge is how to balance Sino – CEE relations with China's relations with the European Union. China, while developing relations with the CEE countries, now has to think about the concerns of the EU and some Western Euro-

pean countries. They fear that the countries of the Western Balkans that have not yet joined the EU will “choose China and reject the EU”, and the countries that have already joined the EU will “move closer to China and away from Europe”, which will lead to a split in Europe.

The second challenge is how long it will be possible to maintain China's economic advantages and how to make the development of economic cooperation sustainable. Today the countries of CEE are showing interest in cooperation with China, and after the financial crisis they wanted to get Chinese capital. However, the indispensability of Chinese investment for CEE is not so high. Mutual complementarity in trade and economic cooperation is increasing, but at the stage of rising contradictions between the EU and China is also becoming bigger [2]. If the European and American economies recover after the crisis, there is a risk that Chinese investment in CEE will be in a state of fierce competition with investors from Europe and the United States. This is not only a question of the size and volume of investments, but also their competitiveness, degree of interdependence and attractiveness. In trade, the main partner for the CEE countries is Western Europe – their mutual complementarity and mutual dependence is much higher than with China.

The third challenge is the asymmetry of the strategic needs of the two sides. There are no historical problems between China and the CEE countries, and there is no serious conflict of interests. Nor do they have a strategic mutual need for each other. Thus, in fact, there is not a single important issue where CEE countries need China's support (the problem of Kosovo is an exception for China and Serbia) [6].

The fourth challenge is the issue of road safety caused by the unstable political situation in the Balkans, as well as the Eastern borders of CEE. Also problematic issues include the strained economic relations between the EU and the Russian Federation, which provoke difficulties in transporting goods across the borders of these countries. Central and Eastern European countries are closely monitoring China's position on this issue. They are concerned about security and are getting closer to NATO, and the growing level of Sino – Russian relations may arouse suspicion in some states. In the construction of the BRI, any traditional threats, especially security – challenging geopolitical games, can have an impact on the participants. Therefore, China's reaction to the violation of international norms becomes an important criterion for psychological judgment in the development of relations with China by CEE countries.

Thus, according to the researcher, China, as a current superpower, should pay attention to not taking a strict position and not making statements that can give rise to security concerns and distrust in the CEE countries.

As a fifth challenge, we should point to the problem of the balance of large states and external pressure on the development of China's relations with CEE. Thus, after the end of the Cold war, the countries of Central and Eastern Europe

became truly subjects of international relations with their own interests. The US does not want the deepening of CEE countries' relations with China to harm their strategic interests in Europe. Russia also allegedly fears that China, relying on the countries of Central and Eastern Europe, will penetrate to its Western borders and take a place there. Therefore, in some areas and issues, these countries can put pressure on China and the CEE countries.

As a result of the analysis of China – CEE relations in the framework of the BRI project, as well as the results of the analysis of European public opinion, it was concluded that there are both positive trends and possible challenges in China – CEE relations and their role in China's relations with the EU.

While the specific impact of BRI “integrity” on European territory is still limited, new transport corridors are already emerging and the frequency of their use is growing rapidly. One is the rail link between China and Western Europe via Poland to Germany and beyond; the other is the North – North corridor between Greece and the Baltic region through Central Europe, Piraeus as a fast – growing center in the Mediterranean, actors in Italy are involved in expanding their profile as part of an expanding South – North logistics network. At the same time, cooperation with third countries (Ukraine, Russia, Belarus) remains at very early stages, as the degree of readiness of European companies to participate in Chinese-led infrastructure projects outside Europe remains unclear [4].

However, at a broader diplomatic and strategic level, the BRI has become a symbol of China's growing importance in international affairs, changing regional dynamics in geographical areas close to or even within Europe. At the most basic level, the strategic implications of expanding China's policy in the EU stem not so much from a set of projects with a single link, but from its comprehensive nature.

It can be traced that China – related initiatives, such as the AIIB and BRI, have already changed the global financial development landscape. Similarly, in the sphere of security relations, there is a need to protect assets and citizens abroad leading to the “securitization” of Chinese BRI participation abroad, which is likely to significantly change China's role in the regions of European interests. Within Europe and in conjunction with sub-regional mini – initiatives of China, such as 16 + 1, BRI also contributes to changes in the policy – making landscape in Europe and China.

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十六至十七世纪法国北部的教堂“设防设防”特征  
**FEATURES FORTIFICATION OF CHURCHES «EGLISES  
FORTIFIES» OF THE NORTH OF FRANCE IN THE PERIOD  
OF THE XVI-XVII CENTURIES**

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**摘要。** 文章专门介绍了位于法国两个部门(埃纳和阿登省)境内的泰拉什地区农村强化教堂的防御体系的发展。泰拉什地区增强的“防御工事”教堂位于埃纳和阿登两个部门的领土内。这些原始的宗教和防御工事建筑的总数一直保持至今,大约有60座教堂集中在Vervins公社周围的各个小村庄中,离巴黎东北面175公里。按时间顺序排列的许多建筑纪念碑和文字都更加详尽地证明,泰拉莎教堂的要塞是在16世纪和17世纪的漫长欧洲战争期间建立的。

**关键词:** 强化教堂, 埃纳, 阿登, 宗教战争, 设防, 宗教建筑

**Summary.** *Article is devoted to development of a system of fortification of the rural strengthened churches of the region Tyerash located in the territory of two departments of France: Aisne and Ardennes. The strengthened "eglises fortifiees" churches of the region Tyerash are located in the territory of two departments Aisne and Ardennes. Total number of these original religious and fortification constructions which remained up to now about sixty churches concentrated in various small villages around the commune Vervins in 175 kilometers to the northeast from Paris. Chronological dating of numerous architectural monuments and texts prove more exhaustively that Tyerasha churches fortresses were erected during long European wars of the 16th and 17th centuries.*

**Keywords:** *the strengthened churches, Aisne, Ardennes, religious wars, fortification, cult constructions*

### **Introduction**

The strengthened "eglises fortifiees" churches of the region Tyerash are located in the territory of two departments Aisne and Ardennes. Total number of these original religious and fortification constructions which remained up to now about sixty churches concentrated in various small villages around the commune Vervins who is in 175 kilometers to the northeast from Paris. Chronological dating of numerous architectural monuments and texts of that rough era prove more exhaustively that Tyerasha churches fortresses were erected during long European wars of the 16th and 17th centuries; from an era of Francis I who constructed a bastion de La-Chapel till an era of Louis XIV who bore it. Characteristic feature of all these strengthened churches is existence of powerful unapproachable walls and the bell tower in the form of the donzhon which is often surrounded with several angular towers. The thickness of walls of these churches is cut through by the narrow loopholes allowing to fire from firearms which replace traditional windows.

**Research objective:** Emergence of a similar architectural phenomenon was connected with the fact that in the 16th century the boundary region Tyerash regularly appeared in the center of the fierce military conflicts which almost continuously broke out between France and Spain. Later the same region became the arena of bloody religious wars, Thirty years' war and Opposition when since 1515 to 1715 almost continuous 200 years' war on border of Picardy and Champagne went. [3, 174] Robert Pujol, the former sub-prefect Vervins, in the basic research devoted to the strengthened Tyerash's churches, presented in 1959 lit a role of local communities which took the lead of strengthening of church and provided its financing: " Local governments which should not be confused with the Commune provided by the king or señores were legal entity which was engaged in strengthening of churches ... So, though the community of inhabitants played the prevailing role in strengthening of churches, it appears, as churchwardens, the cure, the bishop, abbots also promoted efforts on the general protection ... The fact that thanks to joint efforts, modest local settlements could sustain painful property duties on construction of quite large donzhon is explained by it as, for example, in Prises or Saint-Algis ..." [1. 27]. The current state of safety of these strengthened churches variously, is known to us only the last condition of alteration of the fact that there was once strengthened churches of the region Tyerash in the 16-17th centuries aiming to convert them in fortification objects of a threefold role: shelters, passive and active protection. And, It should be noted the fact that already from the moment of strengthening of these buildings, they gradually lost the military function only and finally in favor of their cult use as the place of a meeting and prayers. The funds of communities of the region hardly restored by the end of the XVII century allowed to restore at first roofs, bearing structures and the arches; pavements were replaced, plaster is updated and recoloured. Final alteration of the

strengthened churches in usual happens since 18th century (1715-1750). Naves of buildings were increased, and new expanded side-altars completely contained in themselves all country people. At once after Great war of 1914-1918 these non-professional alterations were resumed, is frequent not in view of old architectural forms and an esthetics of that era. For these reasons it is sometimes very difficult to find original projects of strengthenings of the 16th century. But, nevertheless, we got several buildings in a condition of the safety, sufficient to allow to understand the principles of the organization of ancient fortification.

### **Results of a research and their discussion**

Centuries the parish church offered villagers the place of a shelter and safety at approach of robbers. Thanks to the cult appointment it commanded respect the believer and as it often was the only strong building of the village, it was more difficult to be destroyed or burned (besides it was quite spacious to accept all population). How many times it performed this function before foreign mercenaries: the landsknechts, soldiers of papal guard, lyezhets, Dutches, true professionals of robbery rather capable to arsons, games with peaks and arkebuzes, than to imposing on a cross. The Romance church offered passive protection behind the thick walls, narrow windows, high and small gate which easily could be barricaded from within. The bell tower served as the place of the review of vicinities; the observer who was vigilantly on duty in the years of disorders warned a bell ring about approach of army. The remained witnesses – Romance (XI and XII вв) and Gothic (XIII-XIV-XV вв) churches, such numerous around Laonnois and in Soissonnais, – are especially rare in Thierache. They were strongly remade, it is possible in the 14th century during Centenary war, and most of them most likely in the 16th century. We find traces of it in Bosmont-sur-Serre, Franqueville, Montcornet, Prisces, Hary, Renneval, Vigneux-Hocquet, all of them are obviously defensive works which in the 16th and 17th centuries played an extra-liturgical role. Sometimes these churches intended only for a church service possessed the equipped halls shelters in a bell tower. Bernard Ansyen, the president of Archaeological society Soissonnais, drew attention to these special designs of the strengthened churches in the message on the Congress of societies of scientists in Énée (l'Aisne) (Vervén, September, 1975). [2., 30].

Before starting a research of strengthening of the church, it is worth remembering a role of a natural landscape in the system of fortification. Position of church on a natural hillock on the region of the plateau or near the river very complicated approach to a sanctuary shelter in Agnicourt, Prisces, Nanpcelles-la-Cour, Saint-Algis. Though hardly the choice of the place can be justified only with care of protection. Organization of cult places often happened in old times and it is seldom precisely known that was originally constructed: Romance church, merovingian church, gallo-Roman sanctuary, cult pagan place of Gauls. Let's notice that in a

configuration of the site there are sometimes natural obstacles facilitating protection of approaches to it so the steep slope topped with a dense thorny fence is a traditional element of the region Tyerash who prevents approach of the rider and infantryman. The parish cemetery almost always surrounds rural church Tyerash, and its space is completely closed. This site together with church forms a certain "sacred" space, the fact of the shelter in its limits created spiritual safety for the believer. Therefore the cemetery sometimes became stronger a series of specially created obstacles to complicate or in general to forbid overcoming the protected space. The cemeterial strengthenings which nowadays disappeared were various later, but modern shooting from air, for example locations of Parfondeval church, allowed to find traces and the remains of the ditch surrounding the cemetery.



*fig. 1 The Strengthened Church in l'Aisne*

It is possible to distinguish three main types from monuments of "eglises fortifies" of that era which well remained up to now fortification solutions of the problem of protection of a cult construction:

1) Full preservation of the building of ancient church (Romance or Gothic) and construction around it some fortification elements (the acting hinged loophole-mashikuli, wooden fighting gallery, angular watchtowers (bay windows-bartizanov), loopholes ...) and the safe hall above: Renneval, Morgny-en-Thierache.

2) Partial preservation of ancient church (Romance or Gothic) and construction on its base of the new building of the strengthened building (type fort): Priscès, Burelles.

3) Construction of absolutely new strengthened church conceived entirely as the mixed building, fortification and religious appointment, real "eglise fortifiée" Plomion, Englancourt.



*fig. 2 The Strengthened Church in Plomion,*

Each of these decisions corresponded to the, special unique situation. Numerous factors which could affect the reasons of the choice of any given type of a fortification solution: solidity of the ancient building; motivation of residents of the village; funds which are at their disposal; support of the señor, king, clergy; special military and public conditions, prospect of new disorders and new robberies; will of the population and bodies of community. In general, degree of an intensification of enemy attacks, and the related economic depression based on constant diplomatic tension between France and Spain, which was expressed in repetition of "chivalrous war" (*guerre guerroyable*): sufficient reasons to explain the nature and scale of fortification construction works of the region. Some ancient churches which building construction initially did not provide a shelter and defense of locals at all were thoroughly reconstructed and modified. The speech, first of all, punching loopholes within the walls of a nave, a cross aisle or choruses. Such works on the forced strengthening of actually cult parts of ancient stone churches can and be seen in Montcornet, Vigneux today, Renneval. Protection of flanks (angular walls) by maintaining the flanking fire at attackers became possible, first of all, thanks to construction of angular watchtowers (*bartizan*) at top of buttresses of all church building – for example, in Rozoy-sur-Serre and Montcornet. Access to such angular watchtowers and the acting hinged loopholes (*mashikula*) was generally carried out through a roof of church over the arches and overlappings of a ceiling. Sometimes these roofs raised in such a way that it turned out the real closed "safe hall". The largest windows of an upper case towering over the acting hinged loopholes formed peculiar fighting galleries passes behind choirs of the building, for example, in an apse of Montcornet church.

The researcher R. Rodyer well described similar reorganization of ancient choruses (13th century) the strengthened churches in Morgny-en-Thierache, Renneval and Vigneux. The works which are carried out in the first half of the 16th

century. In these churches, consisted in overlapping of the temple the arch and also in at a raising of walls to establish the new, protected room "safe hall" above the building. In these three cases of a wall of these high halls were also punched by loopholes with double slopes for conducting firing (inside and outside). It is, thus, about rooms for the shelter of locals and about rooms the "safes" adapted for active defense. Numerous windows loopholes, at height of human growth, within the walls of the main nave and cross aisles, were punched above the building, in towers and "bartizanakh". These fortification architectural forms were constantly improved during the entire period of wars of the XV-XVIII centuries, and today scientists conduct thorough typological, chronological and regional inspections. The most widespread type of windows loopholes of a facade of the strengthened churches of the region (the end of XVI – the beginning of the 17th centuries) from the attacking opponent presents a narrow gleam (literally to several cm), more or less high (10-40 cm), the employee at the same time and an aim opening and an opening for arrangement of firearms. [1. 34] This shooting crack loophole, obviously visible gleam on an outer surface of a wall, is sometimes framed with two or four stones (for a ricochet) whereas all surface of a wall is put from a brick. From within the building (from defending) the loophole represents more or less wide embrasure inclined outside and from top to bottom to facilitate hinged firing at attacking, with direct or vaulted horizontal stone facing. Today some researchers call in question an active role in defense of the building of these loopholes apertures. The measurements of loopholes made by Jean Mure (J. - P. Meuret) in churches of the region, prove a possibility of use of windows loopholes for firing from easy firearms. Studying loopholes apertures allowed to estimate in a new way functional advantages of these windows embrasures in the system of defense of the building. So, in the strengthened Origny-en-Thierache church in one hall also embrasures actually for firing from muskets and wider and high apertures alternating with them for firing from small guns on the same wall are located above.

Openings loopholes on angular sentry turrets (bartizanakh), for example in churches Fontaine and Englancourt often have the same functional specialization. Proofs of military functional purpose show us loopholes of churches which special device demonstrates their fitness to firing by small arms: in Renneval the side window slopes are carefully squared and ground in the form of a quarter shaft for pass of the small gun. Sometimes on a ledge on a prop (support) the special stone limiting return of a fire weapon is located, and in Gronard church such crossbeam (strut) from wood has wear from the tool in the middle. Let's notice, at last, that the loophole is always located not at height of eyes as it would be possible to expect from an observation post, but below (about 1 m-1.20 m from floor level), such arrangement of a window loophole coincides with a position of the aiming shooter inclined forward and leaning elbows on an embrasure niche. [3. 35]



*fig. 3 churches in Origny-en-Thierache and in Glancourt*



*fig. 4 church in Renneval*

**Conclusions:** Thus, existence of these windows loopholes which are specially equipped for conducting firing is the most obvious sign of the initial defensive project of builders in the absence of other fortification elements or after their disappearance. We showed how the rural parish churches which are earlier constructed only as cult constructions were strengthened in the period of the XVI century, thanks to special fortification alterations which sharply increased their defensive potential and provided to the population more reliable shelter. At the same time these military and religious constructions did not change the basic structural elements of Catholic church as both its planning and its various parts (chourses, a cross aisle, a nave, a church porch ...) remained the same that in traditional Romance or Gothic religious architecture. [4.] It is possible to distinguish from churches "eglises fortifies" of that era accurately three main types fortification

solutions of the problem of protection of a cult construction: 1) Full preservation of the building of ancient church (Romance or Gothic) and construction around it some fortification elements (the acting hinged loophole-mashikuli, wooden fighting gallery, angular watchtowers (bay windows-bartizanov), loopholes ...) and the safe hall above: Renneval, Morgny-en-Thierache; 2) Partial preservation of ancient church (Romance or Gothic) and construction on its base of the new building of the strengthened building (type fort): Prisces, Burelles; 3) Construction of absolutely new strengthened church conceived entirely as the mixed building, fortification and religious appointment, real "eglise fortifiée" Plomion, Englaucourt.

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典型溶血性尿毒症综合征患儿的促炎细胞因子  
**PROINFLAMMATORY CYTOKINES IN CHILDREN  
WITH TYPICAL HEMOLYTIC UREMIC SYNDROME**

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抽象。典型的溶血尿毒症综合症是血栓性微血管病的严重疾病。它的发病机制与Stx诱导的内皮损伤以及活化的白细胞和巨噬细胞释放促炎性和硬化性细胞因子有关。全身性炎症的标志物，特别是促炎性细胞因子及其可溶性受体，可能对tHUS具有预后价值，可作为疾病严重程度的预测指标。

目的：确定tHUS急性期儿童的血清TNF $\alpha$ 和rTNF $\alpha$ ，IL-6和rIL-6，IL-10的浓度，并评估其作为疾病严重程度和持续时间的预测指标。

材料与方法：30例tHUS急性期患者，采用ELISA法检测上述细胞因子及其受体的血清浓度。对照组由tHUS随访期间的21名儿童组成。

结果：tHUS急性期患儿的TNF $\alpha$ 和rTNF $\alpha$ ，IL-6和rIL-6，IL-10显著高于通病组。rTNF $\alpha$ 和IL-6的增加最为明显。血清IL-6和CRP浓度显着正相关，IL-6和C3呈负相关。IL-10水平与入院时白细胞数量，无尿持续时间显着相关，而在无尿持续时间超过7天的儿童亚组中，IL-10的水平显着更高。

结论：在急性tHUS患者中，高水平的IL-6和/或IL-10并伴有高白细胞增多和CRP水平，可被视为严重和长期全身性炎症反应的另一项实验室标准，并且可预测严重的疾病。

关键词：溶血尿毒症综合征，儿童，细胞因子

**Abstract.** *Typical hemolytic-uremic syndrome is a severe disease of thrombotic microangiopathies. It's pathogenesis is associated with Stx-induced damage of the endothelium and release of pro-inflammatory and prosclerotic cytokines by activated leukocytes and macrophages. Markers of systemic inflammation, in particular; proinflammatory cytokines and their soluble receptors, may have prognostic value for tHUS as predictors of disease severity.*

**Objective:** *to determine serum concentrations of TNF $\alpha$  and rTNF $\alpha$ , IL-6 and rIL-6, IL-10 in children with acute phase of tHUS and to evaluate their informativeness as predictors of the disease's severity and duration.*

**Materials and methods:** *The serum concentration of the above cytokines and their receptors was studied by ELISA in 30 patients in the acute phase of tHUS. The comparison group consisted of 21 children in the follow-up period of tHUS.*

**Results:** *TNF $\alpha$  and rTNF $\alpha$ , IL-6 and sIL-6, IL-10 was significantly higher in children in the acute phase of tHUS than in the catamnesis group. The increase of rTNF $\alpha$  and IL-6 were most pronounced. Significant positive correlations of the serum concentrations of IL-6 and CRP, negative correlation of IL-6 and C3 were revealed. The level of IL-10 was significantly correlated with the number of leukocytes at admission, with the duration of anuria and was significantly higher in the subgroup of children with more than 7 days anuria duration.*

**Conclusion:** *in patients with acute tHUS a high level of IL-6 and / or IL-10 in combination with high leukocytosis and the level of CRP, can be considered as an additional laboratory criterion of severe and prolonged systemic inflammatory response and a predictor of severe disease.*

**Key words:** *hemolytic-uremic syndrome, children, cytokines*

### **Introduction.**

A typical hemolytic uremic syndrome is a disease from the group of thrombotic microangiopathies, the cause of which is an infection caused by Shiga toxin (Stx) -producing microorganisms, primarily enterohemorrhagic Escherichia coli. The disease most often affects children from 6 months to 5 years, although it is possible at any age, manifested by the development of a triad of symptoms - hemolytic anemia, thrombocytopenia, acute renal damage - after the prodromal period of acute intestinal infection, often hemocolitis. [1,2,3]

It was previously shown that high leukocytosis in the onset of tHUS is a predictor of the severity of the disease [4,5]. It can be assumed that other markers of systemic inflammation, such as tumor necrosis factor-alpha (TNF $\alpha$ ), soluble TNF- $\alpha$  receptor (sTNF $\alpha$ R), interleukin 6 (IL-6) and soluble IL-6 receptor (sIL-6R), and also the anti-inflammatory cytokine interleukin-10 (IL-10) may have prognostic value in tHUS in terms of the risk of cortical necrosis, neurological damage, and multiple organ failure.

**The aim:** The aim of this work was to study the serum concentrations of TNF $\alpha$ , sTNF $\alpha$ R, IL-6, sIL-6R, IL-10 in children in the acute phase of tHUS, as well as to assess their information content as markers of the severity and duration of the disease.

**Material and methods.** We examined 30 patients (17 boys, 13 girls) in the acute phase of tHUS and 21 children (12 boys, 9 girls) in the follow-up history. All children underwent ultrasound examination of the kidneys with dopplerography, a study of laboratory parameters characterizing the activity of TMA and hemolysis (hemoglobin, platelets, LDH), the severity of inflammation (leukocytes, C-reactive protein, C3 component of complement), the state of the coagulation system (RFMC, D-dimer), degree of renal damage (urea, creatinine). Serum samples to study the content of TNF $\alpha$  and sTNF $\alpha$ R (60 kDa), IL-6 and sIL-6R, IL-10 for

children in the acute phase of tHUS were taken on the first day from admission to the department (on days 2-4 from the onset of tHUS symptoms), children of the comparison group - with a routine follow-up examination. The above cytokines and their soluble receptors were determined by ELISA using test systems from eBioscience (Austria).

### Results.

The content of cytokines and their soluble receptors in children of the main and control groups are presented in table. 1. Since the data in the groups had a different distribution than normal, they are represented by the median (M) and the interquartile gap (Q1-Q3).

**Tabl.1** The content of cytokines and their soluble receptors in the blood serum of children with acute phase tHUS and catamnesis (median, Q1-Q3)

Criteria (normal values)	Acute tHUS, n=30	Remission of tHUS, n=21	p
TNF $\alpha$ ng/ml (0-6)	3,4 (2,2-4,6)	1,9 (1,8-2,2)	0,004
sTNF $\alpha$ R (60 kDa) ng/ml (1,47-4,16)	3,2 (1,4-4,2)	0,1 (0,0 – 0,4)	0,003
IL-6, pg/ml (0-12,7)	17,1 (13,2 – 67,9)	2,8 (2,6 – 3,0)	0,0008
sIL-6R, pg/ml (65,9-202,7)	187,5 (150 – 225)	125 (100-150)	0,02
IL-10 pg/ml (7,9-12,9)	8,7 (6,8-79,4)	6,1 (5,2-9,1)	0,02

In children of the comparison group, the level of the studied cytokines did not go beyond the reference indicators, and sTNF $\alpha$ R was not determined (0 pg / ml) in 47.6% of children in the control group. In the acute phase of tHUS in children, both normal and elevated values were noted.

Thus, the level of TNF $\alpha$  in all children in the acute phase of the disease was within normal limits (although higher than in the control group). TNF $\alpha$  s level was increased in 23.3% of children, IL-6 in 76.6%, sIL-6R in 30.0%, IL-10 in 36.7% (differences with the control group were significant for all cytokines,  $p < 0.05$ ).

We did not find a reliable relationship between the level of the studied cytokines and their receptors with the clinical manifestations of the infectious process (fever and severity of hemocolitis). Reliable ( $p < 0.05$ ) positive correlations of IL-6 and CRP level ( $r = 0.76$ ), negative correlation of IL-6 and C3 level ( $-0.68$ ) were revealed. The level of IL-10 was significantly ( $p < 0.05$ ) correlated with the number

of leukocytes at admission ( $r = 0.44$ ). The duration of anuria as an indicator of the severity of the disease and the risk of long-term consequences was positively correlated with the number of leukocytes at admission ( $r = 0.64$ ,  $p < 0.05$ ), CRP level at admission ( $r = 0.46$ ,  $p < 0.05$ ), and also the level of IL-10 ( $r = 0.77$ ,  $p < 0.05$ ).

**Conclusion.** Thus, in children in the acute phase of tHUS, in comparison with the catamnesis group, increased levels of a number of pro-inflammatory cytokines, as well as increased levels of anti-inflammatory cytokine IL-10, were found. At the same time, it can be assumed that with tHUS, the maximum active secretion of cytokines occurs at the height of the infectious process, at the time of prodromal Stxemia, i.e. in the prodromal period of tHUS. Subsequently, with the already developed symptoms of HUS (as in our patients), toxinemia decreases and the secretion of cytokines is declining and, since the half-life of cytokines in vivo is short, their plasma level decreases. The detection of a high level of IL-6, IL-10 in patients in the early stages of tHUS, along with high leukocytosis and CRP level, can serve as a marker of a pronounced and prolonged systemic inflammatory response and a predictor of the severe course of the disease. IL-10 can be both a marker of severe systemic inflammation (since its secretion is triggered by pro-inflammatory cytokines), and also have its own adverse effect on the pathological process in tHUS by excessive immunosuppression.

