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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参与者的英文报告

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

Part 1: Participants' reports in English

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这些会议文集结合了会议的材料 – 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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These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examines tecnical and sociological issues of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

Authors are responsible for the accuracy of cited publications, facts, figures, quotations, statistics, proper names and other information.

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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 56 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。

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宪法对新闻工作者获取信息权的规定
CONSTITUTIONAL REGULATION OF THE RIGHT OF JOURNALISTS TO ACCESS INFORMATION

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本文的注释专门分析了记者访问信息的权利。 作者在信息自由，外国实践和欧洲人权法院的实践等领域对俄罗斯宪法进行了分析，得出的结论是，媒体和新闻记者具有搜索，接收，产生和传播信息的多种权力。 但是，他们的权利基于知情权，而不是绝对的。
关键词：宪法，宪法法规，人权，信息自由，记者权利。

Annotation *this article is devoted to the analyses of the right of journalists to access information. The author analyses Russian Constitutional law in the sphere of freedom of information, the foreign practice and practice of European Court of Human Rights and comes to the conclusion that the media and journalists have a number of powers to search, receive, produce and disseminate information. However, their right is based on the human right to information and is not absolute.*

Keywords: *constitutional law, constitutional regulation, human rights, freedom of information, the rights of journalists.*

The role that information plays in modern society is difficult to overestimate. The possibility of full and effective implementation of the vast majority of human rights and freedoms depends on the quality of information about events and phenomena provided to him. The main source of obtaining such information is the media. Legislation R.F. provides for the possibility of citizens receiving R.F. information he needs at his request directly from state bodies. Nevertheless, in connection with the development of modern means of communication, the transmission and dissemination of information necessary for a person through the media is the most efficient way of transmitting and disseminating it. It should also be borne in mind that not only information about the activities of state bodies, but also other socially significant information can be transmitted through the mass media. An individual may not be able to obtain such information in another way or from another source.

Currently, in foreign legal literature, the most difficult is a dispute about the legal nature of such powers. The fact is that in the laws of some states those powers in the information sphere that belong to journalists are not directly fixed. Normative legal acts usually refer to the right of a person to receive the information he needs in any way possible, and refers to the prohibition of censorship, which, as a rule, is a guarantee of the exercise of this right. The availability of powers in the information sphere can be established in another manner provided for by the legislation of this country. At the same time, in some countries, any competences of journalists in the field in question are absolutely denied. In this case, the legislator deliberately creates obstacles for a person to exercise his right to information. After all, it is obvious that the main task of the media is to ensure that the person receives quality information about the events and phenomena of objective reality.

The right of journalists to information is not an independent right, since it is based on a similar human right and serves its most effective implementation. Both rights are interrelated, but the main one is the human right to information. In this case, the legislator needs to establish whether the right of a journalist to information is an independent right or is it just an element of a human right that is more extensive in essence.

From the functions carried out by the media and journalists, as their agents, in modern society, it follows that a journalist cannot hush up or disseminate the information that he received for the indicated purposes. If a journalist receives information that is necessary only for him personally and is not of public interest, he acts as a private person, and therefore does not perform any public functions in this case. Therefore, all the powers granted to journalists in the information sphere are an element of the human right to information. The journalist does not have in the information sphere any special rights separate from human rights. However, to deny on this basis the existence of such powers in general is fundamentally wrong. Journalists should be given the opportunity to protect their rights in the information sphere. The establishment of liability for violation of the rights of a journalist is not only a guarantee of his rights, but also a human right to information. Therefore, many foreign researchers not without reason believe that the right of a journalist to information, if recognized by the law of the state, should be considered secondary or derived from the corresponding human right.

The provisions of international legal instruments lead to the same conclusion. So, in 1949, the UN Subcommittee on the Right to Information and the Press and the UN Subcommittee on Human Rights gave the following definition of the human right to information in Chapter IV of his report to the UN Commission on Human Rights "Establishment of the rights, duties and implementation subject to inclusion in the concept of the right to information "(Statements of the rights, obligations and practices to be included in the concept of freedom of information).

The Subcommittee and the Subcommission indicated that the right to information implies the right to think and make up one's opinion without outside interference, to seek, receive, information and ideas in any way and regardless of borders. For journalists (news personnel). The sources of information, the report emphasizes, should be respected.

From the meaning of this document it follows that the right of the media to information should be included in the concept of the human right to information, since the former is a guarantee of the realization of the latter.

Recognizing this fact, the national constitutional courts of several states established the right of journalists to search and collect information for professional purposes. Such decisions were made, for example, by the courts of Austria, Japan and India [1, p.68]

Thus, both the provisions of regulatory legal acts and modern theories related to the right to information give grounds to consider a journalist's right to information to be derived from a similar right inherent in any person and secondary to him.

The reason for this phenomenon is obvious. Until the twentieth century, there was no particular need to separate this right into a separate institution, since a rather limited amount of information circulated in society, and the process of exchanging it took place slowly and often not on an ongoing basis. That is, there was not enough information on regularly produced media for general use (newspapers, magazines, film and video tapes, etc.). For the society of the XVIII-XIX centuries, it was much more important to consolidate the human right to independently and freely produce information in the most accessible ways at that time, that is, by means of spoken and printed words.

Modern Russian legislation contains legal rules governing the access of the media and journalists to information of interest to them, as well as the possibility of their distribution.

Thus, in the Decree of the President of the Russian Federation "On Additional Guarantees of Citizens' Rights to Information" dated December 31, 1993, the importance of the role of the media in covering the activities of state bodies of all branches of power is mentioned. This Decree emphasizes the need to create cycles of programs (programs) that explain the activities of state bodies; informing citizens of the main provisions of legal acts and decisions of state bodies on the main issues of domestic and foreign policy on the day of their release; bringing the content of speeches of deputies in the debate on bills to their voters, etc. (paragraphs 4-7 of the Decree) [2].

Naturally, in order to transmit high-quality and reliable information, we must obtain it ourselves. Paragraph 7 of the aforementioned Decree states that it is necessary to notify broadcasting companies in advance of the alleged consideration of the most important issues of public interest. Thus, the state assumes the responsi-

bility to ensure that information on the activities of its bodies in a timely manner, without any delays, reaches citizens.

The procedure for obtaining information on the activities of state bodies by the media is also regulated by the Law of the Russian Federation "On the Mass Media" of December 27, 1991. In accordance with Art. 38 of this law, "citizens have the right to promptly obtain reliable information through the media about the activities of state bodies and organizations, public associations, and their officials." State bodies and organizations, public associations are obliged to provide information about their activities to the media [3].

The editorial offices of the media have the right to independently request information on the activities of state bodies and organizations, public associations, their officials. Request for information is possible, both orally and in writing.

The right to receive information from government bodies is possessed not only by the editorial staff of the media, but also by journalists working in these organizations. Their rights in this area are established by Art. 47 of the Law of the Russian Federation "On Mass Media" [3]. According to this article, journalists have the following rights: to seek, request, receive and disseminate information; visit government bodies and organizations, enterprises and institutions, bodies of public associations, or their press services; be accepted by officials in connection with a request for information; to get access to documents and materials, except for information constituting a state secret; copy, publish, publish or otherwise reproduce documents and materials, subject to the requirements established by the legislation of the Russian Federation; to make recordings, including using audio and video equipment, film and photography, with the exception of cases provided by law; visit specially protected places of natural disasters, accidents and catastrophes, riots and crowds of citizens, as well as areas in which a state of emergency is declared; attend meetings and demonstrations; verify the accuracy of the information communicated by him; state personal opinions and assessments in messages and materials intended for distribution signed by them; some other rights related to the publication of material prepared by them.