The revealed correlations of the duration of anuria with leukocytosis, CRP level, a more pronounced decrease in C3 in the subgroup of children with severe tHUS confirm the adverse effect of severe systemic inflammation and complement activation on the severity of tHUS.

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窄带光辐射 (波长为540 nm的NOR) 对临床和整体指标的比较评估动力学  
**DYNAMICS OF COMPARATIVE EVALUATION OF CLINICAL AND  
INTEGRAL INDICATORS UNDER THE INFLUENCE OF NARROW-  
BAND OPTICAL RADIATION (NOR WITH A WAVELENGTH OF 540  
NM) IN PATIENTS WITH ARTERIAL HYPERTENSION**

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抽象。 该综述提供了在高血压患者中窄带光辐射 (波长为540 nm的NOR) 影响下临床积分指标的动态。

关键字: 高血压, 窄带光辐射, 波长540 nm, 光致变色疗法。

**Abstract.** *The review provides the dynamics of clinical integral indicators under the influence of narrow-band optical radiation (NOR with wavelength of 540 nm) in patients with arterial hypertension.*

**Keywords:** *arterial hypertension, narrow-band optical radiation, wavelength 540 nm, photochromotherapy.*

Solar radiation is the source of all processors on the Earth. [1]. We are able to perceive electromagnetic waves from violet to red (from 380 nm to 780 nm) [2]. Photochromotherapy is currently being developed intensively. This section takes into account the fact that all processes are wavelength selective. Wavelength is an important parameter, because it determines the photobiological effect - the resonant absorption of light energy by molecules by sensitizers. The colors of radiation possess the energy of photons, which causes the primary photophysical processes that trigger biochemical and biophysical reactions. Ultraviolet rays are absorbed in the epidermis, blue and green in the dermis, red and infrared radiation in deeper layers [5]. Narrow-band optical radiation (NOR) does not have a damaging effect on cells, tissues, organs; contributes to the development of adaptive reactions, due to the significant similarity of its physical characteristics with environmental radiation, which ensures good tolerance of procedures. The simplicity and safety of using the method determines the relevance of its radiation [5].

Not enough attention is paid to the light itself, there are works on the use in neurosurgery in children (Bratova EA, 2004, Mustafaeva A., 2010).

Arterial hypertension (AH) in terms of contribution to mortality from cardiovascular disease (CVD) takes the first place. The disease affects people of working age [9]. Despite a significant number of antihypertensive drugs, the prevention and treatment of AH are not completely resolved. In this regard, the search for new approaches to normalize and maintain blood pressure at the proper level remains relevant. Treatment of AH requires an integrated approach using physical factors [11]. In this regard, narrow-band optical radiation (NOR) of various wavelengths is of great interest. There is no data in the literature on the possibility of using NOR with a wavelength of 540 nm in patients with arterial hypertension.

The aim of the study is to substantiate the possibility of using narrow-band optical radiation with a wavelength of 540 nm (green light) in the complex treatment of patients with arterial hypertension.

This work was carried out on the basis of the cardiological department of the Federal State Budgetary Institution of Health “St. Petersburg Clinical Hospital of the Russian Academy of Sciences”. Under the supervision were 115 patients aged 40 to 70 years, among them 84 women (73%) and 31 men (27%). The average age of the patients was  $62.8 \pm 1.1$  years. The average duration of AH disease in the observed patients was  $12.4 \pm 1.3$  years and  $10.8 \pm 1.5$  years, in groups 1 and 2, respectively.

In both groups, patients with 2 and 3 degrees of AH prevailed (75.4% (49 people) in the main group and 74% (37 people) in the comparison group. The average level of systolic blood pressure (SBP) at rest was 172 in the main group,  $8 \pm 3.2$  mmHg, in the comparison group -  $170.0 \pm 3.3$  mmHg, diastolic blood pressure (DBP) -  $97.9 \pm 1.6$  mmHg and  $95.6 \pm 1.8$  mmHg, respectively, average heart rate (HR)  $79.1 \pm 2.07$  bpm in the main group and  $78.3 \pm 2.2$  bpm in the comparison group. According to the indicators listed above, the groups were comparable. The selection of patients for the study was carried out by the continuous sampling method. The selection criteria for the formation of the sample were the following conditions: patients with long-term history of hypertension. The study did not include patients with cancer, active, severe and decompensated diseases of the kidneys, liver, heart, lungs, thyroid gland, anemia, leukemia, peptic ulcer of the stomach and duodenum, autoimmune diseases, diffuse connective tissue diseases and systemic vasculitis, with acute coronary syndrome.

Patients were divided into the main and control groups. According to the recommendations for the treatment of arterial hypertension ESH/ESC 2013, drug therapy was carried out with a course of standard drugs for the treatment of AH [14]. The frequency of use of hemodynamically active drugs (angiotensin-converting enzyme inhibitors, angiotensin II receptor antagonists, beta-blockers, diuretics,

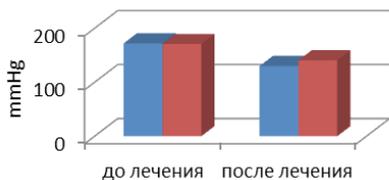
calcium channel antagonists) did not differ in subgroups ( $p \geq 0.05$ ). In patients of the main group, in addition to the complex of drug therapy, photochromotherapy (PCT) was used. The PCT procedure was performed using the "Spectrum-LC-02" apparatus. The following parameters were used: matrix radiation mode - constant (wavelength 540 nm), radiation intensity gradation was chosen 100%, radiation power density 4 mW/cm<sup>2</sup>, projection of the "collar zone". The duration was 5 minutes per field (2 fields in total) using the contact method. The total radiation dose is not less than 2.4 J/cm<sup>2</sup>. The course of treatment consisted of 10 procedures carried out daily.

Patients underwent: collection of frequently encountered complaints presented by patients, an anamnesis of life, an objective examination was conducted. Clinical and laboratory research methods were presented: by determining the concentration of plasma homocysteine was determined by enzyme immunoassay. autonomic equilibrium, an ultrasound examination was performed "test with post-occlusal reactive hyperemia (PRH)" according to the classical method proposed by D.S. Celermajer (1992) [12]. Filling out the "quality of life" questionnaire "SF-36". To assess the degree of autonomic equilibrium in the regulation of the cardiovascular system, we used: HR, SBP, DBP, and Kerdo index, calculated pulse pressure, mean blood pressure.

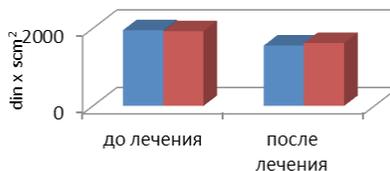
Statistical processing of the research results was processed using the "STATISTICA for Windows" system program (version 6.0).

The examination revealed complaints: headache, heart pain, shortness of breath, dizziness, memory impairment. The maximum amount is 5 points. Each individual complaint - 1 point. In patients of the main group, the total number of complaints decreased from 2.5, points to 0.4, in the comparison group from 2.5 points to 1.0 points. The difference in the average amount of complaints is 0.6 points ( $p < 0.01$ ).

In the main group, a significant decrease in mean blood pressure (MBP) was observed from  $122.3 \pm 2.0$  to  $97.4 \pm 9$  mmHg, the difference was 24.9 mmHg. In the control group, the differences of this indicator before and after treatment were only 19.2 mmHg. An analysis of the dynamics of HR did not reveal significant changes in both groups. Combined therapy using NOR with a wavelength of 540 nm led to a decrease in peripheral vascular resistance (PVS) from  $1956.1 \pm 31.3$  to  $1558.3 \pm 14.3$   $\text{din} \times \text{s/cm}$  in the main group ( $p \leq 0.05$ ). In the control group, the decrease in PVS was less significant ( $1623.8 \pm 17.4$ ) at a rate of 1350. The decrease was significant ( $p < 0.05$ ) in the main group by 2.5 times compared to control.

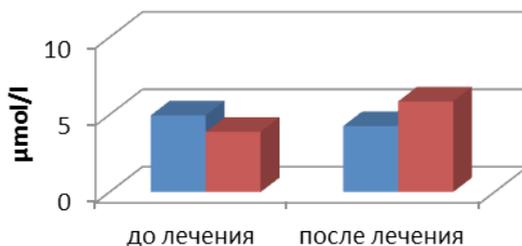


**Figure 1** – Comparative evaluation results by SBP



**Figure 2** – Comparative evaluation results by PVS

Homocysteine was determined by enzyme immunoassay. When assessing the change in the indicator during treatment, the approximation of the indicator to Popt was considered positive, and deviation from this value was considered negative. By dynamics we mean the difference between deviations from Popt before and after treatment. The changes in the main group were  $0.59 \pm 1.6$ , and in the control group  $-2.52 \pm 2.79$ . As a result of treatment in the main group, the average homocysteine levels approached normal, and in the control group, on the contrary, they deviated more strongly from the normative indicators (5 to 15  $\mu\text{mol/l}$ ) ( $p < 0.05$ ), which we interpret as a favorable effect of combined therapy. It is likely that narrow-band optical radiation with a wavelength of 540 nm affects the level of homocysteine in the blood, which requires further research.

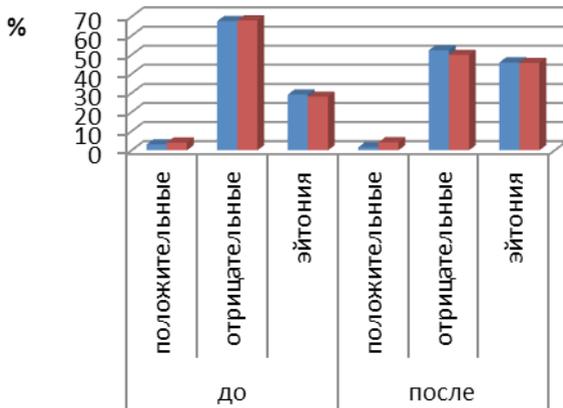


**Figure 3** – Comparative evaluation results by Hz

Despite the difficulty in interpreting the dynamics of the Kerdo index, all patients received drug therapy (adrenergic blocking agents). There were no statistically significant differences between the Kerdo index groups before treatment and after the course of PCT ( $p > 0.05$ ). In both groups, pretreatment was dominated by patients with negative values of HI - 67.7% (44 people) in group 1 and 68% (34 people) in the second group, what we regarded as the dominance of parasympathetic influence. Before treatment, autonomic dysfunction syndrome is usually diagnosed in 70% of patients with AH in the form of persistent autonomic regulation disorders in the form of hypersympathicotonia, which, in turn, not only increases blood pressure and stabilizes in subsequent AH, but also has other adverse

effects on cardiac vascular system [3]. After treatment in both groups, a significant increase in the proportion of patients with eutonia (29.2% (19 people) vs 46.0% (29 people) in the main group and 28% (14 people) vs 45.8% (22 people) in the comparison group) ( $p < 0.05$ ).

Changes in the Kerdo index of AH patients during therapy may reflect adaptive reactions of the body, manifested in a decrease in the stress of autonomic homeostasis [6]. This confirms the validity of the use of therapy in the treatment of AH patients.



*Figure 4 – The result of a comparative assessment by KI*

When assessing endothelial vascular function using an ultrasound examination of the "test with post-occlusal reactive hyperemia" (PRH), the values of the basal diameter of the brachial artery in patients of both groups did not practically differ. The test results before treatment showed that in both groups, patients with impaired endothelial function predominated.

According to our observations, the proportion of patients with a positive breakdown in which the diameter of the artery increased by less than 10% was about 70%, which implies a violation of the vasoregulatory function of the vascular endothelium.

The analysis of the dynamics of the growth of the diameter of the brachial artery in response to a test with PRH revealed that there were no differences in the diameter of the vessels as a result of treatment in any group. However, we noted a decrease in the proportion of patients with a vasoconstrictor reaction from 15.38% to 7.69% in the main group, which indicates the positive effect of combination therapy. Linear blood flow velocities were comparable in both groups. A decrease

in blood flow velocity was expected to be observed by 5 minutes. According to our observations, after complex therapy, the rate decreased at all stages of the ultrasound examination of the sample with PRH ( $p < 0.05$ ). This, in our opinion, is associated with a decrease in the rigidity of the vascular wall and explains the effect of vasodilation and a decrease in BP. With a decrease in systolic pressure, the linear velocity of blood flow decreases, with an increase - on the contrary, the speed will increase. This dependence is due to passive vasodilation of blood pressure [8, 13]. In the control group, no such relationship was found.

The increase in blood flow velocity in both groups was initially less than 20%, which indicates a decrease in the reserve capacity of the microvasculature in patients with AH. However, after treatment, in the main group there was a significant increase in blood flow velocity (1.09% before treatment and 6.7% after treatment,  $p < 0.05$ ), which indicates an improvement in microcirculation.

Quality of life (QoL) was studied using the SF-36 questionnaire. Physical function (PF), physical role (RP), physical pain (BP), vitality (VT), social function (SF), emotional role (RE), and mental health (MH) were determined. The result of each scale was evaluated separately. The indicator varies from 0 to 100. The scales are grouped into two indicators: “physical component of health” and “psychological component of health.” Before treatment, the groups did not differ ( $p > 0.05$ ). After treatment, statistically significant differences appeared for a number of indicators.

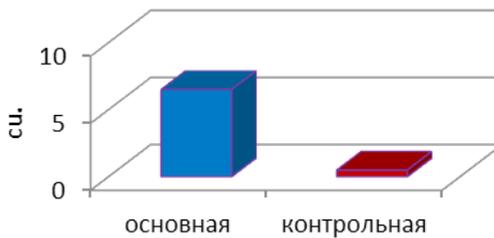
In the main group, QoL is statistically significantly higher in the following indicators: physical function, physical role, social role, as well as on both final scales. Emotions play the role of a trigger mechanism in the human body, activate the neuroendocrine system [7]. In the control group, QoL statistically significantly increased only in terms of: physical pain and general health (GH). In final scales, no significant differences are observed.

**Table 1 - Quality of life of patients of the main and control groups before and after treatment**

Main group (n=65)										
	PF	RP	BP	GH	VT	SF	RE	MH	PH	MH
Before treatment	50,81	37,16	67,19	53,3	51,89	53,72	46,85	53,84	40,09	40,8
(points)										
After treatment	67,84	64,86	69,92	60,97	52,16	73,99	54,05	54,59	46,86	42,89
(points)										

Reliability (p)	0,003*	0,01*	0,64	0,03*	0,65	0,001*	0,1	0,52	0,05*	0,05*
Control group (n=50)										
	PF	RP	BP	GH	VT	SF	RE	MH	PH	MH
Before treatment (points)	52,92	33,33	58,5	47,79	45,42	59,9	36,11	57,17	37,46	40,6
After treatment (points)	60,83	32,29	67,83	50,79	46,04	63,02	27,78	53,33	42,27	37,75
Reliability (p)	0,07	0,89	0,04*	0,05*	0,88	0,43	0,51	0,2	0,63	0,47

When studying the total score of the weighted structure in the main group was 6.5 cu At the same time, with one drug therapy, its value was 0.5 cu.



**Figure 5 – Integral evaluation**

Thus, the use of NOR with a wavelength of 540 nm in the complex treatment of AH patients leads to a significant decrease in the level of systolic blood pressure (by 30 mmHg) of average blood pressure (by 24.9 mmHg), peripheral vascular resistance and serum homocysteine level.

Photochromotherapy with a wavelength of 540 nm causes an increase in the number of patients with eutonia, both in the main and in the control group, which indicates an adaptive reaction of the body, manifested in a decrease in the tension of autonomic homeostasis in groups.

Complex treatment using NOR with a wavelength of 540 nm showed a significant ( $p < 0.05$ ) increase in blood flow velocity at all stages of an ultrasound examination of a sample with reactive hyperemia. A twofold decrease in the proportion of patients with a vasoconstrictor reaction compared with the control group confirms the effect of NOR with a wavelength of 540 nm on the elastic properties of the vascular wall and vascular tone.

Combined therapy using NOR with a wavelength of 540 nm in patients with AH leads to a significant improvement in the quality of life, both in physical condition and in psycho-emotional state. ( $p < 0.05$ ).

Summing up, we can confidently say that photochromotherapy affects the autonomic nervous system, blood pressure, vascular tone and improves the "quality of life".

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义齿治疗, 支持种植体

## DENTURE TREATMENT WITH SUPPORT FOR IMPLANTS

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抽象。当前, 基于植入物的假体是解决缺牙问题的另一种有希望的方法。与传统的修复术不同, 使用植入物作为可移动修复术的支撑物有助于防止骨骼组织的萎缩, 并允许您在拔出牙齿后立即恢复牙列的完整性。

这种治疗牙本质的方法的优点是改善了咀嚼功能, 确保了患者的心理舒适性和他的社会适应能力, 以及进行合理的口腔卫生的能力。

借助假体植入物, 语言功能和失去的美感得以恢复。许多临床研究表明, 使用基于植入物的完全可移动义齿修复后, 患者的生活质量有了明显改善。

关键字: 牙本质, 义齿支持植入物治疗。

***Abstract.** Currently, prosthetics based on implants is an alternative and promising way to solve the problem of missing teeth. The use of implants as supports for removable prostheses, unlike traditional prosthetics, helps to prevent atrophic processes in bone tissue and allows you to restore the integrity of the dentition immediately after tooth extraction.*

*The advantages of this method of treating adentia are improved chewing function, ensuring the psychological comfort of the patient and his social adaptation, as well as the ability to conduct rational oral hygiene.*

*With the help of prosthetics on implants, speech functions and lost aesthetics are restored. Many clinical studies have shown a clear improvement in the quality of life of patients after prosthetics with full removable dentures based on implants.*

***Keywords:** adentia, denture treatment with support for implants.*

### **Introduction**

Revived in the middle of the XX century, dental implantology due to its knowledge-intensive and integrative potential is undergoing rapid development among the areas of modern medicine. Research conducted to improve this type of dental care primarily related to the life of the implants. It was determined that on average 92% of orthopedic constructions on dental implants have been functioning for more than 10 years.

In 1964, Leonard Linkov proposed a plate-like implant design with holes and became the world's recognized founder of one-stage fibro-osteointegrated implants. Another concept of implantation was put forward by Per-Ingvar Brånemark. On its basis, in 1965, the Swedish National School of Implantologists was created, which is based on the theory of osseointegrated two-stage implants. By 1978, the level of development reached a standard that allowed to obtain good treatment results [1].

Deep scientific research in the field of implantology was first done in Russia in the early 90s of the XIX century and is associated with the name of N. N. Znamensky. Dental implantology in our country received the “second wind” in the 50s of the XX century and was associated with the names of E. Ya. Varez, V. G. Eliseev. Their innovative developments, carried out without contact with the world dental community, generated interest in the problem of treatment on “artificial roots”, but could not substantively justify the use of the method in practical health care.

For many years, implantation was prohibited in the USSR. Only in 1986 did the Ministry of Health of the USSR officially lift its ban on its use. This event was associated with the appearance of the order of the Ministry of Health of the USSR № 310 dated 03.03.1986 “On measures to introduce the method of orthopedic treatment using implants”. A certain positive role in the emergence of this order was played by the employees of the Central Research Institute of Communication and the Kaunas Experimental Laboratory of Dental Implantation and Prosthetics.

The achievement of the modern level of DI in the USSR was also facilitated by G. B. Brahman (1956), S. P. Mudry (1956), G. M. Ivashchenko (1957), V. V. Los (1985), V. N. Olesova (1986, 1993), A.S. Chernikis (1988), I.V. Baluda (1990), A.I. Matveev, A.I. Ageenko, O.N.Surov (1987), M.Z. Mirgazitov (1993), A. I. Matveeva (1993), M. D. Perova (1999), etc. [1].

In the last 50 years, significant changes have taken place in implant dentistry from experimental treatment to the highly predicted option of replacing missing teeth with implants [2]. Currently, implant treatment methods are widely used in everyday practice, both in partial and in full adentia, because modern implantology offers not only significant functional and biological advantages for many patients compared to conventional fixed or removable dentures, but also provides excellent long-term results in more than 90% of cases, as evidenced by numerous long-term studies [3,4].

At the moment, dental implantation is the most dynamically developing branch of dentistry [5,6,7,8,9]. New designs of dental implants and composite materials are constantly appearing on the market. If in 1988 a total of 45 dental implant systems were proposed, then in 2008 it was already 600, and currently about 364 manufacturers offer 1,600 different implant systems [10].

### **Results and discussion**

Currently, prosthetics based on implants is an alternative and promising way to solve the problem of missing teeth [11, 12, 13, 14]. The use of implants as supports for removable prostheses, unlike traditional prosthetics, helps to prevent atrophic processes in bone tissue and allows you to restore the integrity of the dentition immediately after tooth extraction [11, 15].

The advantages of this method of treatment of adentia are improved chewing function, ensuring psychological comfort of the patient and its social adaptation, as well as the possibility of rational oral hygiene [3,4].

Studies by various authors have shown that the use of dental implants for prosthetics of the edentulous jaws with full removable dentures increases masticatory efficiency by 18-44% compared with traditional prosthetics, and also helps to restore motor and tonic activity of the masticatory muscles [8, 9]. According to S.P. Rubnikovich et al., The physiological adaptation of masticatory muscles to complete dentures based on implants is accelerated twice [16].

Using prosthetics on implants, speech functions and lost aesthetics are restored [17]. Many clinical studies have shown a clear improvement in the quality of life of patients after prosthetics with full removable dentures based on implants [8,9].

Implantation of implants is performed in a classic or simultaneous way. Then the abutments are installed, casts are taken and prostheses are made. Next, the prosthesis is tested and adjusted, the fixation system is installed, the prosthesis is fixed, and the patient is taught the rules of hygiene [15].

The success of prosthetics and the service life of an orthopedic design depend on many factors, the most important of which is the nature of the distribution of loads on it. Therefore, the leading task for a specialist is the correct selection of the required number and type of implants, as well as determining their location in the bone, taking into account all the available features of a particular clinical situation [11, 13].

An incorrect specialist decision can lead to destruction of the paraimplant bone tissue and loss of the implant. Strict adherence to standards and recommendations when applying the standard implantation protocol, proper installation and optimal placement of implants in the jaw bone, healing in the absence of stress, ensuring the greatest possible sterility, manufacturing of provisional prostheses to form the scalloped edge of the gums - all this provides a predicted and long-term outcome of patient rehabilitation [ 3].

The choice of the “optimal” number of implants for prosthetics of the edentulous jaw is still a controversial issue [18]. The opinions of scientists are extremely controversial [12,13,15].

There are studies demonstrating the effectiveness of orthopedic treatment of patients with total adentia using complete removable prostheses based on just one

implant. According to the authors, such gentle treatment is indicated for older people, patients with somatic pathology, and limited financial resources. The authors indicate the high social significance of this method of prosthetics, since its use reduces the volume of surgical interventions, as well as financial costs for treatment. This method can be successfully used not only to optimize a new, but also an existing lower complete removable prosthesis for a patient [13].

Most specialists are of the opinion that at least 4 implants are necessary for an adentia of the upper jaw, regardless of the type of restoration. The all-on-4 concept, which implies the installation of four implants for fixing the prosthesis, has shown high efficiency in prosthetics of the toothless lower jaw, as evidenced by various studies. R. Crespi et al. Also implemented this concept in relation to the upper jaw and reported implant survival after 3 years of operation in 98.96% of cases [19].

Some authors believe that the most adequate and effective way to rehabilitate patients with total adentia of the lower jaw is prostheses with support on 3-4 implants and combined with a beam structure with a semi-labile joint [15,16].

Other authors do not see differences in the effectiveness of two or four implants. So, according to A.V. Latysheva, in patients with total lower jaw adentia, having removable artificial teeth, in assessing the results of prosthetics in the long term, the number of implants (2 or 4) does not significantly affect the results of the masticatory effectiveness and stability of the implants. According to the author, the installation of two implants is more justified in terms of lesser volume of surgical interventions, financial costs and simplification of oral hygiene [20].

A.N. Chuyko and R.A. Lewandowski noted that in the process of biting off food at a large distance between the two implants, a large deflection of the beam is possible up to contact with the mucous membrane, which contributes to its systematic injury. Three implants, according to the authors, provide better fixation compared to two, but with this option, the central implant, especially installed bicortically, will absorb almost the entire load, which casts doubt on the strength of this design.

Reducing the distance between the central and lateral implants allows you to redistribute the load more evenly. In case of installation of four implants, a sufficiently good fixation is ensured. In the process of biting off food, two central implants perceive almost the entire load.

The optimal distance between the central and lateral implants allows you to redistribute the load more evenly. Installing more than four implants can interrupt the blood supply to surrounding tissues. Therefore, such an arrangement of implants, according to the authors, can be recommended only in specific clinical cases, for example, with a very wide frontal part.

One of the leading factors in the successful rehabilitation and functioning of the entire dentition is the correct positioning of dental implants. The ideal placement of the implant is determined by the requirements of the applied orthopedic design. It is important to determine the location of the implant and ensure the correct distribution of the implants in the anteroposterior direction [8,9].

Studies of domestic and foreign scientists have proved that implant placement at an angle to the acting forces is a gross neglect of the biomechanics of the dentofacial system, which ultimately contributes to the development of complications in the form of peri-implantitis and bone resorption [13].

The absence of anatomical landmarks in patients with complete absence of teeth complicates the correct positioning of dental implants. In such situations, the solution to the problem is possible with the use of computer technology and the use of navigation surgical templates. Their use in practical orthopedics makes it possible to correctly install implants in patients with total adentia in difficult clinical situations.

Actively conducted research is devoted to studying the effectiveness of the use of implants of various diameters, as well as studying the features of their osseointegration.

Violation of the process of osseointegration inevitably leads to increased bone resorption, which, ultimately, can cause loss of the implant. So, in the works of I.R. Kalamkarova showed that when comparing the degree of bone resorption when installing implants with a diameter of 4.0 mm and 2.0 mm for a period of 6 to 12 months, a more significant loss of bone tissue occurs when installing implants with a larger diameter, due to the invasiveness of the surgical intervention.

However, at a later date of the study, stabilization of atrophic processes is noted. Moreover, after 36 months of atrophy, the level of bone resorption in the area of implant placement with a diameter of 4.0 mm was less than with 2.0 mm [18]. Studying the microcirculation indicators in the installation area of implants with a diameter of 4.0 mm and mini-implants, the author obtained results on a decrease in microcirculation in the first 10 days after implantation, which indicates a violation of the function and trauma of the tissues surrounding the implants. Six months later, microcirculation indicators recovered and showed average normal values throughout the study period, which indicates the preservation of active blood flow and active reparative processes in bone tissue [19].

In practical orthopedics, the two-stage implantation technique developed by the Swedish scientist P.I. Branemark, the founder of modern implantology, is most often used, in which the implant is placed in the bone for a period of 3 to 6 months, followed by its opening and loading with the prosthesis [15, 27]. It is believed that such tactics are a more reliable and predictable method. The disadvantage of this method is the long treatment period, since it takes 3-4 months from the time

of tooth extraction for the healing of the holes and the period of osseointegration requires 3-6 months before the completion of orthopedic treatment [21].

Currently, in dental implantology an urgent problem is the early rehabilitation of patients with partial and full adentia. One of the urgent and poorly studied problems of modern dentistry is the problem of temporary prosthetics of patients for the period of implant treatment. This rather new direction of modern implantology is of interest to scientists around the world, as it is very promising [21].

It is also important to determine the safe level of load on the implant. According to the theory of osseointegration, the main factor in the successful functioning of the implant is the formation of bone tissue around it in conditions of its complete isolation from the external environment for a period of 3 to 6 months after installation. Currently, the load on the implant is very variable from immediate loading to 8 months after implantation. They depend on many factors: the implantation technique used, implant design, bone density and the general condition of the patient.

Increasingly, immediate-load protocols are used. More and more researchers are of the opinion that early functional load, including on implants directly placed in the tooth socket, has significant advantages, since it prevents bone resorption. The use of protocols with immediate or early loading on dental implants promotes faster healing and early restoration of function and aesthetics. When using removable prosthetics on attachments, immediate loading is not shown [15, 16]; in this situation, the possibilities of temporary prosthetics are especially relevant.

Rehabilitation of patients with total adentia through osseointegration of dental implants and complete dentures based on implants are scientifically and clinically proven methods of treatment [20]. After completion of orthopedic treatment, constant monitoring and control throughout life is required, regular hygienic care and prevention of possible complications are also required.

To date, it has been proven that all modern implants are well osseointegrated and serve patients for many years, if a team of specialists consisting of a surgeon, orthopedist and dental technician has strictly fulfilled all the necessary work protocols taking into account the specific clinical situation. Literature data indicate that with professional coordinated work of such a team, success can be predicted in 99.9% of cases [9].

### **Conclusion**

Thus, prosthetics based on implants was a revolutionary discovery in orthopedic dentistry. To date, there are various options for prosthetics of the edentulous jaw using implantation technologies, however, the option of full removable prosthetics based on implants has gained widespread application. However, despite the proven effectiveness of the method, many issues remain controversial. In addition, to date, there are no studies on the function of the temporomandibular joint and its readaptation after prolonged adentia with full removable prosthetics based on implants, which actualizes our study.

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远东国立医科大学在维护学童健康中的作用

## THE ROLE OF FAR EASTERN STATE MEDICAL UNIVERSITY IN MAINTAINING THE HEALTH OF SCHOOLCHILDREN

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**摘要。** 总体而言，年轻人的健康是公共健康的良好指标。在社会发展的现阶段，创造促进小学生对其健康的积极态度的环境变得越来越重要。体检数据显示：健康儿童的数量为36%，患有功能障碍的儿童的数量为44%，患有慢性疾病的儿童的数量为18%。在各种病理中，眼部疾病居首位。心血管系统疾病排在第二位，肌肉骨骼系统疾病排在第三位，内分泌系统疾病排在第四位（体重和肥胖过多）。健康的生活方式在预防非传染性疾病的策略中起着主要作用，早期诊断，治疗标准。

**关键词：**年轻人，体格检查，学童健康，健康的生活方式，超重，远东国立医科大学。

**Summary.** *The health of young people is a good indicator of the public health in general. At the present stage of society development, creation of the environment promoting positive attitude of schoolchildren to their health becomes ever more important. Medical examination data revealed that: the number of healthy children was 36%, the number of children having functional impairments was 44%, and the number of children with chronic diseases - 18%. Among pathologies, eye diseases take the first place; diseases of the cardiovascular system take the second place, diseases of the musculoskeletal system – the third place, and diseases of the endocrine system rank fourth (excess of body weight and obesity). Healthy lifestyle plays the main role, early diagnostics, standards of therapy in the strategy of prevention of noninfectious diseases.*

**Keywords:** *young people, medical examination, health of schoolchildren, healthy lifestyle, overweight, Far Eastern State Medical University.*

The health of young people is a good indicator of the public health in general. For the last 10 years the morbidity of adolescents in Russia has increased by 30%

(Baranov A.A., 2018)

At the present stage of society development, creation of the environment promoting positive attitude of schoolchildren to their health becomes ever more important.[]

The study of the problem of the positive attitude of schoolchildren to their health becomes ever more important for several reasons. The prevalence of endogenous or internal factors of morbidity and mortality of the population in general and children in particular, a relatively low level of health culture and behavioral culture in the structure of today's schoolchildren health.

Considering the negative trends in the health condition of the younger generation, the Russian Federation President V.V. Putin outlined the main directions for the next 10 years having highlighted "provision of medical aid to the students of the educational institutions" as one of the key points.

In this framework, the project with the Far Eastern State Medical University (FESMU) as the key player is being implemented in the Khabarovsk Territory. Initiator – Far Eastern State Medical University With the participation of: the Ministry of Health of the Khabarovsk Territory, the Ministry of Education and Science of Khabarovsk Territory, Khabarovsk Branch of the Federal Interindustry Scientific and Technical Complex «Microsurgery of the Eye».

In view of this, the aim of our research was to improve the provision of medical services to children and to prevent diseases at educational institutions.

The first stage of research included medical examination of pupils from the 1st to the 11th grade by doctors including narrow medical specialists (neurologists, ophthalmologists, dentists, cardiologists, otorhinolaryngologists, surgeons, orthopedists). While the second stage consisted of the survey of pupils and their parents.

2400 children aged 7-17 years old, students of comprehensive secondary schools and 2050 parents of the above-mentioned students took part in research.

Medical examination data revealed that: the number of healthy children was 36%, the number of children having functional impairments was 44%, and the number of children with chronic diseases - 18%. Among pathologies, eye diseases take the first place; diseases of the cardiovascular system take the second place, diseases of the musculoskeletal system – the third place, and diseases of the endocrine system rank fourth.

Parents most often point at complaints of their children associated with the nervous and gastro-intestinal system. Sleep problems (difficulties falling asleep, difficulties with getting up) - 75%, headaches (with no reason, on agitation, after classes) - 67,7%, complaints of pains in the stomach - 57,2%, weakness, fatigue (after classes and at home) – 52,7%.

The physical development of children is an indicator determining the child's health status. Thus, boys more often had deviations in the physical development

(57,7% - boys, 49,4 - girls).

Excess of body weight and obesity remain the serious medical and social problems of the modern society. According to WHO, there are about 155 million of overweight schoolchildren in the world. Up to 25% of adolescents in the developed countries are overweight, 15% suffer from obesity. Prevalence of obesity in the developed countries is often compared with an epidemic.

In Russia the prevalence of overweight in children of different regions ranges from 5,5% to 11,8%, with this indicator being lower in rural children as compared with those living in cities.

In Khabarovsk, 27,8% of boys and 14,75% of girls are overweight and obese which exceeds the Russian nationwide indicators.

The main factors causing overweight and obesity are low physical activity, sedentary lifestyle and consumption of high-calorie foods. It was of great interest for us to analyze nutritional behavior of children depending on the self-estimation of their body weight. Fruits and vegetables serve as the basis for healthy diet. The relation between the consumption of fruits and vegetables and good health and welfare has long been proved. Thus, 57% of children responded that they consume fruits and vegetables daily. [3]

One in two children consumes sweets, and as for sweetened beverages, they are consumed by 12% of schoolchildren on a daily basis.

We analyzed self-estimation of their body weight by the children of Khabarovsk city, and compared the data with those in Russia in general. The study showed that in the Russian Federation the percentage of children considering themselves "too fat" is not big in comparison to that of the majority of other countries and Khabarovsk. The Russian Federation ranks low among the countries in the number of children considering themselves fat [2].

The cultural influence of the ideals of slenderness and diet in the pursuit of weight loss, prevailing in the modern society, have found its way into the school environment. Almost half of teenagers in Russia find excess body weight in themselves, while actually 83% of them have a normal body weight.

We compared the survey data of schoolchildren with the medical examination data, and revealed that actually there are more boys with a real excess of body weight, and that such girls are fewer in number.

Correction of body weight achieved through healthy methods is an important element of health consciousness. Many teenagers use healthy diet and physical exercises to correct their body weight. The use of unhealthy methods of weight reduction brings about unfavorable physical and psychological consequences.

There is a similar trend in Khabarovsk (38%), Russia (28%) in the percentage of schoolchildren taking steps to reduce body weight. Notably, girls more often

resort to these steps (48,5%-girls and 17,5%-boys).

The health status of children is more often affected by the lifestyle. The life style has not been formed yet, in this respect primarily parents most often influence their children at different stages of development. Secondly, educational institutions, teachers, medical personnel can display their influence (through daily regimen, diet, personal relations).

Healthy lifestyle plays the main role, early diagnostics, standards of therapy in the strategy of prevention of noninfectious diseases in Russia.

Considering that the Far Eastern State Medical University is declared the Territory of Healthy Lifestyle, we are developing comprehensive measures aimed at preventing noninfectious diseases among schoolchildren. This is raising awareness of healthy lifestyle, public health education. The main directions of populational prevention include smoking cessation, consumption of vegetables and fruits, limiting salt consumption, physical activities [1].

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颌骨骨折患者固定运输方法的发展

**DEVELOPMENT OF METHODS FOR TRANSPORT  
IMMOBILIZATION OF PATIENTS WITH FRACTURES  
OF THE JAWS**

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注解。颌面区域的一个重要问题是对面部骨骼，尤其是下颌骨的创伤。尽管颌骨碎片的运输固定应由牙科医生进行，并且已经广泛描述了此类方法，但是由于各种原因（缺乏可用方法，其制造和应用困难），因此并未进行。

我们工作的目标是颌骨骨折的受难者开发一种容易获得的急救方法。

研究结果：我们已经开发了单独和标准的颞式运输固定方法。在两种方法中，利用合成聚合物材料是塑料铸件。与其他运输固定方法不同，下颞的碎片的重新定位和固定不仅在下颞的下巴部分进行，而且在其整个长度上进行。新的标准下颞下吊带可提供足够的刚度来固定碎片，在安装和拆卸时不需要特殊技能。它可用于患有精神疾病，癫痫和颅脑外伤的患者。

结论：下颌骨骨折的受害者需要通过口外固定碎片的方法进行运输固定，以防止并发症，从而获得显著的经济效益。已经开发了一种用于颌骨骨折的运输固定方法。

关键词：颌骨骨折，运输固定。

**Annotation.** *An important problem of the maxillofacial area is trauma to the bones of the face, especially the lower jaw. Although transport immobilization of jaw fragments should be performed by dental surgeons and such methods are widely described, but for various reasons (the lack of available methods, difficulties in their manufacture and application), it is not carried out.*

*The goal of our work is to develop an accessible method of first aid to victims with jaw fractures.*

**Research result:** *we have developed methods of transport immobilization of the jaws, both individual and standard. In both methods utilize a synthetic polymer material is a plastic cast. Unlike other methods of transport immobilization, reposition and fixation of fragments of the lower jaw to the upper one is carried out not only for the chin section of the lower jaw, but throughout its entire length. The new standard submandibular sling provides sufficient rigidity for fixing fragments, does not require special skills when installing and removing. It can be used in patients with mental illness, epilepsy and combined traumatic brain injury.*

**Conclusion:** *Victims with jaw fractures need to carry out transport immobilization by extra-oral methods of fixing fragments to prevent complications and thus obtain a significant economic effect. An accessible method of transport immobilization for jaw fractures has been developed.*

**Keywords:** *jaw fractures, transport immobilization.*

**Relevance.** An important problem of the maxillofacial area is trauma to the bones of the face. At the same time, fractures of the lower jaw, according to domestic and foreign clinics, account for 70-85% of the total number of injuries to the bones of the facial skeleton [1,2,3,4]. First aid to victims should be provided by transport immobilization of the jaw fragments [5], which will prevent further displacement of the jaw fragments during transportation. The available literature describes methods of transport immobilization in fractures of the jaws as extra-oral (chin sling Pomerantseva-Urbanscaya, bandage, parietal-chin bandage Hippocrates, etc.), and intra-oral (inter-jaw ligature bonds according to Ivy) [6].

Previously, we conducted a questionnaire study and found that victims were admitted to hospital treatment without transport immobilization of jaw fragments [7]. That is, the doctors to whom the primary victims were treated did not apply transport immobilization bandages. The reasons given were the lack of available techniques, difficulties in their manufacture and application.

Therefore, we set a **goal** to develop an accessible method of first aid to victims with jaw fractures.

**Research results:** earlier, in 2014, we developed an individual method of transport immobilization [8]. Since this technique required certain skills in manufacturing and fixing the tire, the development was continued in order to create a standard method of transport immobilization of fragments in fractures of the jaws and currently received a patent "Standard submandibular sling for transport immobilization in fractures of the jaws" [9]. This device is made of a polymer synthetic material - plastic gypsum - Scotchcast (3M company) and is modeled by the protruding contours of the lower edge of the lower jaw. After solidification of plastic plaster, in the submandibular part of the indentation 1 cm from the lower edge of the lower jaw, a fissure boron symmetrically on each side makes 3 arc-shaped slits,

the base of the arc facing the inner surface of the body of the lower jaw, into which rubber rings are inserted, for example, stationary.

Due to the location of hook slits in the submandibular part of the sling, reposition and reliable fixation of the fragments of the lower jaw to the upper jaw is achieved throughout by pulling the fragments to any available head cap.

Since the chin sling has an arched shape, it easily changes shape in the horizontal direction, but due to the stiffening ribs cannot be deformed in the vertical direction, which makes it universal (standard) for various sizes and shapes of the lower jaw.

The proposed standard submandibular sling for transport immobilization in fractures of the jaws provides sufficient rigidity for fixing fragments, is easy to install and remove, the upward pull is carried out throughout the lower edge of the entire lower jaw, and not separately on the chin, dentition or alveolar process, as in known devices. It is also important that it can be made not in a dental laboratory, but directly at the workplace of a dental surgeon.

It can be used in patients with mental illness, epilepsy and combined traumatic brain injury.

**Conclusions:** 1. Victims with jaw fractures need to carry out transport immobilization by extra-oral methods of fixing fragments to prevent complications and thus obtain a significant economic effect.

2. An accessible method of transport immobilization for jaw fractures with a standard submandibular sling has been Developed.

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预防牙齿疾病的新牙刷技术

**A NEW TOOTHBRUSHING TECHNIQUE FOR DENTAL DISEASE  
PREVENTION**

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注解。关联。全世界的科学家特别重视改善牙科治疗和预防措施。不可否认，口腔卫生是预防包括龋齿，牙周病和口腔粘膜在内的牙科疾病发展和传播的关键因素之一。

工作的目的：使用新的牙刷技术改善牙齿卫生。

研究的材料和方法。为了确定和评估龋齿的危险因素，编制了一份调查表，并采访了喀山牙科诊所的121名患者。另外，对使用常规的手动刷和常规的手动牙刷与牙科刷组合以从口腔侧清洁牙齿的36人的口腔卫生进行了比较分析。

调查数据的结果表明，该人群 (61.98%) 偏爱均衡饮食。大部分人口 (98%) 每天刷牙2-3次，清洁时间为1-3分钟 (66.94%)。 51.24%的受访者更喜欢手动牙刷，48.76%的受访者更喜欢电动牙刷。 46.49%的受访者使用含有氟化物的治疗性和预防性牙膏，22.81%的人使用卫生型牙膏，24.56%的替代性糊剂和6.14%的受访者对糊剂的成分不重视。

由于使用Tureski指数同时考虑了牙齿的外表面和内表面，因此当使用建议的常规手册和牙刷的组合来清洁牙齿的所有表面时，口腔卫生得到了显著改善。

关键词：龋齿，预防龋齿，口腔卫生，牙刷

**Annotation.** *Relevance. Scientists all over the world pay special attention to improving dental treatment and preventive measures. It is undeniable that oral hygiene is one of the key factors in preventing the development and spread of dental diseases, including dental caries, periodontal disease and oral mucosa.*

*The purpose of the work: to improve dental hygiene using a new toothbrushing technique.*

*Material and methods of research. To identify and assess the risk factors for dental caries, a questionnaire was developed and 121 patients from dental clinics in Kazan were interviewed. Also, a comparative analysis of oral hygiene in 36 people using a conventional manual brush and a conventional manual toothbrush in combination with a dental brush for cleaning the teeth from the oral side was conducted.*

*The results of the survey data showed that the population (61,98%) prefers a balanced diet. The majority of the population (98%) brushes their teeth 2-3 times a day with a cleaning time of 1-3 minutes (66,94%). 51,24% of respondents prefer manual toothbrushes, 48,76% prefer electric ones. 46,49% of respondents use therapeutic and preventive toothpastes containing fluorides, 22,81% use hygienic toothpastes, 24,56% alternate pastes and 6,14% do not attach importance to the composition of the paste.*

*Since the use of the Tureski index takes into account both the external and internal surfaces of the teeth, when using the proposed combination of a conventional manual and a toothbrush for cleaning all surfaces of the teeth, oral hygiene has significantly improved.*

**Keywords:** *caries, caries prevention, oral hygiene, toothbrushes*

**Relevance.** Scientists all over the world pay special attention to improving dental treatment and preventive measures [1,2,3,4]. It is undeniable that oral hygiene is one of the key factors in preventing the development and spread of dental diseases, including dental caries, periodontal disease and oral mucosa [5,6,7,8].

**Purpose:** to improve dental hygiene using a new toothbrushing technique.

**Material and methods of research.** A survey of 121 residents of a large industrial city of Kazan was conducted: 58 men (48%), 63 women (52%) aged 19-54 years. In our work, we used an author's questionnaire consisting of 11 items, covering issues of oral hygiene.

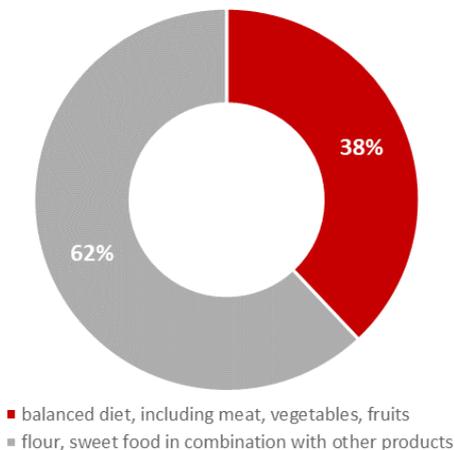
A clinical dental examination of 36 people aged 19 to 28 years (20 women (55,5%) and 16 men (44,5%)) was carried out. Patients were randomly divided into 2 groups, each of which was offered a specific protocol for oral hygiene. In group I, a regular manual toothbrush was used for brushing teeth, and in group II, a regular manual toothbrush was used in combination with a toothbrush for brushing teeth from the oral side [9]. All participants in the study used a paste containing aminofluoride.

The determination of the level of hygiene followed by a comparative assessment of the hygienic state of the mouth was carried out at the beginning of the study and after 2 weeks using the Quigley-Hein index modified by Turesky (1970),

since this index is characterized by high sensitivity to changes in the hygienic state of the mouth. At our chosen index assessment, plaque is accurately recorded in the area of contact surfaces and the cervical third of the tooth crown.

After staining, the oral and vestibular surfaces of the teeth were examined. The rating scale for each surface: 0 – no staining, 1 – staining in a thin line on the border with the gum, 2 – line on the gums wider, 3 – painted gingival third of the surface, 4 – coloured 2/3 of the surface 5 – painted more than 2/3 of the surface. The result was taken into account as the sum of all points divided by the number of teeth examined.

**Results:** The survey showed that 61,98% of the population (75 people) prefer a balanced diet, including meat, vegetables, fruits; 38,02% (46 people) – flour, sweet food in combination with other products (Fig.1).



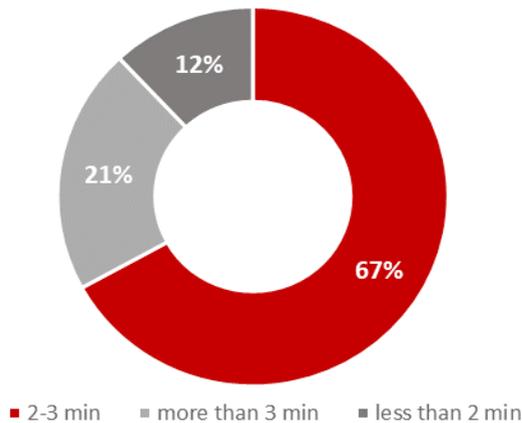
*Fig.1. Distribution of respondents according to the diet.*

At the same time 99,0% of respondents brush their teeth; do not brush their teeth at all – 1%. Frequency of brushing teeth is 2 times a day – 115 people (95,0%); 1 time a day – 2 persons (1,7%); more than 3 times a day – 4 persons (3,3%).

Duration of brushing teeth is 2-3 minutes – 81 people (66,94%), more than 3 minutes – 25 people (20,66%), less than 2 minutes – 15 people (12,40%) (Fig.2).

51,24% of respondents prefer manual toothbrushes, 48,76% prefer electric ones. 46,49% of respondents use therapeutic and preventive toothpastes containing fluorides, 22,81% use hygienic toothpastes, 24,56% alternate pastes and 6,14% do not attach importance to the composition of the paste.

When comparing the values of the Turesky index in the first and second visits (after 2 weeks), positive dynamics were detected in 18 (15 of the II group) cases out of 36. The Turesky index in the I group (a conventional manual toothbrush was used) through 2 weeks amounted to  $2,41 \pm 0,07$  points, and in the second (use of a conventional manual toothbrush in addition to a toothbrush for cleaning teeth on the oral side) –  $1,91 \pm 0,05$  points. Since both the vestibular and oral surfaces of the teeth were taken into account when using the Turesky oral hygiene index, this suggests that the combination of a regular manual and a new toothbrush has a positive effect on oral hygiene ( $p < 0.001$ ).



*Fig. 2. Distribution of respondents by the duration of brushing their teeth.*

The use of the proposed toothbrush does not imply a wide opening of the mouth for access to the internal surfaces of even the frontal group of teeth, as the least accessible for cleaning the oral surfaces of the teeth, which adds convenience when cleaning teeth for patients with periodontal disease and / or with lesions of the oral mucosa. In addition, it effectively cleanses the inner surface of the teeth when they are crowded and the dentition is narrowed (by sweeping movements along the dentition), as well as in the presence of fixed orthopedic structures on the teeth. Therefore, the quality of cleaning hard-to-reach oral surfaces of teeth from soft plaque is improved.

**Conclusions.** 1. Survey data showed that the population prefers a balanced diet, including meat, vegetables, and fruits (61,98%), but flour, sweet food in combination with other products makes up a significant proportion (38,02%).

2. The majority of the population (98%) brushes their teeth 2-3 times a day with a cleaning time of 1-3 minutes (66,94%).

3. To prevent the development of dental caries in the adult population, a new method of brushing teeth is proposed – the use of 2 brushes, the second of which [9] due to the convex shape of the arrangement of the bristles is designed to brush the teeth on the oral side of the dentition

**The authors declare that there is no conflict of interest.**

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交感肾上腺系统在胃食管反流病患儿运动障碍发展中的作用  
**THE ROLE OF SYMPATHOADRENAL SYSTEM IN THE  
DEVELOPMENT OF THE MOTOR DISORDERS IN CHILDREN  
WITH GASTROESOPHAGEAL REFLUX DISEASE**

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抽象。 该研究的目的是评估交感肾上腺系统在胃食管反流病患儿运动障碍形成中的作用。 发现在胆汁反流的儿童中，观察到交感-肾上腺系统的介质连接的活性降低，而多巴胺相对增加。

关键词：交感肾上腺系统，儿茶酚胺，儿童，胃食管反流病。

**Abstract.** *The purpose of the study was to evaluate the role of the sympathetic-adrenal system in the formation of motor disorders in children with gastroesophageal reflux disease. It was found that in children with biliary reflux, a decrease in the activity of the mediator link of the sympathetic-adrenal system was observed with a relative increase in dopamine.*

**Keywords:** *sympathetic-adrenal system, catecholamines, children, gastroesophageal reflux disease.*

### **Introduction**

The pathology of the digestive organs in children in recent years still occupies a leading position among somatic diseases, second only to respiratory diseases [4.8].

Among all diseases of the digestive system, chronic inflammatory diseases of the upper digestive tract occupy a dominant place in pediatric gastroenterology, which, despite all the advances in their diagnosis and treatment, tend to increase [2].

Recently, a decrease in the frequency of peptic ulcer has been recorded in the world, with a simultaneous increase in the number of patients suffering from gastroesophageal reflux disease (GERD), which has led leading gastroenterologists to call the XX century - the century of peptic ulcer, and the XXI century - the century of GERD. The relevance of the GERD problem is explained not only by its prevalence, but also by its serious complications (erosion, peptic ulcer, bleeding, strictures, development of Barrett's esophagus - a precancerous condition, esophageal adenocarcinoma) [3].

All this dictates the need for further study of the pathogenetic mechanisms of the formation of this pathology in order to develop new, more effective treatment methods.

Currently, there is no doubt in the important role of the sympathetic-adrenal system (SAS) and its mediators catecholamines (CA), which play a role in the metabolic processes of the body in the pathogenesis of chronic gastroduodenal pathology. In therapeutic practice, the role of CA in the formation of various topical variants of peptic ulcer has been proved [4], nevertheless, their significance in the development of motor disorders in GERD, including in children, is poorly understood.

Thus, the purpose of this study was to evaluate the role of catecholamines in the formation of motor disorders in children with GERD.

### **Materials and research methods**

We examined 43 children suffering from GERD between the ages of 8 and 14, of which 20 were girls and 23 were boys. Verification of the diagnosis was carried out according to the results of a general clinical examination, esophagogastroduodenoscopy, ultrasound of the abdominal organs. According to the results of the examination, GERD patients were divided into 2 groups: group I - 20 children with gastroesophageal reflux (GER), group II - 23 children with biliary reflux (BR). The control group consisted of 15 healthy children (I and IIa health group) from 8 to 15 years.

To assess the state of SAS, daily excretion of catecholamines (adrenaline (A), norepinephrine (NA) and dopamine (DA)) and their precursor (dioxiphenylalanine (DOPA)) with urine was studied. The study was carried out in standardized conditions, not earlier than on the 5th day of the patient's stay in the hospital, i.e. after a period of adaptation. Catecholamines in daily urine were determined by fluorimetric method according to E.Sh. Matlina et al. as modified by V.V. Menshikov [3].

Statistical processing of the research results was carried out using the Microsoft Excel and Statistica for Windows software packages (version 10.0) by the method of variation statistics and correlation analysis. The data are presented as

the median, as well as the 25th and 75th percentiles [Me (25% - 75%)]. Significance of differences was evaluated using non-parametric criteria Mann-Whitney, Fisher, "chi-square". The significance level was considered  $p < 0.05$ . The criterion "chi-square" was used as a criterion for the relationship between qualitative and quantitative indicators with a large number of gradations. Based on it, we determined the degree of connection tightness — the coefficient of mutual conjugacy of K. Pearson ( $r$ ). It was assumed that if  $r > 0.7$ , then it was believed that the relationship between the signs is strong.

### Study results and discussion

An endoscopic examination revealed that GERD proceeded against the background of a catarrhal form of gastroduodenitis and was complicated by degree I reflux esophagitis.

Patient history data showed that hereditary burden of gastroenterological pathology occurred in 67.4% of children, more than half of the children (58.1%) had a pathology of the perinatal period (pregnancy toxicosis, threatened miscarriage, pathology of childbirth, umbilical cord entanglement and etc.), 37.2% received artificial or early mixed feeding, 41.9% had frequent episodes of SARS (3 or more times a year), foci of chronic infection were noted in 20.9% of children.

When assessing specific complaints, there were no statistically significant differences in clinical manifestations between children of groups I and II. Most children (97.7%) were diagnosed with pain. Most often, pains were localized in the epigastric (97.7%) and pyloroduodenal (55.8%) areas. 69.8% of children showed combined localization of pain.

Dyspeptic syndrome was detected in 95.3% of children and was manifested by nausea (74.4%), belching (53.5%), heartburn (39.5%), and vomiting (39.5%).

Asthenovegetative syndrome was detected in 97.7% of children. The most characteristic symptoms were headache (76.7%), dizziness (55.8%), fatigue (27.9%), increased emotional lability (58.1%).

Studies have shown that the content of CA in daily urine varied in groups of patients. In group I of children (GER), the results were as follows (tab. 1):

1. There was a decrease in the excretion of A, NA, and DA compared with healthy children ( $p < 0.002$ ;  $p < 0.05$ ;  $p < 0.05$ , respectively).

2. There were no significant differences in the excretion of CA precursor (DOPA) compared with healthy children ( $p > 0.05$ ).

In the II group of children (BR), daily excretion of catecholamines was characterized by the following symptoms (tab. 1):

1. A decrease in daily excretion of NA and DA was found ( $p < 0.05$ ;  $p < 0.05$ , respectively).

2. No statistically significant differences in the elimination of A and DOPA were found compared with the control group ( $p > 0.05$ ).

When comparing the indicators of catecholamine excretion in children of groups I and II, the following was found (tab. 1):

1. Increased excretion of A in children of group II (BR) compared with children of group I (GER) ( $p < 0.05$ ).
2. Reduced daily excretion of NA in children of group II (combination of BR) compared with children of group I (GER) ( $p < 0.05$ ).

In addition to studying changes in the content of individual CAs, it was of interest to study their correlation in SAS. Since the level of excretion of free CAs is determined by the ratio of the rate of their biosynthesis and metabolism, the increased formation and / or slowdown of CA decomposition processes in any part of the sympathetic-adrenal system can lead to a disturbance in the physiological balance between the activity of its main units - hormonal and mediator. It was found that A, found in urine, is mainly of the adrenal origin, and NA in the urine is mainly secreted by the ends of the sympathetic nerves. In this regard, the ratio of NA to A is widely used as an indirect indicator of the ratio of the activity of the mediator and hormonal links of the sympathetic-adrenal system [1].

The NA/A coefficient in children of group II (BR) was reduced compared to that in children of group I (GER) ( $p < 0.001$ ) (Table 1).

For a more detailed description of the effect of the CA ratio in SAS on motor impairment in children with GERD, we calculated an additional coefficient of catecholamine ratio - (NA+A)/DA. The coefficient (NA+A)/DA in children of group II (BR) was reduced compared with children of group I (GER) ( $p < 0.01$ ) and healthy children ( $p < 0.001$ ) (tab. 1).

Interpreting the obtained data on increased A excretion, decreased NA excretion, and NA/A coefficient in children with BR compared with children with GER, it was possible to suppose in children with BR a decrease in the activity of the SAS mediator link, which led to increased motility of the organs of the gastro-duodenal zone and the occurrence of combined reflux [9,10].

A decrease in the coefficient (NA+A)/DA in children with BR compared with children with GER indicated a decrease in the total amount of A, NA in children with BR, and the relative prevalence of DA, whose effect on gastroduodenal motility is twofold, firstly, DA causes inhibition of contractions of the antrum and, secondly, it activates the motility of the duodenum, which, apparently, led to the development of biliary reflux [7].

Thus, indicators of the sympathetic-adrenal system affect the motility of the organs of the gastrointestinal tract. The decrease in the activity of the mediator link of the sympathetic-adrenal system with the relative activation of the dopamine link leads to the formation of combined refluxes in the gastro-duodenal zone.

**Table 1**

*Daily excretion of catecholamines in children with gastroesophageal reflux disease, Me (25% -75%), nmol/day.*

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<i>Control group (N=15)</i>						
<i>Me</i>	17,60	53,21	594,24	36,40	3,02	0,13
25 percentile	14,92	51,97	539,23	25,28	2,59	0,12
75 percentile	20,05	64,12	641,94	49,29	3,54	0,15
<i>Group I (GER) (N=20)</i>						
<i>Me</i>	12,30	44,62	438,31	32,93	4,12	0,11
25 percentile	8,60	40,66	314,04	29,55	2,98	0,09
75 percentile	14,38	49,93	565,23	37,49	6,60	0,18
P (I and Control)	p<0,002	p<0,05	p<0,05		p<0,05	
<i>Group II (BR) (N=23)</i>						
<i>Me</i>	15,14	30,25	395,02	32,93	2,75	0,08
25 percentile	10,98	22,46	363,79	21,11	1,44	0,06
75 percentile	18,60	48,95	527,87	38,93	3,38	0,09
P (II and Control)		p<0,05	p<0,05			p<0,001
P (I and II)	p<0,05	p<0,05			p<0,001	p<0,01

Note: 1 – adrenaline, 2 – norepinephrine, 3 – dopamine, 4 - DOPA, 5 – NA/A, 6 – (NA+A)/DA

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药物开发的科学关联

CORRELATION OF SCIENCES OF DEVELOPING DRUGS

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抽象。药物的化学结构与其生物学作用之间没有明确的联系。有时，分子结构的最细微变化都会导致生物活性完全消失或发生强烈变化。反之亦然，通常在化学性质完全不同的物质中观察到几乎相同的活性。

新药的发现需要对该疾病的生化性质进行基础研究。具有有效治疗特性的有机分子的建模以及将其转化为可以显示最佳药理活性的衍生物的方法，应该是朝着生产药物的方向发展的经济且安全的步骤。

应该注意的是，即使分子的化学结构发生轻微变化，即立体化学，几何形状，官能团的变化，以及在剂型形成过程中可能连续发生的各种氧化还原反应，也可以从根本上改变分子结构。活性物质的治疗活性。

关键字：药物开发，药物科学。

**Abstract.** *There is no unambiguous connection between the chemical structure of the drug and its biological effect. Sometimes the slightest changes in the structure of a molecule lead to a complete disappearance or a strong change in biological activity. And vice versa, often almost the same activity is observed in substances of completely different chemical nature.*

*The discovery of new drugs requires fundamental studies in the biochemical nature of the disease. The modeling of organic molecules with effective therapeutic properties and their conversion into derivatives that can show optimal pharmacological activity should be economical and safe steps towards the creation of a drug.*

*It should be noted that even a slight change in the chemical structure of a molecule, namely a change in stereochemistry, geometry, functional groups, as well as various redox reactions that can continuously occur during the formation of a dosage form, can fundamentally change the therapeutic activity of the active substance.*

**Keywords:** *pharmaceutical drug development, pharmaceutical sciences.*

### **Introduction**

A new pharmaceutical product is obtained in only one case out of 25 thousand - if you act by trial and error. But there is another principle that can lead to a goal faster. This is a focused synthesis, which includes the knowledge accumulated over many decades, and our own experience, and the intuition of the researcher. An experienced specialist, looking at the structural formula, will tell with high confidence what pharmacological action should be expected from this compound. It is known which groups and radicals enhance the effect, which ones weaken [1].

Nevertheless, the introduction into practice of each new drug requires tremendous efforts of many researchers, chemists, biologists, doctors, pharmacologists. They are also searching for new medicines at major research centers around the world. The discovery of new drugs requires fundamental studies in the biochemical nature of the disease. The modeling of organic molecules with effective therapeutic properties and their conversion into derivatives that can show optimal pharmacological activity should be economical and safe steps towards the creation of a drug.

It should be noted that even a slight change in the chemical structure of a molecule, namely a change in stereochemistry, geometry, functional groups, as well as various redox reactions that can continuously occur during the formation of a dosage form, can fundamentally change the therapeutic activity of the active substance. To prevent these processes at the stages of pharmaceutical development, many researchers are increasingly using molecular design, which contains the field of medical chemistry [2].

The vast majority of the work on the creation of the aforementioned drugs was done without any «conscious design», by the «trial and error» method, when organic chemists largely randomly replaced some chemical groups with others.

### **Results and discussion**

Medical chemistry is one of the basic sciences in the algorithm for the search and development of medicines. At the moment, the exact nature of its role is undergoing visible changes, not only due to modern synthetic methods for producing pharmaceutical substances, but also the bioinformatics design methods of new molecules.

This discipline includes the basic principles of pharmaceuticals, biology and medicine, is engaged in the design, optimization and development of new chemical compounds for use as the basis for the further development of medicines [2].

The main role of this science is the identification, detection, development and preparation of biologically active compounds, followed by the study of their metabolism at the molecular level and the creation of a structure-activity relationship.

The connection between chemistry and medicine, which has arisen from ancient times, continues to exist now, as the synthesis of new drugs that can play a key role in the treatment of various diseases, substances that find their application in medicine continues [2].

Biological chemistry - a) «the science of the structure of chemicals that make up living matter, their transformation and the physicochemical processes that underlie life» [3]; b) «a science that studies the chemical nature of the substances that make up living organisms, their transformations, as well as the relationship of these transformations with the activity of organs and tissues» [4].

«Bioorganic chemistry studies the structure and biological functions of the most important components of living matter, primarily biopolymers and low molecular weight bioregulators, focusing on elucidating the laws of the relationship between structure and biological action» [5].

So, neither biological nor bioorganic chemistry claims to solve the problem of creating drugs, although they are important, for example, to understand their effects. The situation is different if the definitions of such scientific fields as pharmacology and pharmaceutical chemistry are considered [2].

«Pharmacology [from the Greek Pharmakon (medicine) and Logos (teaching)] is the science of the interaction of drugs with the body and of ways to find new drugs. The main sections of pharmacology are pharmacodynamics and pharmacokinetics». There is a shorter definition: «Pharmacology is the science of drugs» [6].

«Pharmaceutical chemistry is a science that, based on the general laws of chemical sciences, explores the methods of preparation, structure, physical and chemical properties of drugs, the relationship between their chemical structure and effects on the body, methods for controlling the quality of drugs and changes that occur during storage» [7].

It can be seen that the formal definition given by pharmacology is excessively broad, so much so that it covers both the tasks of pharmaceutical and medical chemistry. However, after studying the real concepts and materials given in textbooks on pharmacology and pharmaceutical chemistry, it becomes clear that these fields of science do not answer the main question, what structure needs to be synthesized in order to create a medicinal (physiologically active) compound, a question that occupies in medical chemistry is central.

Biopharmacy - a science that studies the influence of pharmaceutical factors on the speed of onset and the strength of the pharmacological effect; on the nature of absorption, transport, biotransformation, distribution and excretion of drugs and their metabolites from the body - has become the basis of research aimed at the development, creation and use of highly effective drugs.

Pharmaceutical technology (from the Greek. «Techne» - art, craftsmanship; logos - teaching, science, knowledge) means "the study of technology" or "science of skill" and how science solves the following important technological problems:

- development of theoretical foundations, existing (traditional) methods for the manufacture of dosage forms;
- improving the compositions and manufacturing methods (modification) of traditional dosage forms;
- the creation of new methods for the manufacture of dosage forms based on the development of theory and the use of the achievements of related sciences.

Search for new dosage forms, systems for delivering drugs to the body (to organs and tissues) that can provide the optimal pharmacological effect, targeted transport, controlled release, minimal side effects and are easy to use.

### **Conclusion**

Currently, the most diverse principles of creating new medicinal substances are used, from various screening options to identifying and studying biologically active substances of plant and animal origin, reproducing them synthetically and obtaining various modifications of molecules. And no matter what way of creating new drugs was chosen, it is not possible without the joint efforts of many researchers, chemists, biologists, doctors, pharmacologists and technologists, since the end result should be aimed at ensuring the basic requirements - safety and efficacy of the drug.

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使用计算机程序“Chemmetr1.0”进行药物质量控制的计量评估  
**USING COMPUTER PROGRAM «CHEMMETR 1.0» FOR  
METROLOGICAL EVALUATION OF DRUG QUALITY CONTROL**

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抽象。这项工作的目的是演示“ ChemMetr 1.0”计算机程序对药物分析技术进行计量评估的功能。为了对分析结果进行统计处理，根据XIV版本的俄罗斯联邦国家药典的要求使用了变化统计方法。研究了用分光光度法定量测定各种高地种草样品中黄酮含量的方法。分析人员报告的结果与计算得出的参数之间的差异表明，定量确定方法的计量评估程序不正确，或者结果的故意篡改。提出了一种算法，用于评估验证方案的内容，药物分析方法的验证，以及有关定量测定方法发展的印刷出版物。

关键字：计量特性；电脑程序；药物分析。

**Abstract.** *The purpose of the work is to demonstrate the capabilities of the "ChemMetr 1.0" computer program for metrological evaluation of pharmaceutical analysis techniques. For statistical processing of the analysis results, methods of variation statistics were used according to the requirements of the State Pharmacopoeia of the Russian Federation of the XIV edition. The method of quantitative determination of the sum of flavonoids in grass samples of various species of highlanders by spectrophotomerism was considered. The difference between the results from the analyst's report and the calculated parameters indicates the incorrectness of the metrological evaluation procedure for the quantitative determination methodology, or the deliberate falsification of the results. An algorithm is proposed for assessing the content of validation protocols, verification of analytical methods of pharmaceutical analysis, as well as printed publications on the development of quantitative determination methods.*

**Keywords:** *metrological characteristic; computer program; pharmaceutical analysis.*

In pharmaceutical analysis, the procedure for validation of analytical methods is traditionally used for the purpose of quality control of drugs. All methods included in the regulatory documents must be validated, including methods for the quantitative determination of active substances in pharmaceutical substances, as well as finished drugs and medicinal plant materials, which are multicomponent objects of analysis. Approaches to validation of any test depend on its type and the applied analytical method [1].

The metrological characteristic of the analysis method (quantitative determination), according to the requirements of SP XIV, involves the determination of precision parameters: standard deviation  $S$  and variance  $S^2$ , as well as correctness parameters: the relative value of the systematic error  $\delta$ . Correctness parameters can only be estimated if the analyst has access to the true value of the measured quantity  $\mu$  (or the accepted reference value). As the accepted reference value, the concentration of the analyte in the standard sample is used [2].

The relative errors of the result of a separate determination of  $\varepsilon$  and the average result of  $\varepsilon_{av}$ , determined according to pharmacopoeial requirements, were considered by us as an integral indicator of the error of the quantitative determination method.

An important element of the statistical processing of the obtained sample of quantitative determination results is the assessment of its uniformity: for small samples ( $n < 10$ ) - using the  $Q$ -criterion; for large-volume samples ( $n \geq 10$ ) - based on a comparison of the deviation of an individual result from the value  $3 \cdot S$  (“ $3 \cdot S$  criterion”).

**Purpose of the work** – demonstration of automation capabilities of the procedure of metrological characteristics of the method of quantitative determination as an important element in the implementation of standard metrological procedures in the practice of routine analysis.

**Results.** We have developed a computer program “ChemMetr 1.0” for IBM PC-compatible personal computers (certificate of state registration of a computer program № 2017663573) [3]. The program is designed to automatically calculate the metrological characteristics of quantitative chemical analysis techniques in pharmaceutical, chemical and toxicological analyzes and forensic chemical examination. It can be used for metrological characterization of methods of quantitative chemical analysis in the practical activities of pharmaceutical analysts and expert chemists in the study of pharmaceutical substances, multicomponent objects of analytical control (medicinal plant materials, pharmaceuticals, biological material - organs and biological fluids, objects of non-biological origin).

The program allows to implement the following functions:

- check the uniformity of the sample of values of the results of quantitative chemical analysis (by the  $Q$ -criterion and by the  $3 \cdot S$  criterion);

- exclude analysis results burdened with gross error;
- evaluate confidence intervals, reproducibility parameters, systematic error (in the presence of reference samples - standard samples of the analyzed objects);
- generate a final report on the metrological characteristics of the quantitative chemical analysis methodology.

The "flexibility" of a computer program and the support of any Internet browser allows it to be used on tablet computers and mobile phones with Windows 7/8/10 and Android operating systems.

This computer program is focused on solving the following problems:

- settlement – an automated calculation of the metrological characteristics of quantitative analysis techniques;
- educational – proposed for training students and residents in the basic metrological aspects of pharmaceutical analysis;
- controlling – preliminary a priori examination of the correctness of the determination of metrological characteristics in the analysis.

The most important practice for pharmaceutical analysis is the ability to implement the controlling function of the "ChemMetr 1.0" computer program; it was shown using the example of quality control of medicinal plant materials.

**Example.** To do this, we considered a method for the quantitative determination of the sum of flavonoids in grass samples of various species of highlanders by spectrophotometry according to the State Pharmacopoeia of the Russian Federation of the XIV edition.

**Table 1**

*Metrological characteristics of the method of quantitative analysis of the sum of flavonoids in grass samples of various species of polygonum (based on the results of the report of the analytical chemist)*

$\mu$	$f$	$x_{av}$	$S^2$	$S$	$P$	$t(P, f)$	$\Delta x$	$\varepsilon_{av}$	$\delta$
1	2	3	4	5	6	7	8	9	10
Polygonum aviculare grass									
-	9	0,84	0,00026	0,016	95	2,26	±0,037	± 4,52	-
Persicaria hydropiper grass									
-	9	1,12	0,00044	0,021	95	2,26	±0,046	± 4,17	-
Persicaria maculosa grass									
-	9	0,73	0,00019	0,014	95	2,26	±0,032	± 4,34	-

According to the results of the analysis of grass samples of polygonum species by the chemist-analyst, the quality control department of the pharmaceutical enterprise X ... presented a report on the metrological characteristics of the methods (Table 1).

The correctness of the statistical processing of the analysis results was not controlled by us.

Based on the obtained values of the average indicators of flavonoid contents in the samples and the standard deviations  $S$ , using the module "random number generation" application MS Excel (for the normal distribution law), we obtained model samples of the contents of the sum of flavonoids ( $n = 10$ ) of each type of raw material (tab. 2).

**Table 2**  
*Model samples of flavonoid content in grass samples of various types of polygonum*

№	The content of the amount of flavonoids, %		
	Polygonum aviculare grass	Persicaria hydropiper grass	Persicaria maculosa grass
1.	0,86	1,13	0,74
2.	0,83	1,12	0,71
3.	0,85	1,12	0,73
4.	0,82	1,12	0,74
5.	0,85	1,11	0,75
6.	0,84	1,14	0,75
7.	0,78	1,13	0,72
8.	0,86	1,10	0,76
9.	0,85	1,13	0,73
10.	0,81	1,10	0,74

Then, the obtained samples of the values of the total flavonoid contents were loaded into the "ChemMetr 1.0" program, with the help of which their uniformity was estimated, the required set of metrological characteristics was calculated at a confidence level of 95% set by us. The calculated metrological characteristics are presented in table 3.

A comparison of the metrological characteristics of the method of quantitative analysis of the sum of flavonoids in grass samples of various types of polygonum obtained from the report of the analytical chemist and according to the calculation results using the "ChemMetr 1.0" program shows the following features:

- in the conditions of inaccessibility of the values of the primary sample of the report by metrological characteristics, it is impossible to assess: whether or not the uniformity of the sample was evaluated by an analytical chemist; how this assessment was carried out; standard deviation and half-width of the confidence interval relate to the results of a single measurement or average value;

- the obtained values of the model sample obey the law of normal distribution; therefore, they adequately reproduce the analysis results inaccessible to us;
- the standard deviations of  $S$  and the relative errors of the definitions of  $\varepsilon$  from the analytic chemist's report do not correspond in magnitude to the values of the standard deviations and the relative errors of the individual measurements of  $S$ ,  $\varepsilon$  and the average values of  $S_{av}$ ,  $\varepsilon_{av}$ , which indicates the incorrectness of a real analytical experiment.

In the case we are considering, there are no pronounced patterns of discrepancy. To determine the sum of flavonoids in polygonum, the relative error from the report is 4.52%, while the calculated errors of a single determination and the average value are 6.39% and 2.02%, respectively. For Polygonum aviculare grass, the calculated errors are less than the error presented in the report. Only in the case of analysis of persicaria maculosa grass does the relative error from the 4.34% report have practically the same value with the calculated error of the average value of 4.56%.

The difference between the results from the report and the calculated parameters indicates the incorrectness (complete absence) of the metrological evaluation procedure for the quantitative determination method, or the deliberate falsification of the results in order to reduce the relative error of the results of a single determination and the average result.

**Table 3**

*Metrological characteristics of the method of quantitative analysis of the sum of flavonoids in grass samples of various types of polygonum (based on the results of the report of the "ChemMetr 1.0" program)*

$\mu$	$f$	$x_{av}$	$S^2$	$S$	$P$	$t(P, f)$	$\Delta x$	$\varepsilon$	$\delta$
1	2	3	4	5	6	7	8	9	10
Polygonum aviculare grass									
-	9	0,83	0,00060	0,024	95	2,26	$\pm 0,053$	$\pm 6,39$	-
				0,0075*	95	2,26	$\pm 0,017^*$	$\pm 2,02^*$	-
Persicaria hydropiper grass									
-	9	1,12	0,00022	0,015	95	2,26	$\pm 0,033$	$\pm 2,97$	-
				0,00046*	95	2,26	$\pm 0,010^*$	$\pm 0,94^*$	-
Persicaria maculosa grass									
-	9	0,74	0,00020	0,015	95	2,26	$\pm 0,034$	$\pm 4,56$	-
				0,0047*	95	2,26	$\pm 0,011^*$	$\pm 1,44^*$	-

\* standard deviation  $S_{av}$ , half-width of the confidence interval  $\Delta x$ , relative error for the average value of  $\varepsilon_{av}$ .

Obtaining such comparison results is the basis for the repeated experimental determination of the metrological characteristics of the methodology used in routine analytical practice.

**Conclusions.** We propose to use the developed program when evaluating the substantive part of validation protocols, verification of analytical methods of pharmaceutical analysis, and also when reviewing printed publications and dissertation research related to the development of quantitative determination methods.

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孕妇维生素药物市场的市场研究  
**MARKETING RESEARCH OF MARKET OF VITAMIN MEDICINES  
FOR PREGNANT WOMEN**

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**摘要。** 文章按剂型,使用方法和给药频率,制造商,成分,对孕妇维生素药物进行了市场分析。评估这组药物的竞争力。使用了矩阵修改的配对比较方法来确定竞争力水平。分析的结果是,确定了维生素和矿物质复合物在治疗,药物流行病学,法规和药物经济学特征上的最具竞争力的位置,以及竞争力水平的整体指标。

**关键词:** 维生素药物,市场研究,竞争力。

**Summary.** *The article presents the results of marketing analysis of vitamin medicines for pregnant women by types of dosage forms, method of use and frequency of administration, manufacturers, composition; the evaluation of the competitiveness of this group of medicines. There was used the method of paired comparisons of matrix modification to determine the level of competitiveness. As a result of the analysis, there were determined the most competitive positions of vitamin and mineral complexes on therapeutic, pharmacoepidemiological, regulatory and pharmaco-economical characteristics, as well as an integral indicator of the level of competitiveness.*

**Key words:** *vitamin medicines, marketing research, competitiveness.*

Today people face with a lack of vitamin provision. This problem is of a current interest as a micronutrients shortage affects the reproductive system negatively (4). Pregnant and nursing women are at great risk (6), as the fetus and newborn's development depends on nutrition (7). Low level of micronutrients leads to adaptive system break between pregnant woman and her fetus, different pregnant pathologies, premature birth and congenital malformations (6). Nowadays a lot of researches show that a lack of vitamins can be redressed by micronutrients use (4).

In recent years a great number of multivitamin and vitamin-mineral complexes for pregnancy planning, pregnant and nursing women (5) are on the Russian market. They differ in consistency, dosage, reception mode and contraindication. It causes difficulties to gynecologists and pharmacists. “Elevit Prenatal”, “Complivit “Mother” for pregnant and nursing women are the most adapted vitamin-mineral complexes. But what are the advantages of vitamin medicines?

The aim of this research is to analyze vitamin medicaments for pregnant women. The issues to be solved are marketing research of vitamin medicaments for pregnant women by dosage forms, application methods, multiplicities of reception, manufacturers, compounds and competitive level of these medicaments.

**Materials and methods.** The object of this research are the State register of medicines; the vitamin medicaments instruction for use; the questionnaire for gynecologists and pharmacists, personal cards of pregnant women and puerperants from 2012 to 2016 of the women’s consultation of the state autonomous health institution “Orenburg regional clinical hospital number 2”, information from Orenburg pharmaceutical organizations reports.

The method of pair comparisons and informational copy from personal cards of pregnant women and puerperants is used.

**The results.** According to the results of the vitamin registered medicaments, there are three international unpatented names: “multivitamins”, “multivitamins and minerals”, “multivitamins and other forms”. It includes 23 trademarks.

“Multivitamins and minerals” are the largest group. It has 15 trade names (65%). According to the comparative review this group is the most effective one among either single-agent medicaments or multivitamins.

As for aggregate state, 21 names (91%) are solid pharmaceutical forms, among them 14 names (61%) are tablets, 4 names (18%) are dragee, 2 names (9%) are capsules, 1 name (4%) is a lyophilizate for preparing a solution for injections. Only 2 names are liquid (9%), they are Feroglobin-B12 (syrup) and Vectoron (drops for oral administration).

The multicomponent vitamins are convenient for consumers, but the problem is in the interaction of these components. The interaction is peculiar in liquid forms, that is why solid forms are preferable. To avoid interaction in solid forms some vitamins are covered by gelatin (lyophilization) or multivitamins are produced by the way of tablets lamination (multilayer), which are joined in one single form at final step.

The largest part of vitamins is for the internal use (22 names of 23, 96%), solid forms are used 1 time per day (17 names, 74%). “Makrovit” is used 2 times per day, “Revit” – 3 times per day.

According to the instruction for use, 21 vitamin medicaments should be used after meal. The reasons are better absorbing of fat-soluble vitamins; better digest-

ibility; levelling of side effects (for example, diarrheal disease in case of usage magnesium with meal). “Beviplex” is used parenterally, lyophilizate for making injection fluid.

As for producers’ research, the part of Russian manufacturers is almost equal to the foreign ones (11 and 12 correspondingly). Public corporation “Farmstandart – UfaVITA” produces “Complivit trimestrum (1, 2, 3 trimester), “Complivit “Mother”, “Ferrovit forte” (5 names – 45%); Public corporation “Valenta Farmatsevtica” produces “Bio-Max”, “9 months”, “Fendevit” (3 names – 27%); Public corporation “Uralbiofarm” produces “Revit” (1 name – 9%); the limited liability company “Vneshtorgfarms produces “Vetoron” (1 name – 9%) and the close corporation “Altayvitamins produces “Undevit”(1 name – 9%).

As for foreign companies, it is impossible to mark the largest manufacturer as all of them produce only one medicament.

The research of vitamin compounds proves that there is no one single medication to provide the pregnant women by all necessary vitamins and minerals.

Some medicaments provide the normal admission of separate micronutrients. “Elevit Pronatal” contains all water soluble and fat-soluble vitamins. Also, it is produced with the help of special technology which prevents antagonism inside the tablet. “Complivit “Mother” has 8 of 9 water soluble vitamins, all fat-soluble vitamins and standard of needs in such vitamins as B2, B9, C. It is produced with considering the possibilities of interaction between components. “Vitrum Prenatal” contains 7 of 9 water soluble vitamins, all are fat soluble vitamins, the standard of needs in B1, B2, B6, B12, C and D vitamins. “MultitubsPerinatal” has the best suited mineral complex for pregnant women. It also has the standard needs in B2, B12 vitamins (see the table and the table 2).

These medications were listed to rate their competitiveness. “Bio-Max”, “Complivit Trimestrum” and “Duovit” were also included as they were prescribed to pregnant women according to the information from their personal prenatal records.

**Table 1**  
*Comparative compound of vitamins included into vitamin-mineral complexes for pregnant women*

Medication trade name	A mcg	D mcg	E mg	B1 mg	B2 mg	B3 mg	B6 mg	B7 mcg	B9 mg	B12 mcg	B5 mg	C mg
9 months	608	5,9	18	2,6	2,7	17	3,6	20	0,4	4,2	11	80
Bio-Max	1135	-	10	1	1,3	7,5	5	-	0,1	2,5	5	50
Duovit	294	200	10	1	1,2	13	2	-	0,4	3	5	60
Vitrum Prenatal	1376	10,0	11	1,5	1,7	18	2,6	-	0,8	4	-	100
Vitrum Prenatal Forte	860	10,0	10	3	3,4	20	10	30	0,8	12	10	120

Complivit 1 Trimestr	170	2,5	7	0,8	1	9	5	-	0,4	2,5	3	50
Complivit 2 Trimestr	344	3,7	10	1,2	1,4	12	3	-	0,4	2	6	60
Complivit 3 Trimestr	416	5,0	12	1,5	2,1	16	3	-	0,3	1,5	10	70
Complivit «Mother»	567	6,25	20	2	2	20	5	-	0,4	5	10	100
MultiMax	550	-	15	2,1	2	20	5	20	0,4	5	10	60
Multitubs Perinatal	800	5,0	10	2,1	2,4	27	3	-	0,1	2	9	90
Fenuls	-	-	-	2	2	15	1	-	-	-	2,5	50
Fenuls Zinc	-	-	-	4	-	-	3	-	1,5	15	-	-
Ferrovit Forte	334	5,0	5	0,8	-	50	0,9	-	0,8	6	3	100
Elevit Pronatal	1238	12,5	15	1,6	1,8	19	2,6	20	0,8	4	10	100

11 gynecologists and 11 pharmacists were questionnaire to mark the competitiveness. The experts were leveled by competence. The gynecologists' competence level was from 0,8 to 1 (middle value – 0,90), the pharmacists' competence level was from 0,75 to 1 (middle value – 0,90), that is to be satisfactorily.

**Table 2**

*Comparative compound of macro- and microelements in vitamin mineral complexes for pregnant women*

Medication trade name	Fe mg	Zn mg	F mg	Cu mg	Mn mg	Se mg	Cr mcg	Mo mcg	I2 mcg
9 months	60	15	-	1,3	-	28	-	-	150
Bio-Max	5	2	-	0,8	2,5	-	-	100	-
Duovit	10	3	-	1	1	-	-	-	-
Vitrum Prenatal	60	25	-	2	-	-	-	-	-
Vitrum Prenatal Forte	60	25	-	2	5	20	25	25	150
Complivit 1 Trimestr	5	6	-	0,6	1	60	-	-	200
Complivit 2 Trimestr	5	6	-	0,6	1	60	-	-	200
Complivit 3 Trimestr	15	8	-	1	1,5	9	-	-	100
Complivit «Mother»	10	10	-	2	2,5	-	-	-	-
MultiMax	18	10	-	2	3	20	25	25	200
Multitubs Perinatal	14	15	-	2	2,5	50	-	-	150
Fenuls	150	-	-	-	-	-	-	-	-
Fenuls Zinc	150	62	-	-	-	-	-	-	-
Ferrovit Forte	55	-	-	-	-	-	-	-	-
Elevit Pronatal	60	7,5	-	1	1	-	-	-	-

This material was rated by people from their professional point of view. Gynecologists compare their therapeutic characteristics, effectiveness and safety. Pharmacists compare their pharmacoepidemiological characters, demand and availability. We inquire their normative characteristics, presence in regimented list, expiration date, pharmaeconomical characteristics, price and availability.

Besides the medication marking the responders determined the importance of indications, that is therapeutical – 0,38, pharmaeconomical – 0,26, normative – 0,18 and pharmacoepidemiological – 0,17.

As for results of questionnaires, “Elevit Pronatal” and “Vitrum Prenatal” are more effective and safe vitamin mineral complexes for pregnant women. Bio-Max, Complivit “Mother” and Multitubs Perinatal are in the middle. “Complivit Trimestrum” and “Duovit” have less effectiveness, see the table 3.

**Table 3**

*Therapeutic characteristic rating of vitamins for pregnant women*

Medication trade name	P1	P2	P
Elevit Pronatal	61/231=0,264	58/231=0,251	0,264+0,251=0,515
Vitrum Prenatal	53/231=0,229	51/231=0,221	0,229+0,221=0,450
Bio-Max	22/231=0,095	29/231=0,125	0,095+0,125=0,220
Complivit “Mother”	24/231=0,104	26/231=0,112	0,104+0,112=0,216
Multitubs Perinatal	24/231=0,104	21/231=0,091	0,104+0,091=0,195
Complivit Trimestrum	9/231=0,039	11/231=0,048	0,039+0,048=0,087
Duovit	2/231=0,009	1/231=0,004	0,009+0,004=0,013

The pharmaeconomical indexes rating was based on the daily dose cost and the medicament availability index. The availability index is based on the monthly salary in Orenburg and the subsistence value.

“Complivit “Mother” and “Duovit” are the cheapest vitamin mineral complexes while “Elevit Pronatal” and “Vitrum Prenatal” are the most expensive ones. So, effective and safe vitamin mineral complexes are costly. See the table 4.

**Table 4**

*The pharmaeconomical indexes rating of vitamin medicaments for the pregnant women*

Medication trade name	Q1	Q2	Q
Complivit “Mother”	6/21=0,286	6/21=0,286	0,286+0,286=0,572
Duovit	5/21=0,238	5/21=0,238	0,238+0,238=0,476
Bio-Max	4/21=0,190	4/21=0,190	0,190+0,190=0,380
Multitubs Perinatal	3/21=0,143	3/21=0,143	0,143+0,143=0,286
Complivit Trimestrum	2/21=0,095	2/21=0,095	0,095+0,095=0,190
Vitrum Prenatal	1/21=0,048	1/21=0,048	0,048+0,048=0,096
Elevit Pronatal	0/21=0	0/21=0	0+0=0

The standard characteristic index was based on the presence of vitally important medicaments in the list and on the expiration date. The national project “Health” provides the pregnant women by vitamins during the first three months, but in the its list there are no vitamin mineral complexes. As for this index, the ratings of vitamins are the same. “Vitrum Prenatal” has the longest expiration date (5 years). “Duovit” is usable for 3 years. The expiration date of other medicaments is 2 years. See the table 5.

**Table 5**

*The standard characteristic index of vitamin medicaments for pregnant women*

Medication trade name	N1	N2	N
Vitrum Prenatal	0	6/21=0,286	0+0,286=0,286
Duovit	0	5/21=0,238	0+0,238=0,238
Complivit “Mother”	0	0	0+0=0
Bio-Max	0	0	0+0=0
Mulitubs Perinatal	0	0	0+0=0
Complivit Trimestrum	0	0	0+0=0
Elevit Pronatal	0	0	0+0=0

The pharmacoepidemiological characteristic results show that “Elevit Pronatal”, “Complivit “Mother” and “Vitrum Prenatal” are in constant demand and always in stock. It proves the therapeutic characteristic rating and the pharmaco-economical indexes rating that “Elevit Pronatal” and “Vitrum Prenatal” are more effective and safe, and often recommended by the doctors, while “Complivit “Mother” is the available. See the table 6.

**Table 6**

*The pharmacoepidemiological characteristic rating of vitamin medicaments for pregnant women*

Medication trade name	S1	S2	S
Elevit Pronatal	57/231=0,247	47/231=0,203	0,247+0,203=0,450
Complivit “Mother”	44/231=0,190	41/231=0,177	0,190+0,177=0,367
Vitrum Prenatal	48/231=0,208	33/231=0,143	0,208+0,143=0,351
Bio-Max	22/231=0,095	24/231=0,104	0,095+0,104=0,199
Duovit	19/231=0,082	22/231=0,095	0,082+0,095=0,177
Complivit Trimestrum	20/231=0,086	15/231=0,065	0,086+0,065=0,151
Mulitubs Perinatal	15/231=0,065	12/231=0,052	0,065+0,052=0,117

The integral index of competitive level is based on the sum of the researched indexes and their value. All the competitive level indexes are in the table 7.

**Table 7**

*The integral index of competitive level rating of vitamin mineral complexes for pregnant women*

Medication trade name	Therapeutic characteristic	Pharma-economical characteristic	Standard characteristic	Pharmaco-epidemiological characteristic	Integral index
Vitrum Prenatal	0,450	0,096	0,286	0,351	0,307
Complivit "Mother"	0,216	0,572	0	0,367	0,293
Elevit Pronatal	0,515	0	0	0,450	0,272
Bio-Max	0,220	0,380	0	0,199	0,216
Duovit	0,013	0,476	0,238	0,177	0,202
Multitubs Perinatal	0,195	0,286	0	0,117	0,168
Complivit Trimestrum	0,087	0,190	0	0,151	0,108

The largest part of these medicaments has low level of competitiveness (5 of 7, 71%). They are "Vitrum Prenatal", "Complivit "Mother", "Elevit Pronatal", "Bio-Max" and "Duovit".

"Multitubs Perinatal" and "Complivit Trimestrum" have the lowest level of competitiveness. They do not demonstrate even middle results during the research.

Thus the competitiveness of vitamin market segment is low in spite of the variety of vitamin complexes for pregnant women and high indications by therapeutic, pharmaeconomical, standard and pharmacoepidemiological characteristics. Nowadays there is no one single medicament matched the interests either pregnant women or gynecologists and pharmacists. So, to prescribe these vitamin complexes, the doctors should use individual approach for pregnant women.

**Conclusion.** According to the research, vitamin mineral complexes (multivitamins and minerals) are more effective. Most of vitamin medicaments are solid for internal application 1 time a day after meal. There are a lot of Russian and foreign medicaments on market today. But no one of them has a full vitamin complex for pregnant women. "Elevit", "Complivit "Mother", "Vitrum Prenatal", "Multitubs Perinatal" are more suitable for pregnant women. "Vitrum Prenatal", "Complivit "Mother", "Elevit Pronatal", "Bio-Max" and "Duovit" are competitive. But by the Harrington dimensionless scale, these medicaments have low level of competitiveness, as there is no one single medicament matched all needs. Thus, these results may be used by pharmacists to form the trade line, and by the doctors to prescribe these medicaments to pregnant women.

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关于物理范式  
ON THE PHYSICS PARADIGM

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抽象。分析了能量守恒定律的基础。研究表明，在早期宇宙和全球宇宙中，总能量可能不守恒。结果表明，遗迹辐射可以具有不同的温度，Unruh辐射起着遗迹辐射的作用。

关键词：平衡，工作，矛盾

**Abstract.** *The foundations of the law of conservation of energy are analyzed. It is indicated that in the early universe and in the global universe, the total energy may not be conserved. It is shown that the relict radiation can have a different temperature, the Unruh radiation plays the role of the relict radiation.*

**Keywords:** *balance, work, contradiction*

### Introduction

In the modern paradigm on which physics is built, nothing arises from nothing, according to Lomonosov-Lavoisier, the law of conservation of energy is satisfied, any system tends to a minimum of potential energy, the entropy of a closed system increases.

In GTR there is no law of conservation of angular momentum, angular momentum can occur in a closed system. There is also no energy conservation law in the GTR, although perpetual motion is not possible within the GTR.

Obviously, this paradigm is built solely on local experimental material and does not have to take place globally or in the Planck era.

For example, since the Universe as a whole does not have heat transfer, its total entropy does not increase. The introduction of only the classical gravitational field violates the 2nd law of thermodynamics (in the well-known problem of heating two balls, on a thread and on a stand, see [1]) already locally.

The rotation of the electron around the nucleus shows that cyclic processes are possible without dissipation and without moving to a minimum of potential energy.

The conservation of energy follows from the homogeneity of time, but time is homogeneous here and now, in the early Universe - not substantially homogeneous.

The space in the early Universe is essentially heterogeneous, therefore, the full impulse is not preserved.

**Particle birth**

Dirac suggested that the number of particles in the universe grows in proportion to the square of time.

Indeed, if we evaluate the magnitude of the work of expanding the Universe that the vacuum has done, with the work against the forces of the gravitational field, the work of the vacuum is several orders of magnitude greater than the work of the forces of gravity, which implies that the version of the total energy of the Universe equal to zero is incorrect, and the expansion of the Universe constantly generates elementary particles [2].

Representing the Universe in the form of a ball, in the classical case, the work performed during the expansion of the Universe:  $dA = \rho \int_s (\frac{\partial V}{\partial r} + Hr) dr ds$ ,

where  $V = \frac{\gamma M}{r} [1 + \sum_{i=1}^{\infty} \sum_{j=0}^i P_{ij} \sin \varphi (C_{ij} \cos j\theta + S_{ij} \sin j\theta)]$ . If we

imagine that the entire mass of the ball is concentrated in the center, then

$$dA = \int_s \rho (\frac{\gamma M}{r^2} + Hr) dr ds$$

Let us take the average distance between galaxies of 2 Mpc (according to other sources - 0.7 Mpc). Let's take the average mass *m* of the galaxy for 300 billion solar masses:  $m = 2 \cdot 3 \cdot 10^{11} \cdot 10^{30} = 6 \cdot 10^{41} \kappa z$ . One square  $2 \cdot 2 Mnk$  contains one galaxy. Radius of the universe is  $R = 7,4 \times 10^{26}$  m. The area of one square is  $S = 0,36 \cdot 10^{34} M^2$ .  $1nk = 3 \cdot 10^{16} M$ . Total surface density is  $\rho = 1,6 \cdot 10^6 \kappa z / M^2$ . Sphere area is  $S = 4\pi R^2 = 0,68 \cdot 10^{54} M^2$ . Then, if we consider the galaxies as point

$$dA \sim 10^{60} \kappa z (\gamma M / r^2 + Hr) dr, A \sim 10^{60} (-\gamma M / r + H^2 r^2 / 2) \quad (1)$$

If we assume that all the dark energy arose due to the expansion of the Universe, then its mass when estimating the 2nd term on the right side of the equation with *r* corresponding to the dimensions of the observed Universe is about  $10^{60}$  kg. The first term on the right side of the equation has a value that is several orders of magnitude smaller; the integration constants of the picture do not change.

If we assume that the average density of the universe is  $- 10^{-29} \text{ g/cm}^3 = 10^{-26} \text{ kg/m}^3$ , then, given that the radius of the universe is  $1,3 \times 10^{26}$  m, and the volume is  $- 4$

$\times 10^{79} \text{ m}^3$ ,  $m = 4 \times 10^{53} \text{ kg}$ . Meanwhile, the mass of only interstellar gas is estimated at  $10^{58} \text{ kg}$ . Planets and stars make up 0.5% of the entire mass of the Universe, 3-4% - interstellar gas, 20-25% - dark matter, 70-75% - dark energy. 9/10 galaxies are hidden from us. Even if you add three orders, the 60th order will not be achieved.

Let us imagine stars or galaxies with gas atoms and take into account the contribution of their chaotic kinetic (including rotational), "thermal" energy. The rotation speed of the outer parts of the galaxies is 50 - 300 km/s. A group of galaxies, including the Milky Way, the Andromeda galaxy and the Triangle galaxy, moves at a speed of  $627 \pm 22 \text{ km/s}$  relative to relict radiation. There are 125 billion galaxies in total, stars of the order of  $3 \cdot 10^{22}$  stars in the visible part, star masses are in the range from 0.08 to 100 solar masses, the most massive of them is R136a1, 265 solar masses, the mass of the Sun is  $M = 2 \times 10^{30} \text{ kg}$ , the masses of galaxies vary from  $\sim 10^7 \text{ Mo}$  up to  $\sim 10^{13}$  solar masses, according to other sources -  $10^5 - 10^{12}$ . Even if we will not take into account the maximum masses, velocities and numbers of stars and galaxies, their "thermal" energy divided by the square of the speed of light is several orders of magnitude less than  $10^{60} \text{ kg}$ .

Rubakov believes that an increase in dark energy with the expansion of the Universe does not violate the law of conservation of energy, since the negative energy of gravity increases [3].

However, in this case, all dark energy should be generated exclusively due to ordinary matter. Secondly, the nodes of the superclusters of galaxies are condensed, the Universe, expanding, is compressed in the nodes of the superclusters [4]. In general, the reverse process of the formation of galaxies, stars, clusters of galaxies, black holes according to this statement should lead to the disappearance of dark energy. It is known that in the modern Universe there is 5% less dark matter than it was in the era of recombination, which is explained by its decay.

In any case, the processes of formation of stars, galaxies, clusters of galaxies and densifications of their nodes occur with a decrease in entropy, and its gravitational energy decreases. From the above estimates, we see that the increase in the mass of the Universe is not compensated by the energy of gravity. This means that if the mechanism of energy (mass) is due to the work of antigravity, i.e. of expansion exists, then in the Universe there are many "unaccounted for" elementary particles, the number of which grows as a result of expansion.

On the other hand, if, according to Linde, the fluctuations of the scalar field generated particles in the era of inflation, nothing prevents the scalar field from generating ordinary matter in the modern era.

Gorbunov and Rubakov believe that all dark matter was formed in the era of inflation [5].

It is fair to assume that the mass of each type of particle is acquired at substantially different values of the Hubble constant, with a sharp decrease at the end

of inflation, the spectrum of particles arising from vacuum in the Hubble "field" should also change. In the modern era - for example, ultra-long-wave electromagnetic radiation.

Calculations of the number of particle births in cosmology show that only a small number of them could appear from vacuum [6]. However, within the framework of the gravitational vacuum hypothesis, all matter could appear due to the "flashing" of virtual plankones [7].

There are also attempts to explain the appearance of all matter due to the creation of particles [8, 9].

In [8], the density of the number of generated scalar particles was calculated, which coincides with the particle density obtained by Stanyukovich in the framework of a qualitative model leading to the total number of particles in the universe.

In the framework of the closed model, the GTR considered a self-consistent account of the birth of fermions, it turned out that due to this birth up to 90% of all the substance of the Universe could be formed, however, with an extremely narrow choice of initial conditions [10]. This conclusion is modified for the scalar-tensor Brans – Dicke theory [9].

It is also argued that in the modern era the birth of particles is slow, in a first approximation, the number of particles is preserved [11, 12].

In all these models, we are talking about the plankon, gravitational, fermion vacuum and the birth of particles in the gravitational field.

Equation (1) refers to a cosmological vacuum that generates an expansion of the universe whose equation of state is  $\mathbf{e} + \mathbf{p} = \mathbf{0}$ . That is, the birth of particles does not occur in a gravitational field, not due to work against gravitational forces, but rather due to work of expansion, which is much orders of magnitude greater than work against gravitational forces.

At the same time, Dirac put forward a hypothesis according to which the gravitational constant decreases inversely with time.

A change in other fundamental constants with time is considered in [13]. These changes are excluded by the available experimental data [14] At the same time, in the case of a conformal scalar field without interaction in the quasi-Euclidean model, the effective gravitational coupling varies [15].

Obviously, an increase in the number of particles does not mean energy conservation. A change in gravitational constant over time also leads to non-conservation of gravitational energy:

$$E = \alpha Gm^2 / r$$

$\alpha = 0.6(n + 3)(2n + 11) / (n + 5) / (2n + 5)$  – numerical factor determining the distribution of matter within an object. Minimum value  $\alpha = 0.6$  and minimal work take place for  $n \rightarrow \infty$ . At  $n = 1$  is the factor of  $\alpha = 0.743$ . Maximum value  $\alpha = 0.792$  is observed for  $n \rightarrow 0$ , that is, for the case of giant gas nebulae.

The potential energy of interparticle gravitational interaction also changes.

Locally, this non-conservation of energy is impossible to measure and it has no physical meaning, but it is necessary for constructing cosmological models.

**Relict radiation**

Does another physics appear, i.e. physics of the early universe and physics of the global universe locally?

The relict radiation predicted by Gamow appears during the hot phase of the evolution of the universe, high temperature breaks the chain of nuclear reactions leading to the formation of helium.

According to Gamow, the temperature of cosmic radiation is about 3 K [16].

In 1955, Tigran Shmaonov experimentally discovered noise microwave radiation with a temperature of about 3 K. In 1964, A. Penzias and R. Wilson discovered the cosmic background of radiation and measured its temperature - 3 K. It would seem that this confirmed Gamow's theory.

Consider the Fulling - Unruh effect.

The temperature of the observed Unruh radiation is expressed by the same formula as the temperature of Hawking radiation, but does not depend on surface gravity, but on the acceleration of the reference frame  $a$ :

$$T = \frac{\hbar a}{2\pi k c} \approx 4 \cdot 10^{-21} \cdot a$$

Use Hubble's law  $v = Hr, a = H^2 r$ , where  $r$  - radius of the universe.

Photon gas energy -  $E = \frac{8\pi^5 k^4}{15c^3 h^3} VT^4$ , number of photons -

$$N = \frac{2k^3 \zeta(3)}{c^3 h^3 \pi^2} VT^3$$

We estimate the energy of the Unruh photon on Earth, based on a constant estimate of the Hubble order  $10^{-18}$ :

$$E_{\text{Unruh}} = \frac{E}{N} \approx 4,2kT \approx \frac{2\hbar H^2 r}{\pi c} \sim 10^{-52} \delta \omega c$$

Accordingly, the Unruh radiation temperature is of the order of  $10^{-30}$  K.

(Note: the era of inflation lasted from  $10^{-42}$  to  $10^{-36}$  seconds. At this time,  $10^{42} \text{sec}^{-1} > H > 10^{36} \text{sec}^{-1}$ , the radius is about  $10^{-2}$ . Let's take a lower value, then at the end of the era of inflation, Unruh temperature is about  $10^{50}$  K.)

We estimate the energy of the relict radiation:

$$E_{\text{relict}} = \hbar \omega \sim 10^{-22} \delta \omega c$$

By virtue of the principle of relativity, the Milky Way - exactly the same galaxy as the rest - it also moves away with acceleration from other galaxies. In this case, the Milky Way must be penetrated by radiation.

By the principle of relativity, at any point in the Universe, the radiation temperature of Unruh is the same. All galaxies located at distances less than the radius of the Universe give a smaller energy contribution to Unruh radiation.

The difference between the energy of the relict photon exceeds the energy of the Unruh photon by 30 orders of magnitude. Could this be?

The interplanetary space contains about 10 molecules of hydrogen and helium per 1 cm<sup>3</sup>; interstellar space contains about 1 molecule in 1 cm<sup>3</sup>; intergalactic space contains 10<sup>-6</sup> molecules in 1 cm<sup>3</sup>.

By the number of particles with a nonzero rest mass, cosmic rays are 92% protons, 6% helium nuclei, about 1% are heavier elements, and about 1% are electrons.

Plus relict radiation, electromagnetic diffuse background, neutrinos from supernovae, photons of the visible spectrum.

The energy spectrum of cosmic rays consists of 43% of the energy of protons, 23% of the energy of alpha particles, and 34% of the energy transferred by other particles.

The temperature of the gas mixture should be determined by the formulas:

$$T = \sum_i \frac{p_i V_i}{C_{pi} / C_{vi} - 1} \left( \sum_j \frac{T_j p_j V_j}{C_{pj} / C_{vj} - 1} \right)^{-1} \text{ or } T = \sum_{i \neq j} \rho_i T_j \left( \sum_k \rho_k \right)^{-1}$$

(see [17]). That is, due to the inverse Compton effect indicated by Zeldovich, the energy of relict photons should increase, and in billions of years the temperature of the relict gas should be equal to the temperature of interstellar space of 4 K. Unruh has no billions of years of photon gas, it occurs every second, the inverse of Compton scattering allows it to approach only 2.7 K. Therefore, it can be assumed that the measured relict radiation is in fact the Unruh radiation, while the relict radiation has a temperature of 4 K.

In any case, heating, although by a vanishingly small value on the temperature scale, means a violation of the law of conservation of energy, a perpetual motion machine of the first kind.

### Conclusion

Probably, the moments of the local paradigm can be transferred to the field of physics in the early Universe and the global Universe, namely:

1) the ideology of symmetries, 2) the concept of the cycle (cyclical processes), 3) the concept of irreversible qualitative changes, regression as a moment of development (minimum action, dissipation, increase in entropy), 4) the concept of

development as an ascent from lower to higher, from simple to complex, moreover, not only in the form of increasing the number of elements of systems, but complicating their structure, turning potential qualities into relevant ones, 5) the ideology of contradiction as a source of movement.

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高熵涂层的形态

**MORPHOLOGY OF HIGHLY ENTROPIC COATINGS**

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From a large review of 3D images of the surface of highly entropic coatings given in [1], we can estimate the roughness of the coatings. From this work it can be seen that the coatings have a pronounced relief, there are both elevations and depressions. A large volume of review works devoted to highly entropic alloys and coatings of both domestic and foreign publications is given in dissertations [2-4] and several reviews (see, below). So in [5, 6] it was shown that, despite the high strengths in the cast state, technological alloying is inherent in these alloys. In the process of deformation in the high-entropic alloys, a nanostructure is formed, which significantly increases the strength of the material. The nature of the fracture in the studied alloys is viscous kink, and they have high strength characteristics and ductility in the studied temperature range. It was shown in [7, 8] that a feature of highly entropic alloys is the ability to order the lattice parameter during annealing, which is accompanied by a decrease in the lattice parameter and some increase in the elastic modulus and hardness. Surveys [9–11] showed that the hardness of a highly entropic oxide coating reaches 27 GPa with an elastic modulus of 270 GPa, and after annealing at 1100 °C for 300 min in air it decreases to 17 GPa.

In the above studies, it is noted that there is no consensus on the nature, structure, mechanisms and sequence of structural-phase transformations in both cast alloys and coatings.

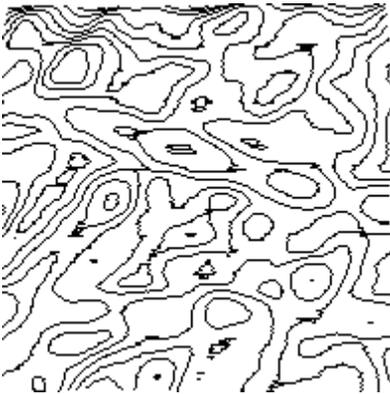
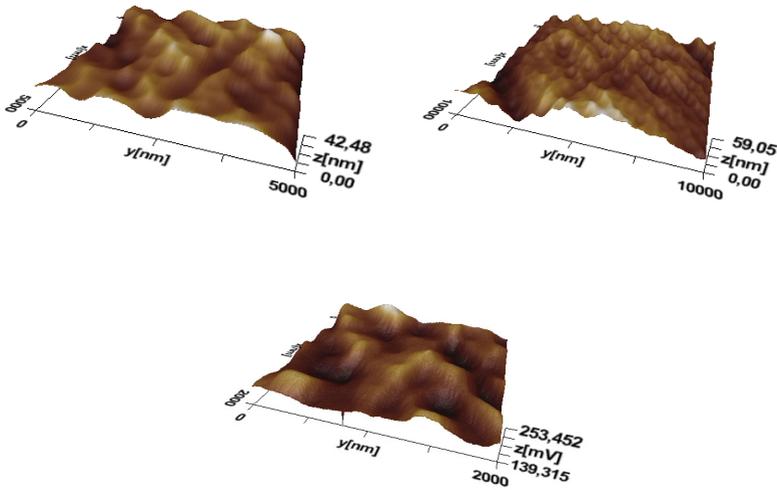
In this work, which is a continuation of [12, 13], various mechanisms of the morphology of deposited coatings are considered on the basis of atomic force microscopy.

To obtain a CrTiNiZrCu magnetron target by mechanical alloying, micropowders of the corresponding metals were taken and mixed in equiatomic proportions

[12, 13]. Coating was carried out on carefully polished samples on the NNV 6 installation with a magnetron target. The measurements were performed on a JSPM – 5400 atomic force microscope manufactured by JEOL.

Figure 1 shows 3D images of the surface of CrTiNiZrCu coatings on AISI-201 steel samples at three different points, and their fractal structures below.

The cellular structure of the high-entropy coating CrTiNiZrCu is observed, the quantitative composition of which is shown in Table 1. The chemical composition of a multicomponent aluminum alloy, which does not belong to the high-entropy coating, and the cellular structure of which we discovered earlier [15] and is shown in Fig. 1, is shown in the same table. 2.



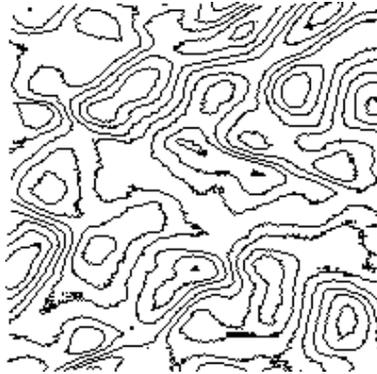


Figure 1 - 3D images of the surface of CrTiNiZrCu coatings at three different points, and their fractal structures below.

Table 1 - Quantitative chemical composition, at. %

Element	Zr	Ti	Cr	Ni	Cu
CrTiNiZrCu	23,2	21,2	19,9	17,1	6,8
Element	Al	Fe	Mn	Si	Cu
AlFeCrMnSiCu	67,26	18,39	4,32	4,64	5,85

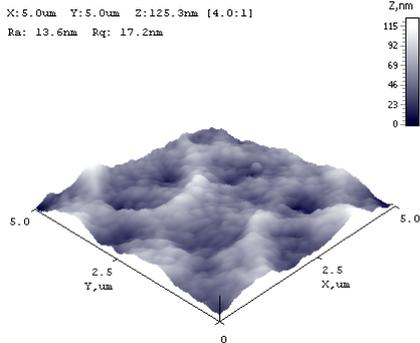


Figure 2 - 3D image of AlFeCrMnSiCu coating

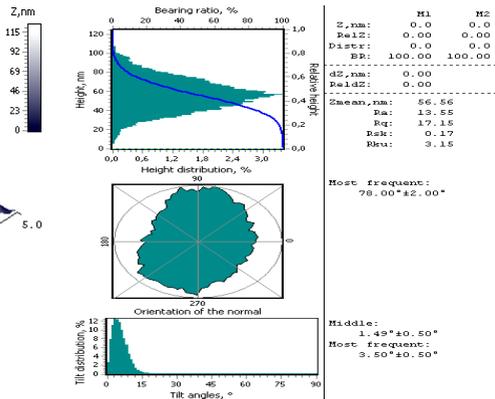
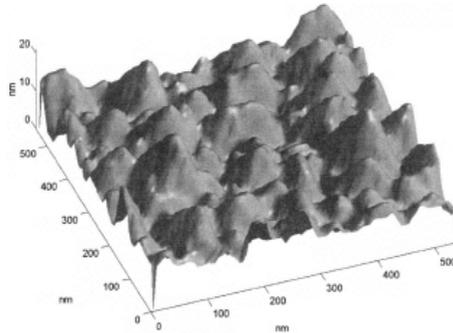


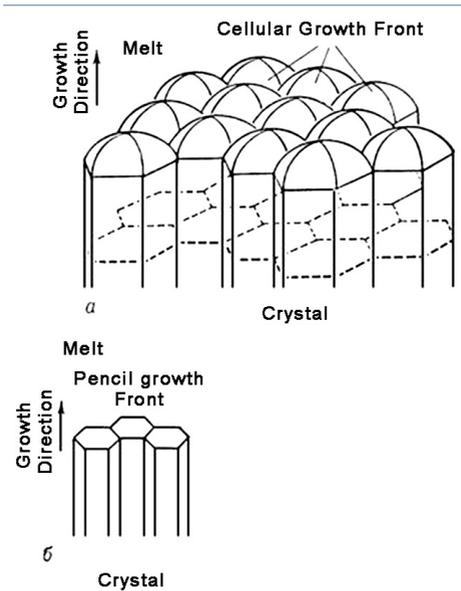
Figure 3 - Histogram of the distribution of hillocks coating

But the cellular structure is observed in coatings of many alloys and compounds [16].



**Figure 4** - Three-dimensional image of the InSiAs surface fragment [9].

A cellular nanostructure arises, as a rule, during crystallization in the mode of concentration supercooling [17, 18]. This structure usually consists of parallel rods that are located in the direction of the crystallization front (Fig. 5).

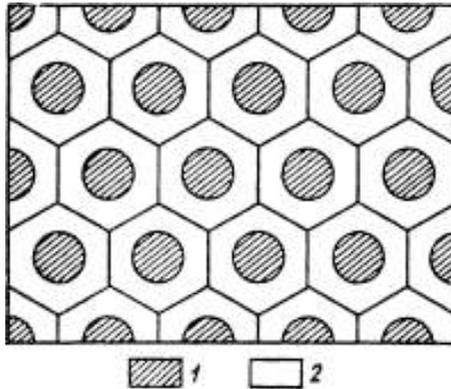


**Figure 5** - Cellular structure (a) and pencil (columnar) structure (b) [10]

In cross section, the structure forms a family of regular hexagonal cells and is a wave structure. After a further increase in the impurity concentration at the crystallization front, the cellular structure transforms into a dendritic one. The

concentration supercooling model is also quite suitable for our model of deposited coating, where one or all elements of a highly entropic alloy can act as an impurity. High entropy alloy contains impurities from 5 to 35 at. % in equimolar ratio. As a rule, it consists of elements of a simple cubic structure. However, the answer to the question about the self-organization of the coating during its deposition from plasma does not follow from this model.

To solve the problem of self-organization of the structural units of the coating, we consider the Benard cell model. Benard cells are the appearance of ordering in the form of convective cells in the form of cylindrical shafts or regular hexagonal figures in a layer of viscous fluid with a vertical temperature gradient (Fig. 6) [19, 20].



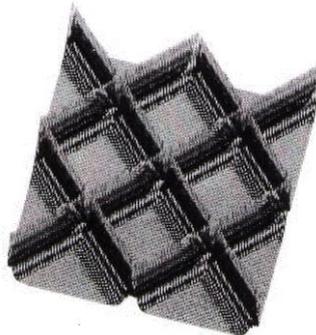
1 - upward movement, 2 - downward movement

**Figure 6** - Layout of Benard cells [19]

Benard cells are one example of self-organizing structures. The control parameter is a temperature gradient, which leads to the wave-like appearance of cellular structures in a homogeneous liquid due to the appearance of inhomogeneity in density. These diffusion shafts, which move towards each other, gradually decay into many waves, forming a cellular structure. But with a further increase in the temperature gradient, the cellular structure collapses and the periodic rolls gradually turn into chaos. The thermal conductivity of our coatings is high and leads to a small temperature gradient, so that it cannot act as a control parameter in the formation of cellular structures such as Benard cells. A rigorous consideration of the physics of Benard cells (see, for example, [19]) as the control parameter, we usually choose the Rayleigh number  $Re = gL^3b\Delta T/\nu\alpha$ , where  $g$  is the gravitational acceleration,  $L$  is the characteristic size,  $b$  is the volume expansion coefficient,  $\Delta T$  is the gradient temperature,  $\nu$  - kinematic viscosity, and  $\alpha$  - coefficient of thermal diffusivity of the medium. Kinematic viscosity is inversely proportional to the magnitude of surface tension (surface energy). Therefore, the control parameter

in the cellular structure should be the surface tension of the coating, as indicated in our work [21].

The appearance of a cellular structure during the formation of plasma coatings is not a simple matter. Here we consider this model with the use of a model of a cellular dislocation structure. It occurs during plastic deformation of a solid or coatings on it and displays the surface topography at various levels (up to the nanostructured level). In [22] (see also references therein), five stages of the formation of a cellular dislocation structure are considered. A cellular dislocation structure is formed at the end of the third stage of strain hardening. This structure also arises in the process of self-organization (as well as Benard cells). However, the mechanism of self-organization is associated with the multiplication and destruction of dislocations (Figure 7).



*Figure 7 - Cellular dislocation structure in axonometric projection [22]*

It turned out that the localization of plastic flow in metals and alloys has a pronounced wave character. Moreover, at the stages of easy slip, linear and parabolic strain hardening, as well as at the prefracture stage, the observed localization patterns are different types of wave processes. An analysis of the wave characteristics of such processes made it possible to measure their propagation velocity ( $\sim 10^{-4}$  m/s), wavelength ( $\sim 10^{-2}$  m) and establish that the dispersion relation for such waves is quadratic. Based on the results obtained in [23], a two-component model of plastic deformation was proposed, which is based on the interaction of the phonon and defective subsystems during deformation. This model can be considered quite promising, since it allows one to correctly assess and predict the behavior of macroscopic patterns of localization in the process of plastic deformation of metals and alloys. We considered the problem of crystallization of the deposited coating in the form of a cylinder of finite dimensions with a moving phase boundary [24, 25]. The non-stationary equation describing this process in a moving cylindrical coordinate system moving according to the law  $\beta(t)$  has the form:

$$\frac{\partial T}{\partial t} = \alpha \left[ \frac{\partial^2 T}{\partial z^2} + \frac{1}{r} \frac{\partial}{\partial r} \left( r \frac{\partial T}{\partial r} \right) \right],$$

where  $\alpha$  is the coefficient of thermal diffusivity.

As a result, the solution is obtained in the form:

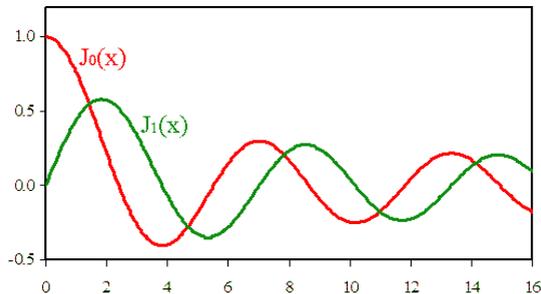
$$T(r, z) = \frac{T_0 R}{\sqrt{\pi z}} I_0 \left( \frac{2r}{R} \right)$$

The radial and axial components of the temperature gradient are equal:

$$\frac{\partial T}{\partial r} = \frac{2}{z} \frac{T_0}{\sqrt{\pi}} I_1 \left( \frac{2r}{R} \right),$$

$$\frac{\partial T}{\partial z} = \frac{RT_0}{\sqrt{\pi z^2}} I_0 \left( \frac{2r}{R} \right).$$

Both equations containing the Bessel functions  $I_0(2r/R)$  and  $I_1(2r/R)$  show the wave character of coating solidification (Fig. 8). Our theory of crystallization of a cylinder of finite dimensions relates to problems with a moving phase interface and is called the Stefan problem [26]. Boundary-value problems of this type differ significantly from the classical problems of heat conduction or diffusion. This difference is due to the movement of the phase separation according to an arbitrary law, so that the separation of variables by classical methods is not feasible. The method of integral Fourier transforms is also not allowed.



**Figure 8 - Graphs of Bessel functions**

The movement of the phase boundary leads to a nonlinearity of the system of equations, which causes the appearance of autowaves.

## Conclusion

The deposition of coatings in a plasma is a thermodynamically nonequilibrium process in an open system. The formation of a cellular nanostructure in the coating can occur according to several models:

- the cellular substructure is often formed upon solidification as a result of the occurrence of concentration hypothermia;
- Benard cells are an example of self-organization. The controlling parameter of self-organization is the temperature gradient, leading to a cellular substructure;
- the cellular dislocation structure is a process of self-organization of dislocations under conditions of multiple slip;
- The model of macroscopic localization of plastic flow also gives a cellular nanostructure. This model shows that the localization of plastic flow in metals and alloys has a pronounced wave character;
- Stefan's problem leads to a nonlinearity of equations that arises due to the motion of the phase boundary and small diffusion of surface atoms. In this case, an autowave process occurs.

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在干旱条件下栽培时不同成熟期Apple果品种的生物特征指标

**BIOMETRIC INDICATORS OF APPLE VARIETIES OF DIFFERENT  
MATURATION PERIODS WHEN CULTIVATED IN ARID  
CONDITIONS**

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抽象。研究于2019年在FSBSI“RAS里海农业联邦科学中心”的果园中进行。研究的目的是评估西北Cas-密集集约化种植中引入的苹果品种的生物特征生长指标。ian研究表明, 樱桃树在生长季节结束时具有良好的总体状态(5.0分), 可以很好地表征该品种对生长条件的适应程度。Rossoshansk深红色, Idared, Weinspur, Starkrimson, Golden Delicious和Renet kuban。在植被的第一年, 树木的高高增长和茎的周长成为秋季各种品种的乌曼斯基冬季, 嘎拉库布, 罗索汉斯克深红色和塔利达(28.8 ... 35.0和1.0 ... 2.0 cm)的特征, 冬季Weinspur, Starkrimson, Golden Delicious, Pinova, Renet kuban, 为纪念Yesaul, Red Chief和Korey(分别为27.0 ... 41.8厘米和1.4 ... 1.8厘米)。在秋季品种塔里达(Talida)以及冬季成熟的斯塔克林森(Starkrimson)和金冠(Golden Delicious)品种中, 观察到年度分支的最大增长, 在该季节达到30厘米或以上。

关键词: 苹果树, 品种, 引种, 生物识别指标。

**Abstract.** *Studies were conducted at the Orchard of the FSBSI "Caspian Agrarian Federal Scientific Center of the RAS" in 2019. The purpose of the study was to evaluate the biometric growth indicators of introduced apple varieties in intensive plantings of the North-Western Caspian. As a result of the studies, the excellent general state of the trees at the end of the growing season (5.0 points) was revealed, which positively characterizes the degree of adaptation of the va-*

*rieties to the growing conditions, was noted in the varieties Cherry, Rossoshansk crimson, Idared, Weinspur, Starkrimson, Golden delicious and Renet kuban. In the first year of vegetation, the height gains of trees and the circumference of the stems characterized the autumn varieties Umansky winter; Gala kub, Rossoshansk crimson and Talida (28.8 ... 35.0 and 1.0 ... 2.0 cm), winter Weinspur, Starkrimson, Golden delicious, Pinova, Renet kuban, In memory of Yesaul, Red chief and Korey (27.0 ... 41.8 cm and 1.4 ... 1.8 cm, respectively). The maximum growth of annual branches, reaching 30 cm or more during the season, was observed in the autumn varieties Talida, as well as in the winter ripening varieties Starkrimson and Golden delicious.*

**Keywords:** *apple tree, variety, introduction, biometric indicators.*

### **Introduction**

Russian gardeners engaged in the cultivation of fruit crops on a large industrial scale are interested not only in the quantity of production received, but also in its quality. Of great importance to them is also the possibility of obtaining high yields at low physical and financial costs. To achieve this goal, in many regions of the Russian Federation, apple trees are grown in intensive-type orchards, where only highly productive zoned varieties resistant to various stress factors are used. The variety should to the maximum extent possess a complex of economically valuable traits, and also have high economic efficiency of cultivation under growing conditions [1; 2].

Extreme climatic conditions of the Northwest Caspian Sea region, characterized by a sharply continental climate with low rainfall and high air evaporation, require selection of varieties with high adaptive potential. Varieties of apple trees grown in the region also need regular updating due to changing production requirements [3].

The aim of the research was to evaluate the biometric growth indices of introduced apple varieties in intensive plantings of the Northwest Caspian.

To achieve this goal it was necessary to solve the following tasks:

- determine the growth of the tree and the circumference of the stem;
- determine the number of branches of the first and second order;
- identify the state of trees at the end of the growing season;
- identify the growth dynamics of annual shoots;
- determine the growth of annual shoots over the summer period.

### **Materials and research methods**

The research material was 25 varieties of apple trees grafted onto mid-sized clone stocks 54-118 and 57-545. Varieties zoned for the Lower Volga region were taken for control: Wealthy (for summer varieties), Cherry (for autumn varieties), Idared (for winter varieties).

The experience was laid down according to the scheme  $5.0 \times 2.0$  m (1000 tree./ha) in 2018. Test - one-factor, repetition - three-fold. The surveys were carried out in accordance with the “Program and Methods of Varietal Study of Fruit, Berry and Walnut Fruits [4]. Statistical processing of experimental data was carried out according to B. Dospekhov. [5] using computer programs Microsoft Office Excel.

**Research results**

As a result of the studies, it was revealed that in the group of autumn varieties the most intensive growth was shown by varieties Umansky winter, Gala kub, Rossoshansk crimson and Talida (28.8 ... 35.0 cm), which exceeded the control by the growth of trees in height and circumference of the stem by 1, 4 ... 2.7 cm and 0.4 ... 0.6 cm, respectively. Varieties Lambourne and Stark red gold, on the contrary, lost control on these indicators by 22.2 ... 22.4 cm and 0.1 ... 0.3 cm, respectively.

In the group of winter varieties, good growth indicators (27.0 ... 41.8 cm and 1.4 ... 1.8 cm) were recorded in the varieties Weinspur, Starkrimson, Golden delicious, Pinova, Renet kuban, In memory of Yesaul, Red chief and Korey. Varieties Prikubanskoe, Renet dyed and Ligol (12.0 ... 22.0 cm) were characterized by more restrained growth in height. According to the growth of the stem, they corresponded to the control (table).

*Table - Biometric indicators of apple varieties, 2019*

Variety	Growth, cm		Number of branches, pcs.		Condition of trees in autumn, score
	tree heights	circumferences of the stem	I order	II order	
summer ripening					
Wealthy (control)	11,8	1,4	4,2	0,0	1,2
July	7,6	1,1	2,8	0,0	1,3
Mantet	3,0	1,0	1,8	0,0	1,1
Quinte	19,2	1,0	1,0	0,0	1,1
LSD <sub>05</sub>	4,3	0,2	1,2		
autumn ripening					
Cherry (control)	47,4	1,4	7,8	1,0	5,0
Umansky winter	30,6	1,0	1,2	0,0	1,3
Lambourne	5,0	1,3	1,6	0,0	1,3
Stark red gold	5,2	1,1	2,6	0,0	1,3
Gala kub	51,6	1,8	2,4	1,0	4,4
Rossoshansk crimson	35,0	2,0	8,6	7,2	5,0

Talida	58,8	1,8	4,6	3,4	4,4
LSD <sub>05</sub>	14,2	1,3	1,7	1,8	
winter ripening					
Idared (control)	64,6	1,9	6,6	1,4	5,0
Weinspur	51,0	1,4	10,0	4,6	5,0
Starkrimson	89,0	1,7	6,8	0,0	5,0
Golden delicious	44,2	1,8	4,6	6,0	5,0
Prikubanskoe	12,0	1,4	7,2	1,4	1,1
Pinova	38,6	1,1	1,0	0,0	1,5
Renet kuban	67,0	1,2	7,0	3,8	5,0
Golden crown	47,0	1,6	4,2	0,0	4,6
In memory of Yesaul	81,0	1,1	6,6	9,4	4,3
Red chief	61,8	1,7	6,0	1,0	4,7
Renet dyed	22,0	1,8	5,0	1,0	4,3
Korey	72,8	1,6	6,2	1,2	4,7
Ligol	16,2	1,4	5,0	0,0	4,4
Florina	44,6	1,5	7,4	0,0	4,5
LSD <sub>05</sub>	2,3	0,7	1,3	0,3	

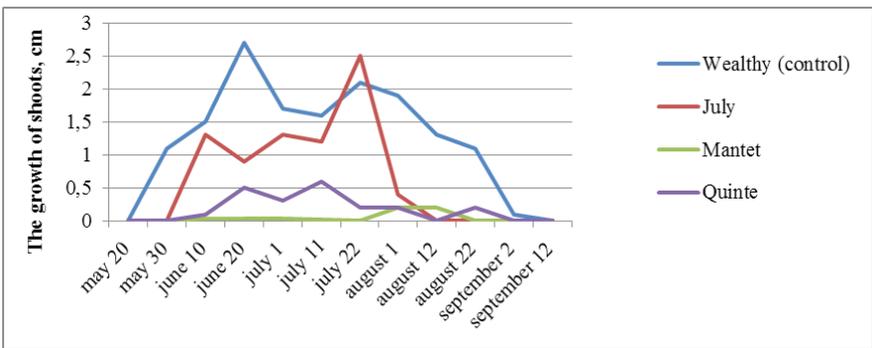
The trees of the summer varieties July and Mantet grew weaker than all, the growth in height of which did not exceed 7.0 cm, and the circumference of the stem reached only 1.0 ... 1.1 cm, which is significantly less than the similar values for the control variety Wealthy (11.8 and 1, 4 cm).

In addition to the main indicators - the height of the tree and the circumference of the stem, the degree of development of young trees characterizes the shoot-forming ability and the magnitude of the growth of annual shoots. Among all the varieties under study, the largest number of branches of both the first and second order was formed in the autumn varieties Cherry (7.8 ... 24.0 pcs.) And Ros-soshansk crimson (8.6 ... 7.2 pcs.), as well as the winter varieties Weinspur (10.0 ... 4.6 pcs.) and In memory of Yesaul (6.6 ... 9.4 pcs.). Less branched trees were summer varieties July, Mantet, Quinte (1.0 ... 2.8 pcs.), Autumn - Umansky winter, Lambourne, Stark red gold, Gala kub (1.2 ... 2.6 pcs.) And Pinova winter variety (1.0 pcs.).

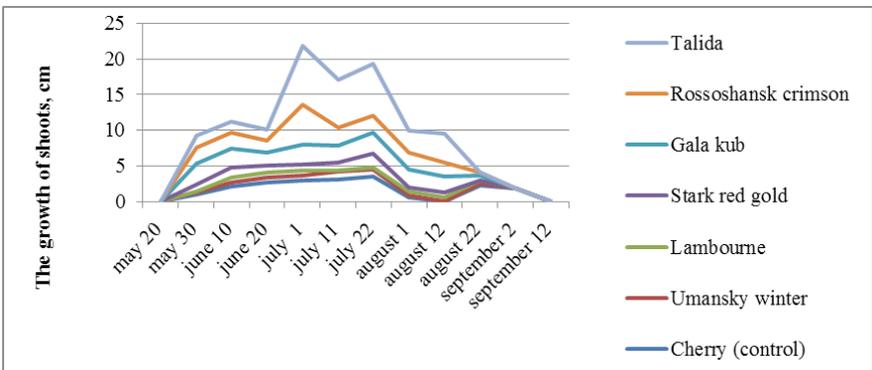
The growth rate of annual shoots is a reliable indicator of adaptation to environmental conditions and characterizes the general condition of the trees. The maximum growth of annual branches, reaching 30 cm or more over the entire growing season, was observed in the autumn varieties Talida (34.3 cm), as well as in winter varieties Starkrimson (36.2 cm) and Golden delicious (40.6 cm), which by 14.4 ... 19.0 cm exceeded the corresponding control.

Most of the studied varieties were characterized by average growths of one-year-old shoots, which varied within 12.8 ... 21.8 cm. This indicator was much lower in summer varieties July, Mantet, Quinte (2.1 ... 7.9 cm). autumn - Uman-sky winter, Lambourne, Stark red gold (4.4 ... 8.4 cm) and winter Prikubanskoe, Pinova (5.3 ... 5.6 cm) (figures 1 ... 3).

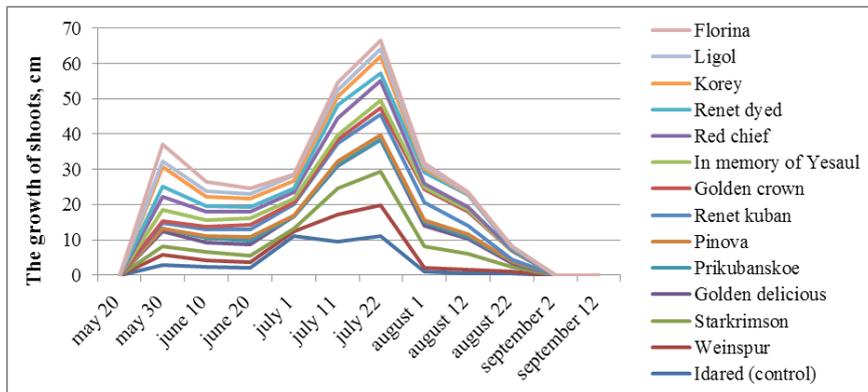
The formation of root shoots is an undesirable sign and negatively affects the growth and development of fruit trees, as the growth inhibits the tree and interferes with maintenance work. The shoots were formed in the winter varieties Renet dyed (1.2 pcs.), Renet kuban (0.6 pcs.), Red chief (0.4 pcs.), Prikubanskoe and Korey (0.2 pcs.), Autumn - Rossoshansk crimson and Cherry (0.2 pcs.).



**Figure 1** – Growth dynamics of apple shoots of summer ripening, 2019



**Figure 2** – Growth dynamics of apple shoots of the autumn ripening period, 2019



**Figure 3** – Growth dynamics of apple shoots in winter ripening, 2019

### Conclusion

Thus, according to preliminary data on the biometrics of a hundred apple varieties introduced into the arid conditions of the Northwest Caspian, the autumn variety Rossoshansk crimson and winter varieties Weinspur, Starkrimson, Golden delicious, Renet kuban, characterized by excellent general condition of the trees by the end of the growing season, were identified and good seedlings of the height of the trees and the circumference of the stems.

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阿斯特拉罕州干旱条件下引进的樱桃品种的生长和发展  
**GROWTH AND DEVELOPMENT OF INTRODUCED CHERRY  
VARIETIES IN ARID CONDITIONS OF THE ASTRAKHAN OBLAST**

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抽象。本文介绍了嫁接在玛哈利卜樱桃根茎上的樱桃Molodezhnaya, Lyubskaya, Turgenevskaya, Miracle樱桃的引进品种研究的第一阶段的结果。提出了在北里海急剧大陆性气候下研究樱桃品种-砧木组合生长力的生物测定指标的结果。研究表明,所研究品种在生长,早熟和生产力方面存在差异。已经证明,3岁时树木的高度不超过1.89 m。表冠容积达到1.65立方米。在生长季节中,进行了年度芽的生长动态。延伸枝的生长速率为28.2-44.7 cm的各种大小。奇迹樱桃品种(44.7厘米)的特点是生长最强。在Molodezhnaya品种(28.2厘米)中观察到很小的生长。在结果的初期,所有的研究品种都具有早熟和高产的特点。在种植的第三年,所有品种都形成了单果。

关键词: 品种, 樱桃, 植被, 生物特征, 冠的生长。

**Abstract.** *The article presents the results of the first stage of the study of introduced varieties of cherries Molodezhnaya, Lyubskaya, Turgenevskaya, Miracle cherry, grafted on the rootstock of mahaleb cherry. The results of studying the biometric indicators of the growth force of varietal-rootstock combinations of cherries in the sharply continental climate of the Northern Caspian are presented. The studies revealed differences in growth, early maturity and productivity of the studied varieties. It has been shown that the height of the trees at the age of 3 does not exceed 1.89 m. The crown volume reaches 1.65 m<sup>3</sup>. During the growing season, growth dynamics of annual shoots was carried out. Growth rates of extension*

*shoots were of various sizes 28.2-44.7 cm. The Miracle-cherry variety (44.7 cm) was characterized by the strongest growths; small growths were observed in the Molodezhnaya variety (28.2 cm). In the initial period of fruiting, early maturity and productivity distinguished all the studied varieties. In the third year of planting, all varieties formed single fruits.*

**Keywords:** *variety, cherry, vegetation, biometrics, growth of the crown.*

Among stone fruit crops, cherry is the most common and in constant demand among consumers. It belongs to the earliest ripening crops, biologically adapted to annual fruiting and the formation of high yields. Fruits are appreciated for the possibility of obtaining the first high-quality, vitamin products, suitable both for fresh consumption and for processing [1].

Astrakhan Oblast has all the prerequisites for creating intense cherry orchards. Currently, there is a vast diversity of varieties with a complex of positive economically valuable traits: resistance to abiotic and biotic environmental factors, high productivity and quality of fruits. However, not all varieties can maximize their production potential in various environmental conditions. In this regard, there is a need to study a new group of cherry varieties in combination with new introduced seed and clonal stocks to highlight stable highly productive variety-rootstock combinations with good fruit quality [2].

Modern industrial technologies for the cultivation of stone fruits provide for the use of varieties corresponding in their economic and biological indicators to an intensive garden [3].

**Material and research methods.** The studies were conducted at the Caspian Agrarian Scientific Center of the Russian Academy of Sciences in 2019. An experimental plot of cherry variety cultivars was laid in 2017. The research material is 4 introduced varieties grafted on mahaleb cherry rootstock. Planting scheme of cherry was 5x3m. The area of plantations was 0.45 ha. The experiment was one-factor. Counts and observations were carried out on 5 typical plants of each variety in accordance with the "Program and Methods of Variety Study of Fruit, Berry and Walnut Fruits" [4], triplicate.

One of the most important areas of modern horticulture is the creation of varieties with stable fruiting amid fluctuating environmental conditions over the years. Features of the passage of the phenological phases of cherry development form the basis of the economic and biological characteristics of the varieties [5].

Weather and climatic conditions have a significant impact on the timing of developmental phenophases. A sharp transition from a harsh winter to a hot summer, lack of precipitation, frequent droughts are characteristic features of the region's climate. In winter, long thaws are observed followed by a sharp cooling and return frosts in spring, which negatively affects cherry productivity [6].

The blooming of generative buds in cherry varieties was simultaneous and came on March 22, vegetative buds - April 3 ... 8. The earliest flowering was observed on April 22 in the variety Miracle-cherry. In varieties Lyubskaya, Molodezhnaya, Turgenevskaya flowering occurred on April 25. The flowering strength of variety-root combinations amounted to 1.8 ... 3.8 points, the flowering duration was within 8 ... 10 days (table 1).

*Table 1 - Dates of the onset of the main phenological phases in cherry varieties, 2019*

Variety	Budding		Flowering		Strength of flowering, score
	generative	vegetative	beginning	end	
Molodezhnaya (control)	22.03	3.04	25.04	4.05	3,8
Lyubskaya	22.03	4.04	25.04	3.04	3,6
Turgenevskaya	22.03	3.04	25.04	4.05	2,6
Miracle-cherry	22.03	8.04	22.04	29.04	1,8

An important characteristic of adaptation of variety-rootstock combinations is the growth force, which includes the growth of the tree in height, the diameter of the crown in two directions, the circumference of the stem.

The height of three-year-old trees on the rootstock of mahaleb cherry reached 139.5 ... 188.9 cm. The maximum value of the height of trees was noted in the Miracle-cherry variety - 188.9 cm, which is 19.0 cm higher than the control indicators of the Molodezhnaya variety. Growths in tree heights were 23.5 ... 39.1 cm. The maximum growths were noted in the Miracle-cherry variety (39.1 cm), the smallest (23.5) cm in the Turgenevskaya variety. In the control cultivar Molodezhnaya, the increase in tree height is 28.2 cm.

The circumference of the stem was 11.6 ... 15.8 cm. The growth of the circumference of the stem was within 3.3 ... 4.4 cm. The highest value was observed in the variety Miracle-cherry (4.4 cm), which is higher than the control indices by 1.1 cm (table 2).

During the growing season, a small crown diameter, which amounted to 117.2 ... 164.0 cm along the row and 118.9 ... 164.5 cm across the row, was formed in the varieties Lyubskaya and Turgenevskaya, the crown diameter increments amounted to 45.7 ... 61, 0 cm along the row and 48.5 ... 64.3 cm across the row. The height of the trees, respectively, was 181.0 ... 139.5 cm.

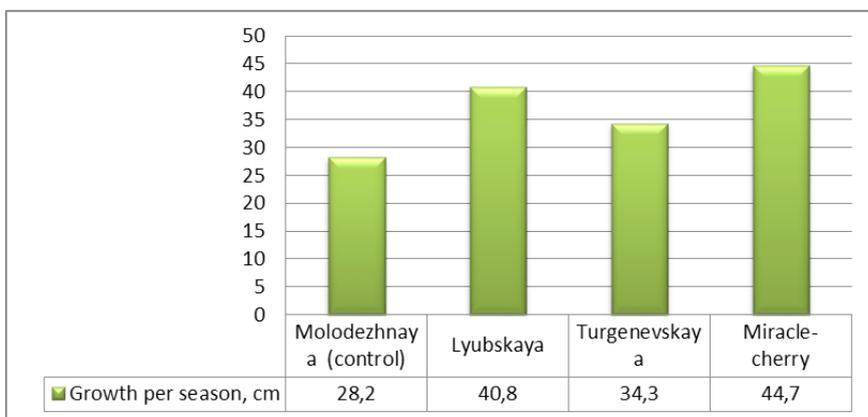
The largest crown diameter was formed in the cultivar Molodezhnaya (164.0 cm along the row and 164.5 cm across the row) with a tree height of 169.9 cm. All varieties except Turgenevskaya are inferior to the control in increments of the crown diameter. Turgenevskaya varieties had diameters in both directions at the control level.

To obtain additional information about the reaction of cherry varieties to growing conditions, annual account was taken of the dynamics of shoot growth.

In the 2017 planting in varieties grafted on the mahaleb cherry rootstock, good growth per season was observed in the Miracle-cherry (44.7 cm) and Lyubskaya (40.8 cm) varieties. The Molodezhnaya control was characterized by the smallest growth - 28.2 cm. Varieties Turgenevskaya (34.3 cm) were characterized by moderate growths. Active growth of continuation shoots was from the second decade of May to the first decade of June (Fig. 1).

**Table 2 - Biometric indicators of the growth force of varietal-rootstock combinations of cherries, 2019**

Variety	Tree height, m	The increase in tree height, cm	The circumference of the stem, cm	The increase in the circumference of the stem, cm	Crown diameter, m		The increase in crown diameter, cm	
					along the row	across the row	along the row	across the row
Molodezhnaya (control)	1,70	28,2	12,9	3,3	1,64	1,65	58,2	64,0
Lyubskaya	1,81	34,6	13,5	3,4	1,24	1,20	45,7	48,5
Turgenevskaya	1,40	23,5	11,6	3,8	1,36	1,39	61,0	64,3
Miracle-cherry	1,89	39,1	15,8	4,4	1,17	1,19	46,3	54,6
LSD <sub>0,5</sub>	0,14	7,6	0,84	0,6	0,13	0,16	9,4	11,6



**Figure 1 - Growth dynamics of the shoots of continuation of varietal-rootstock combinations of cherries, 2019**

It was statistically proven that the biometric growth indicators of the Lyubskaya and Turgenevskaya varieties corresponded to the parameters of the control Molodezhnaya variety. The Miracle-cherry variety had a more powerful development both in comparison with the control and other studied varieties.

Plant productivity is a complex indicator and depends on winter hardiness, adaptability to stressors of the spring-summer period, resistance to diseases, fruiting stability and fruit quality [7].

In the 3rd year of planting, 55.0 ... 75.0% of combinations with a power of 1.8 ... 3.8 points bloomed, however, fruiting was very weak, all varieties formed single fruits this year (table 3).

*Table 3 - Yield of varietal-rootstock combinations of cherries, 2019.*

Variety	Flowering, %	Flowering strength, score	Fruit bearing strength, score	Productivity	
				kg/tree	t/ha
Molodezhnaya (control)	75,0	3,8	0,2	single fruits	
Lyubskaya	60,0	3,6	0,2	single fruits	
Turgenevskaya	68,4	2,6	0,5	single fruits	
Miracle-cherry	59,5	1,8	0,1	single fruits	

Among the variety-root combinations of cherries with the fineness of fruits, the Miracle-cherry variety stood out, which in 2.2 ... 2.5 g. exceeded the mass of control fruits and other varieties (table 4).

*Table 4 - Characteristics of the quality of cherry fruits, 2019*

Variety	Fruit mass, g	Seed mass, g	Fruit mass to the seed mass, %	Tasting, score
Molodezhnaya (control)	4,1	0,7	15,9	3,0
Lyubskaya	3,8	0,4	10,5	3,3
Turgenevskaya	4,1	0,8	18,3	4,0
Miracle-cherry	6,3	0,4	6,3	4,8

Despite the single fruiting of cherry varieties, a tasting assessment was also carried out. The highest score in taste was received by Miracle-cherry variety - 4.8 points, the lowest - control variety Molodezhnaya - 3.0 points.

### Conclusion

As a result of the study of cherry varieties at the first stage of research, it was found that the Lyubskaya and Turgenevskaya varieties corresponded to the biometric parameters of the control Molodezhnaya variety. The Miracle-cherry variety had a more powerful development both in comparison with the control and other studied varieties. The study of early maturity and productivity by productivity components among varietal-rootstock combinations of cherries with fruit size distinguished the Miracle-cherry variety, which is 2.2 ... 2.5 g. exceeded the mass of control fruits and other varieties studied.

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各种生态地理起源的葡萄品种对冬季压力的稳定性研究  
**STUDY OF THE STABILITY OF GRAPES VARIETIES OF VARIOUS  
ECOLOGICAL-GEOGRAPHIC ORIGIN TO THE STRESSES OF  
THE WINTER PERIOD<sup>1</sup>**

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抽象。结合阿纳帕-塔曼地区的区域气候变化，研究了葡萄品种的耐寒性。研究的对象是品种-具有不同生态和地理起源的葡萄的种间杂交种：晶体-欧洲-非裔美国人起源；Krasnostop AZOS，体面-欧美裔；愉悦-阿穆尔裔美国人；Zarif-东欧血统；Aligote-西欧血统。目的-在冬季压力因素的影响下对这些葡萄品种进行生理和生化评估，以鉴定出有望在阿纳帕-塔曼地区种植的葡萄品种。到冬季开始时，在Crystal, Krasnostop AZOS等品种中，发现葡萄组织的水分含量较低（41.4-45.3%）。在越冬芽的相同品种中，发现蔗糖积累增加（是其他研究品种的2倍），表明对低温的抵抗力增加。

结果表明，抗氧化防御系统响应压力的功能增强出现在葡萄品种Crystal, Krasnostop AZOS, Decent和Delight中。在这些品种的皮层中，具有抗氧化活性的花色苷和查耳酮的含量比其他品种增加了1.8倍，发现过氧化物酶活性

<sup>1</sup>The study was financially supported by RFBR and ACC in the framework of the scientific project № 19-44-230021 r\_a

增加了1.9倍。体面的Krasnostop AZOS品种积累的抗坏血酸比其他研究品种高4.42倍。根据生理和生化研究的结果,可以确定,在阿纳帕-塔曼地区气候变化的情况下,与Delight, Zarif, Aligote品种相比, Crystal, Krasnostop AZOS, 像样的葡萄品种具有更强的耐寒性。

关键词: 葡萄; 抗寒性; 水分; 过氧化物酶活性; 抗氧化防御系统

**Abstract.** *The winter hardiness of grape varieties was studied in connection with a change in the regional climate in the Anapa-Taman zone. The objects of research were varieties - interspecific hybrids of grapes of various ecological and geographical origin: Crystal - Euro-Amuro-American origin; Krasnostop AZOS, Decent - of Euro-American descent; Delight - Amur-American origin; Zarif - of Eastern European descent; Aligote - of Western European descent. The purpose - to conduct a physiological and biochemical assessment of these grape varieties under the influence of stressful factors of the winter period, to identify varieties that are promising for cultivation in the Anapa-Taman zone. By the beginning of the winter period, in the varieties Crystal, Krasnostop AZOS, Decent a low water content of grapevine tissue was noted (41.4-45.3%). In the same varieties in wintering buds, an increased accumulation of sucrose was found (2 times more than in the other studied varieties), indicating increased resistance to low temperatures.*

*It was revealed that the increased functioning of the antioxidant defense system in response to stress occurs in the grape varieties Crystal, Krasnostop AZOS, Decent, Delight. In the cortex of these varieties, the content of anthocyanins and chalcones with antioxidant activity increased by 1.8 times in comparison with other varieties, an increase in peroxidase activity by 1.9 times was found. The varieties Krasnostop AZOS, Decent accumulate 4.42 times more ascorbic acid than the other varieties studied. According to the results of physiological and biochemical studies, it was established that the Crystal, Krasnostop AZOS, Decent grape varieties proved to be more winter-hardy in comparison with the Delight, Zarif, Aligote varieties in the changing climate of the Anapa-Taman zone.*

**Keywords:** *grapes, winter hardiness, water content, peroxidase activity, antioxidant defense systems*

## Introduction

Issues of increasing the resistance of grapes to the stressful effects of the winter period have gained particular importance in connection with climate change and unpredictable extreme weather events. An analysis of climatic changes over a long period in the Anapa-Taman zone indicates an increase in recent decades in the incidence of early frosts below -15 °C during the preparation phase of plants for winter dormancy, as well as large temperature differences during the winter. The development of frost resistance in autumn during the hardening process, as well as the loss of acquired frost resistance in response to warm temperatures, are crucial

for the wintering of the vine. Due to the above climatic changes in some grape varieties, the complex of adaptive reactions to new environmental conditions underwent changes, they inadequately prepared for the beginning of the winter period and reduced resistance to winter stresses.

In this regard, studies of the physiological and biochemical mechanisms of adaptation of grape varieties to the stresses of the winter period in a changing climate are relevant. At present, the search for diagnostic indicators characterizing the resistance of varieties to stressful environmental conditions does not stop. This approach will provide an opportunity to increase the efficiency and effectiveness of the accelerated selection of grape varieties that are promising for cultivation in the Anapa-Taman zone.

The purpose of this work is to conduct a physiological and biochemical assessment of grape varieties of various ecological and geographical origin under the influence of stressful factors of the winter period, to identify varieties promising for cultivation in the Anapa-Taman zone.

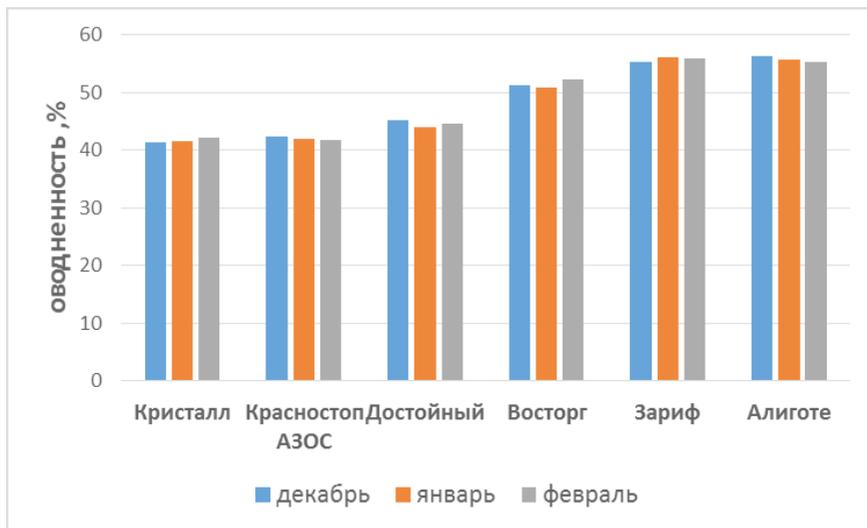
### **Materials and methods**

The studies were carried out in 2017-2019 on the basis of the FSBSI AZOS-ViV ampelographic collection located in Anapa, a quarter of technical grape varieties on southern carbonate chernozem, the "Instrument-Analytical" CUC and the physiology and biochemistry laboratory FSBSI NCFSCHVW. Plants of 1995 year, rootstock Kober 5BB. Formation - two-sided high-stemmed spiral cord AZOS. Landing pattern 3 x 2.5 m. The objects of research were varieties - interspecific hybrids of grapes of various ecological and geographical origin: Crystal (control) - Euro-Amur-American origin; Krasnostop AZOS, Decent - Euro-American origin; Delight - Amur-American origin; Zarif - of Eastern European descent; Aligote - of Western European descent. For the period 2017-2019, it was found that in December the maximum air temperature increased from +12 °C to +14 °C, and the minimum air temperature from -9 °C to -1 °C. In January 2019, the minimum air temperature increased from -13 °C to -3 °C, the maximum air temperature for the analyzed period was +14-15 °C. In February 2019, the maximum air temperature reached + 14-15 °C, and the minimum increased from -11 to -5 °C. It should be noted that the temperature difference in December for the analyzed period decreased by 10 °C, in January by 12 °C and in February by 3 °C.

The hydration of tissues was determined by the gravimetric method, Boyarkin peroxidase activity, the content of sucrose, proline, ascorbic acid by capillary electrophoresis, the content of anthocyanins and chalcones by spectrophotometric method [1-3]. The obtained experimental data were processed using generally accepted methods of variation statistics [4].

### Results and discussion

Under winter conditions, the resistance of grapes to low temperatures varies greatly over the years and depends on external conditions, the physiological state of plants, the orientation and nature of metabolism in its tissues. The winter hardiness of the vine largely depends on the degree of maturation of the tissues and their hydration by the beginning of winter dormancy. With complete maturation of the tissues, a distinct boundary between wood and cambium is indicated.



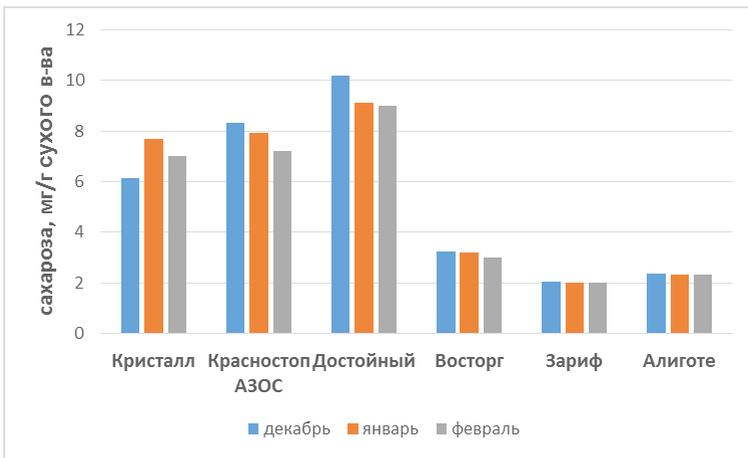
**Fig. 1.** The dynamics of the hydration of grapevine tissue in the winter of 2017-2019. (average values).  $LSD_{0.5}$ : December - 0.16; January - 0.15; February - 0.19

The decrease in tissue water content during the transition of plants from a vegetative state to a dormant state is considered to be one of the indicators of increasing their resistance to adverse environmental factors, and this parameter can be considered as an indicator of the differentiation of varieties by resistance to negative temperatures during winter dormancy. The total water content in the vine of some grape varieties under various cultivation conditions at the beginning of the winter period averaged 50% [5].

In our studies in December, a decreased tissue hydration (41.4-45.3%) was observed in the Crystal, Krasnostop AZOS, and Decent cultivars; in the other cultivars, it was 51.2-56.4%. In January-February, there was a slight increase in water content, while maintaining the previous difference between varieties (Fig. 1).

It is known that the constitutive, inherent in all vegetating plants, resistance to low temperatures, including frost-resistant varieties, is quite low. The formation of frost resistance occurs under conditions of low temperature during hardening. In preparation for winter rest during hardening, intensive starch hydrolysis occurs with the formation of sugars, which are protective substances that weaken the denaturation of protein substances during freezing and stabilize the structure of protoplasm. The accumulation of sugars prevents a large volume of intracellular water from freezing, significantly reduces the amount of ice formed. In frost-resistant grape plants under the influence of low temperatures, hydrolysis of starch and the accumulation of soluble sugars in the cytoplasm were enhanced [6].

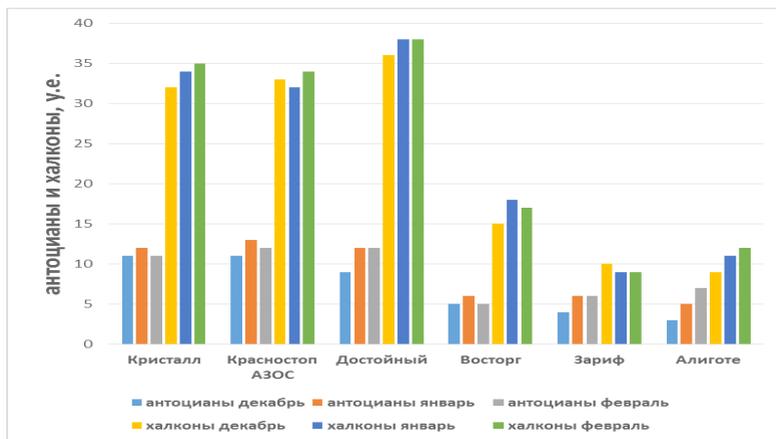
In our studies, the sucrose content in wintering buds of grapes in Decent, Krasnostop AZOS, and Crystal varieties was 2 times higher than in other studied varieties, indicating their increased resistance to low temperatures (Fig. 2).



**Fig. 2.** Dynamics of sucrose content in the buds of grapes in the winter period of 2017-2019. (average values). LSD<sub>0.5</sub>: December - 0.26; January - 0.95; February - 0.21

The preparation of the vine for winter is accompanied by significant changes in the metabolism of phenolic compounds, in particular anthocyanins, which perform a protective function in the resistance of plants to variable temperatures, being a thermal storage barrier. The hypothesis of the involvement of anthocyanins and chalcones in the protective mechanism that shields harmful UV radiation suggests their special tissue localization in the upper epidermis and phloem of the vine [7].

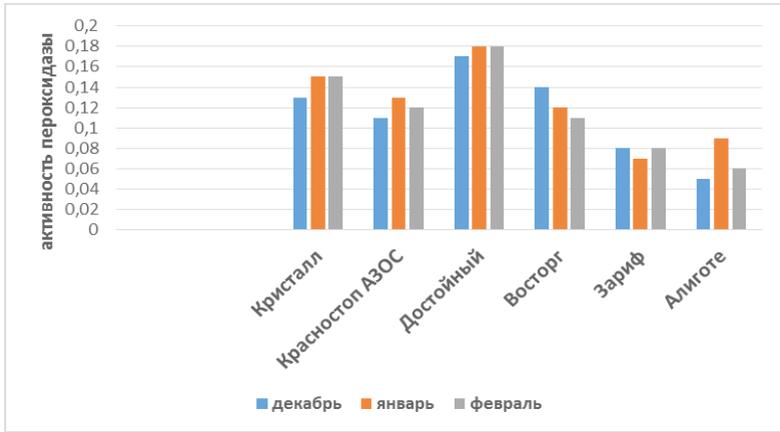
It was shown that the varieties Crystal, Krasnostop AZOS, Decent, Delight were distinguished by a high content of anthocyanins (1.9 times) and chalcones with antioxidant activity (Fig. 3).



**Fig. 3.** The content of anthocyanins and chalcones in the bark of grapes in the winter of 2017-2019. (average values).  $LSD_{0.5}$ : December - 0.27; January - 0.25; February - 0.34

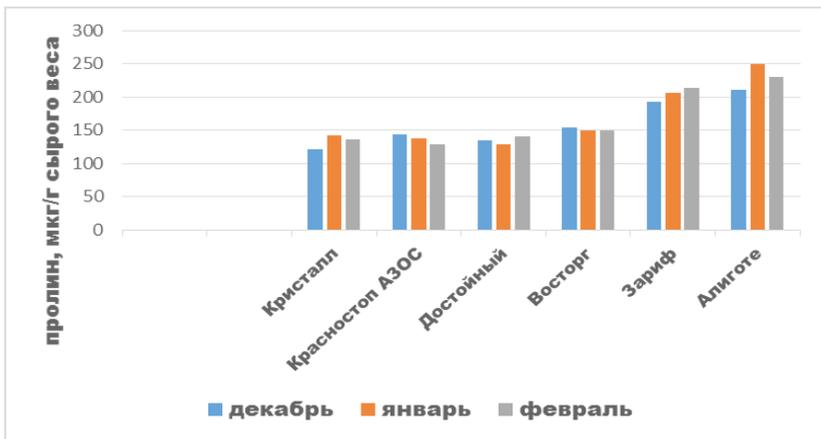
At present, many facts have been obtained that indicate that the acclimation of plants to changing conditions correlates with increased functioning of the antioxidant defense system in response to the formation of reactive oxygen species (ROS), the content of which increases sharply under stress. Both antioxidant enzymes (peroxidases, etc.) and low molecular weight compounds such as proline, ascorbic acid, and phenolic compounds take part in the functioning of the antioxidant protective system under the conditions of abiotic stressors. It is known that an increase in peroxidase activity may indicate the manifestation of protective tissue reactions to low-temperature stress. Some researchers suggest using peroxidase as a diagnostic feature to assess the degree of resistance of plants to stress factors. Thus, frost-resistant wheat genotypes have high peroxidase activity, which can serve as a protein marker of stress resistance [8].

In our studies, a high peroxidase activity in the vine (0.11-0.18  $\text{sec}^{-1}/\text{g}$  wet weight) was observed in the varieties Crystal, Krasnostop AZOS, Decent, Delight. Less peroxidase activity (0.05-0.09  $\text{sec}^{-1}/\text{g}$  wet weight) was observed in varieties Zarif, Aliigote (Fig. 4).



**Fig. 4.** The dynamics of peroxidase activity in the leaves of apple trees in the summer period of 2017-2019.  $LSD_{0.5}$ : June 0.17; July - 0.14; August - 0.11

Low molecular weight compounds such as proline, known not only as an osmoprotector, but also as a scavenger of reactive oxygen species that accumulate under the influence of stress to neutralize ROS, can make up for the lack of activity of enzyme defense systems [9].

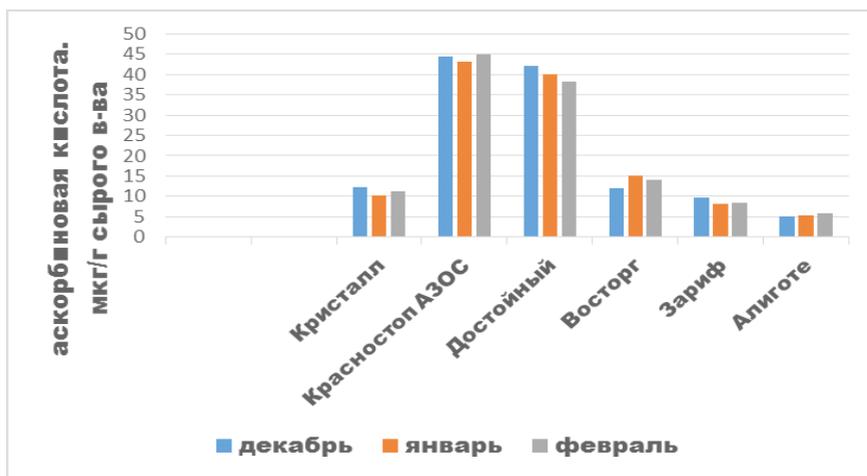


**Fig. 5.** The dynamics of the content of proline in the buds of grapes in the winter of 2017-2019. (average values).  $LSD_{0.5}$ : December - 0.16; January - 0.85; February - 0.13

In the buds of Zarif, Aligote grape varieties, proline accumulated in larger quantities than in other studied varieties (Fig. 5). Probably, the protective properties of the studied grape varieties are manifested in maintaining a balance between the activity of peroxidase and the accumulation of proline during the winter period, which ensures the normal passage of wintering processes.

Another metabolite of the antioxidant defense system, ascorbic acid, is also, according to some authors, an indirect indicator of frost resistance of plants. The protective properties of ascorbic acid are manifested in the inhibition of water intake, a decrease in hydration, in a change in the mobility of intracellular water. An increase in the content of ascorbic acid in winter can serve as an indicator of plant resistance to low temperatures; winter-hardy plant varieties accumulated more ascorbic acid than less winter-hardy ones [10].

The ascorbic acid content in the buds of the studied grape varieties was 5-45 µg/g wet weight (Fig. 6). Varieties of Krasnostop AZOS, Decent showed 4.42 times more ascorbic acid than other varieties studied.



**Fig. 6.** The content of ascorbic acid in the buds of grapes in the winter of 2017-2019. (average values). LSD<sub>0.5</sub>: December - 0.15; January - 0.44; February - 0.25

### Conclusion

According to the results of physiological and biochemical studies, it was established that the Crystal, Krasnostop AZOS, Decent grape varieties proved to be more winter-hardy in comparison with the Delight, Zarif, Aligote varieties in the changing climate of the Anapa-Taman zone.

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火鸡肉的热状态的兽医卫生检查和鉴定

**VETERINARY SANITARY EXAMINATION AND IDENTIFICATION  
OF THE THERMAL STATE OF TURKEY MEAT**

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抽象。 根据感官指标, 组织学方法以及用苏木精-曙红染色的天然火鸡肉制品的制备和显微镜检查方法, 进行了研究以检查冷藏和解冻火鸡肉的显微图像。描述了组织和天然制剂中冷冻和解冻肉的显微照片, 建立了形态特征, 可以识别产品的热态。

关键词: 禽肉, 火鸡肉, 兽医卫生检查, 质量, 安全性, 热状态, 组织学方法。

**Abstract.** *Studies were conducted to examine the micro-picture of chilled and defrosted turkey meat according to organoleptic indicators, the histological method, as well as a method for the manufacture and microscopy of native turkey meat preparations stained with hematoxylin-eosin. A micro picture of chilled and defrosted meat in histological and native preparations is described, morphological characteristics are established that make it possible to identify the thermal state of the product.*

**Keywords:** *poultry meat, turkey meat, veterinary sanitary examination, quality, safety, thermal condition, histological method.*

**Introduction**

Currently, the production of turkey meat is of particular interest. This type of product has already established itself in the domestic market. Since turkey meat is distinguished by high palatability and dietary properties due to its unique nutritional and biological value, it is widely used in everyday, preventive, and baby food.

Turkey meat makes up a rather high price segment of the consumer basket, which can provoke the appearance of poor-quality and unsafe products on the shelves. So, if the terms and conditions of storage of poultry meat are not observed, signs of spoilage of products quickly develop, accompanied by the ac-

cumulation of protein decay products, fat oxidation, which leads to poisoning of people and generally violates food law and consumer rights [6].

In order to increase the shelf life of meat in industry, conservation of meat with low temperatures is widely used - freezing. With such processing of meat, free water crystallizes in muscle cells, during thawing, ice crystals violate the integrity of muscle fibers, and their contents along with nutrients "leak" their product, thereby reducing the nutritional value of raw meat. This fact explains the lower cost of frozen meat compared to chilled [1, 7, 8].

At various stages of the circulation of turkey meat, during its storage, transportation and sale, there is the likelihood of premature defrosting of raw meat, and sometimes intentional. In particular, in a retail chain, the seller defrosts the meat and sells it as chilled, and in some cases, freezes and defrosts it many times. Such actions are prohibited by law. Replacing chilled meat with frozen is nothing more than falsification of products, with repeated or repeated defrosting, the raw materials should be sent to industrial processing [2, 5].

Existing methods for identifying the thermal state of meat include organoleptic methods, very subjective, as well as a histological method. However, the manufacture of histological preparations is laborious, requires special equipment and staff qualifications, and is performed over a long period of time, which together loses its relevance in the real conditions of meat handling, in particular, chilled meat [3, 4, 7].

We have proposed, as an alternative, an operational method for identifying the thermal state of meat, affordable, fairly reliable and easily reproducible under production conditions, which allows you to quickly and accurately assess the compliance of the thermal state of meat products with the declared name when performing incoming inspection of raw materials, in places of storage and sale of meat [2, 3, 6].

#### **Materials and research methods**

As the objects of study, we selected 28 samples of parts of 7 chilled carcasses of turkeys: chest, thigh, drumstick. At the first stage, we conducted a study of chilled samples, then subjected them to freezing at a temperature of +12 ... +14°C for 72 hours, after which we defrosted at a temperature of +2 ... +4°C for 10-12 hours and examined defrosted samples.

The thermal state of the meat was evaluated according to organoleptic indicators: special attention was paid to the consistency of meat and the transparency of the broth when setting the sample by cooking in a ratio of meat and water of 1: 3. Histological preparations were made from each sample according to GOST 19496-2013 "Meat and meat products. The method of histological examination". Microscopy of histological preparations assessed breaks in muscle fibers, the presence of voids inside muscle cells and between them, thickened myofibrils.

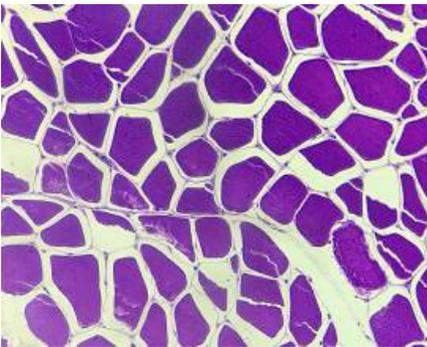
Native turkey meat preparations were also made according to the method we proposed. The essence of this method lies in the fact that muscle slices were made parallel to the muscle fibers, which were crushed between the glasses of the compressorium, stained with hematoxylin-eosin and the micro picture was evaluated [2, 3, 5, 6].

Microscopy was performed under a light microscope with a magnification of  $10 \times 10$ , and the structure of muscle tissue, the number of muscle fiber breaks, the shape and condition of their ends were evaluated.

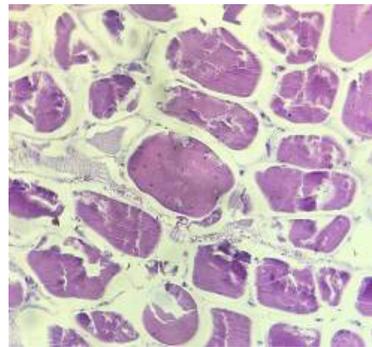
### Results and discussions

During the external examination of the samples of chilled turkey meat, a weakly expressed shiny crust of drying was noted, the meat consistency was elastic, the pit formed by pressure quickly leveled off. The meat broth is transparent, without sediment, flakes and turbidity with a pleasant meat aroma. In defrosted meat, the drying crust was absent, the meat surface was moist, the meat consistency was less elastic, and when the meat was pressed, the resulting fossa slowly straightened. The aroma of the broth was noted less pronounced, the broth is cloudy with a small amount of flakes.

A histological examination of the cross section of the chilled and defrosted product revealed a number of differences in the muscle tissue of the bird meat. Microscopy of preparations of chilled meat raw materials revealed a uniform, homogeneous structure of muscle tissue, muscle fibers were integral, smooth (Fig. 1).



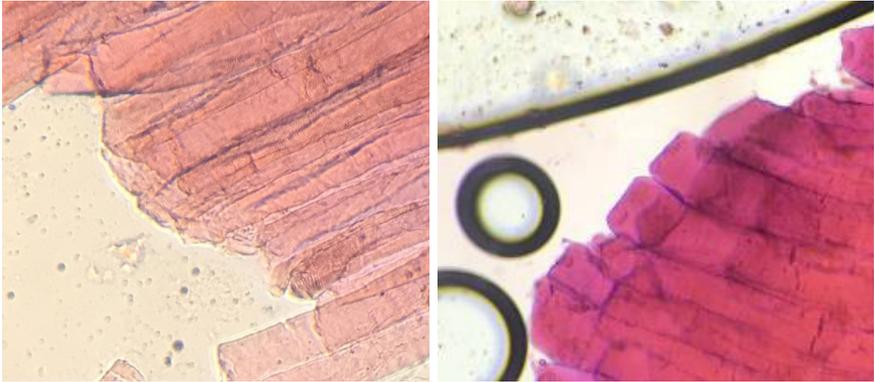
*Fig. 1 Histogram of chilled turkey meat*



*Fig. 2 Histogram of defrosted turkey meat*

In histological preparations of defrosted turkey meat, significant changes in the structure of the arrangement of elements of muscle tissue were observed. The fibers were arranged randomly, the tissue structure was heterogeneous, cell breaks, voids inside the fibers, thickened myofibrils were noted (Fig. 2), while similar morphological changes were found in isolated cases or were not detected in histological preparations of chilled products.

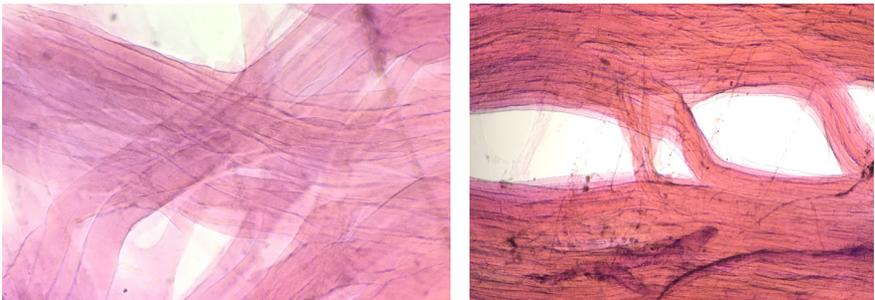
In native preparations of chilled poultry meat stained with hematoxylin-eosin, striated muscle tissue is clearly visible. The cytoplasm is colored pink, the nucleus is purple. Muscle fibers are located densely, evenly, parallel to each other, the structure of the tissue is preserved. The endings of muscle fibers are smooth, steep (Fig. 3, 4).



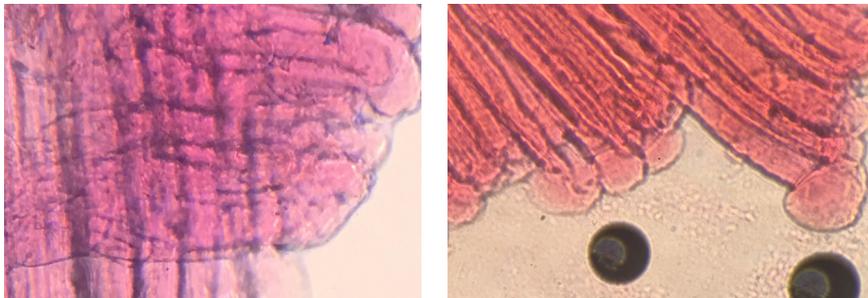
*Fig. 3, 4 Micro-picture of chilled turkey meat in native preparations*

In native preparations of defrosted meat, a violation of the structure of muscle tissue was found, the fibers were randomly located, with breaks and a violation of a single direction. In addition, at the ends of the muscle fibers, peculiar rounded thickenings were found, which were stained sections of the sarcoplasm that went beyond the muscle cells as a result of freezing and subsequent thawing, which was facilitated by squeezing during slicing.

Microscopy of native preparations from defrosted poultry meat, we found that muscle fibers have the form of "torn". The ends of muscle fibers are swollen, rounded at both ends (Fig. 5, 6, 7, 8).



*Figure 5, 6 Micrograph of defrosted turkey meat in native preparations*



*Figure 7, 8 Micro-picture of defrosted turkey meat in native preparations*

### **Conclusion**

The identification and assessment of the thermal state of meat in modern conditions of the food industry and economic activity is crucial in ensuring food security and protecting the interests of consumers. Histological examination informatively, reliably allows to differentiate chilled meat products at any stage of its circulation, however, it is difficult to do in production conditions [1, 3].

The obtained results of studies of turkey meat allow using the proposed method of manufacturing and microscopy of native meat preparations and establish the previous freezing of products. In this case, identification signs are a violation of the structure of muscle tissue, which is manifested by the presence of fibrous areas, tearing of muscle fibers, as well as the presence of thickenings at the ends of muscle fibers [2, 6].

The use of such an accessible and operational method is of interest and promising for the implementation of input and production control of meat raw materials at processing enterprises of the meat industry, in places of storage and sale of products, which in general will simplify the control system for the circulation of meat and prevent the release of falsified meat for sale, as well as will increase the quality and safety of food products sold.

### **Acknowledgments**

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虾饲料添加剂对家禽养分消化率的影响  
**EFFECT OF SHRIMP FEED ADDITIVES ON THE DIGESTIBILITY  
OF POULTRY NUTRIENTS**

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摘要。本文总结了使用虾饲料添加剂的生理经验。研究工作包括使用母鸡口粮补充虾饲料的可能性。饲料补品富含蛋白质，微量元素和矿物质。在滨海边疆区的Hayssex White蛋鸡上进行了研究工作。为了进行平衡实验，我们分为4组（对照组，I实验，II实验，III实验），每组3个目标。我们使用单个笼子饲养母鸡。我们确定实验母鸡超出了营养物质的消化率。III实验组的吸收和氮平衡最大。III实验组的氮同化指数为64.5，比对照高12.9%。III实验组钙磷利用率最高，分别为51.6%和62.9%。

关键词：家禽，鱼粉，母鸡，饲料添加，定量（饮食），消化率，营养素，钙，磷。

***Abstract.** This article contains the materials of physiological experience on the using of shrimp feed additives. Research work includes possibility of shrimp feed supplements using in rations for hen. The feed supplements is very rich in protein, microelements and minerals. Research work was conducted on Hayssex White laying hens in Primorsky region. To conduct the balance experiment, we formed 4 groups (control group, I experimental, II experimental, III experimental) of 3 goals each. We used individual cages for hens keeping. We established that the experimental hens exceeded the control be the digestibility of nutrients. Absorption and nitrogen balance were maximal in the III experimental group. The nitrogen assimilation index in III experimental group amounted to 64,5 and exceeded the control by 12,9 %. The utilization rate of calcium and phosphorus was maximum in the III experimental group and amounted to 51,6 and 62,9 %.*

***Keywords:** poultry, fish meal, hen, feed addition, ration (diet), digestibility, nutrients, calcium, phosphorus.*

One of the factors which influences on the development of animal husbandry, and in particular poultry farming, is the inferiority of the feed base. Poultry farming in the Far East is not only lacking protein, but also vitamins and trace elements and amino acids. The Far East is rich in various marine hydrobionts, which are

rich in protein, essential amino acids, vitamins, and trace elements. Various shellfish, fish, shrimps, krill and other products are extracted and processed on the territory of the region. Waste from the processing of marine hydrobionts can be used as a feed addition. In the Primorye territory, sea silt, corbicula japonica, seashells, spirulina, seaweed, sea urchins, crustaceans, squid, Leda flour, and others were used to increase the nutritional value of compound feeds [1-10].

The purpose of the research is to study the effect of shrimp feed meal on the digestibility of nutrients in rations of poultry.

The object of the study was hens of haysex White cross. To conduct a physiological experiment, we selected 12 heads of laying hens and 12 heads of young animals using the method of analogues. During the experiment, all the livestock were in the same conditions. The physiological experience consisted of two periods: the first period (preparatory) lasted 7 days, the second period of experience, called the accounting period, and lasted a total of 5 days. During the balance experiment, we took into account the amount of feed and water consumed by the bird per day, as well as the amount of excreted droppings. The litter was collected 2 times a day [11].

Hens were divided into four groups (control and three experimental) of 3 heads each. The physiological experiment was performed according to the methodology presented in table 1.

*Table 1 – Scheme of research work*

Kind of poultry	Group	Period	Amount	Diet
Hens	control	7/5 days	3	Basic diet* (BD)
	I experimental	7/5 days	3	BD+3% of shrimp flour
	II experimental	7/5 days	3	BD+5% of shrimp flour
	III experimental	7/5 days	3	BD+7% of shrimp flour

Based on the actual consumption of feed and excreted feces, we determined the coefficients of digestibility of feed nutrients for control and I, II, III experimental groups of poultry. The results of the balance sheet experience are presented in table 2.

*Table 2 – Digestibility of nutrients of hens, %*

Group	Organic matter	Fat	Protein	Fiber
control	76,6	66,7	80,7	12,2
I experimental	78,6	68,3	81,5	13,1
II experimental	78,8	68,0	83,2	13,5
III experimental	78,7	69,5	86,6	14,0

The digestibility coefficients in all experimental groups were slightly higher than in the control group. Thus, the coefficient of digestibility of organic matter was higher by 2.0-2.1%, fat-1.6-2.8%, protein-0.8-5.9% and fiber-0.9-1.8%. The best coefficients for the digestibility of nutrients were chickens of the III experimental group, which received shrimp meal at a dose of 7%.

A similar pattern is observed with young animals. During the physiological experiment, the best coefficients were obtained by the III experimental group, which received 5% of the feed additive (table 3).

**Table 3 - Digestibility of nutrients of young poultry, %**

Group	Organic matter	Fat	Protein	Fiber
control	71,0	72,1	85,1	14,4
I experimental	73,6	74,1	87,5	16,2
II experimental	73,9	74,7	88,1	16,4
III experimental	74,1	75,3	88,7	16,7

Young animals of the control group were also inferior to their counterparts from the experimental groups in the following indicators: organic matter (2.6-3.1%), fat (2.0-3.2%), protein (2.4-3.6%) and fiber (1.8-2.3%). As well as laying hens, the maximum coefficients were noted in the III experimental group.

The maximum difference between the experimental group and the control was observed for protein and was 3.6%.

We have studied the effect of feed additives on the absorption and balance of nitrogen, calcium and phosphorus. The results are shown in table 4.

**Table 4 - Assimilation and balance of nitrogen, calcium and phosphorus, %**

Indicator	Group			
	control	I experimental	II experimental	III experimental
Taken with feed, g:				
nitrogen	3,1	3,1	3,1	3,1
calcium	3,1	3,1	3,1	3,1
phosphorus	0,7	0,7	0,7	0,7
Contained in excrements, g:				
nitrogen	1,5	1,3	1,4	1,3
calcium	1,8	1,7	1,7	1,7
phosphorus	0,3	0,29	0,29	0,26
Assimilated, g:				
nitrogen	1,6	1,8	1,9	1,8
calcium	1,3	1,4	1,4	1,4
phosphorus	0,4	0,41	0,41	0,44

According to the results of the balance experiment, the highest coefficients of nitrogen and calcium assimilation were obtained by chickens of the experimental groups. The maximum absorption of calcium was shown by chickens of the III experimental group. Data show that the shrimp feed flour has a positive effect on the use and absorption of phosphorus. In the body of chickens of the experimental groups, more phosphorus was deposited by 0.04-0.01 g compared to the control group.

The analysis of the obtained data shows that the shrimp feed flour at a dose of 7% for laying hens and for young hens of the cross Hayssex White has a positive effect not only on the balance, assimilation, but also on the deposition of nitrogen, calcium and phosphorus in the body.

Based on the research and results of the balance experience, we have established a positive effect of shrimp feed flour on the digestibility of nutrients, assimilation, balance of nitrogen, calcium and phosphorus. The digestibility of organic matter, protein, fat, and fiber in the experimental group was higher than in the control group. The greatest superiority was observed in the III experimental group. The best use of calcium, phosphorus and nitrogen was also observed in the III experimental group, which was fed a feed additive at a dose of 7% for laying hens and for young animals.

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