According to Art. 48 of the same law, media outlets can apply for accreditation of their journalists in state bodies, organizations and institutions, and bodies of public associations. "An accredited journalist has the right to attend meetings, meetings and other events held by his accredited bodies, organizations, institutions, unless the decision is made to hold a closed event."

Article 54 of the Law of the Russian Federation "On Mass Media" guarantees citizens of the Russian Federation unhindered access to information and materials from foreign mass media. Obstruction of the legitimate professional activities of journalists is a criminal offense under Article 144 of the current Criminal Code of the Russian Federation.

One of the most important guarantees of the right of citizens to information is the prohibition of censorship (part 5 of article 29 of the Constitution of the Russian Federation of 1993, article 3 of the Law of the Russian Federation "On Mass Media"). Citizens of the Russian Federation have the right not only to receive any information, they have the right to receive reliable information. The legislation of the Russian Federation gives citizens the right to verify the accuracy of the information transmitted to them, as well as to seek refutation of information that is unreliable. This right is reserved for citizens and organizations in Art. 43 of the Law of the Russian Federation "On Mass Media". Citizens or organizations have the right to demand that the editorial office of the mass media disseminate information that does not correspond to reality and discredits their honor and dignity, refuting such information. A rebuttal can be made both orally and in writing. Furthermore, in accordance with Art. 46 of the same law, citizens in relation to whom the information defaming them was disseminated, have the right to an answer (commentary, remark) in the same mass media (Article 47).

Thus, Russian law establishes the right of the media and journalists to search, receive, produce, transmit and disseminate information. All these powers are exercised by them solely in the interests of society. The establishment of safeguards to protect the rights of the media and journalists underlines the importance of the work they perform.

The powers of the media and journalists to search, receive, produce, transmit and disseminate information may be limited on the same grounds as the corresponding human right. In accordance with the legislation of R.F. these grounds may be related to the nature of the information, that is, if it is information: 1) constituting a state secret; 2) on the implementation in a lawful order of search and investigative activities; 3) on judicial review of civil and criminal cases in cases where the dissemination of information is prohibited by law or may violate a person's right to an objective review of his case, create a threat to the life and health of citizens; 4) commercial or official secret; 5) on the private life of a person who is trying to obtain without his consent; 6) access to which is limited by federal law (Article 8 of the draft Federal Law "On the Right to Information") [4]. Reporting notes, correspondence, draft documents, instructions of officials and other official information are not subject to obligatory provision.

Thus, journalists, as well as private individuals, may be denied access to information if it is any secret, or if it belongs to the category of information that the state body may not provide at its discretion. Access to information may be restricted for journalists if individuals are allowed to access this information on a non-disclosure basis or on other grounds. Such information is not subject to distribution among the masses, and therefore cannot be provided to journalists.

Journalists cannot be allowed to access information that cannot be provided to

foreign citizens, since these persons will subsequently be able to get acquainted with it through the media.

Secret, as a legal category, can be divided into several types. I.L. Petrukhin divides secrets into two broad categories: personal and professional [5, p.15]. Personal secrets are the secret of creativity, communication, the secret of personal papers and mail and telegraph messages and telephone conversations. The professional secret should include the secrecy of judicial protection and representation, medical secrecy, confession confidentiality, confidentiality of preliminary investigation, secret of notarial acts and acts of civil status.

The inviolability of any of these secrets is protected by modern Russian legislation, criminal liability has been established for their violation (Articles 129, 130, 137, 138, RF, Article 23 of the Constitution of the Russian Federation) [6].

At the core of professional secrets are personal secrets. It should also be noted here that not every personal secret is a private secret. As emphasized by I.L. Petrukhin, the secret of judicial protection, for example, very often consists of information provided by the lawyer to the accused relating to the circumstances of the crime, and not to personal life [5, p.16].

Secret, both personal and professional, is the least regulated institution of modern Russian law. The problem lies not only in the fact that the rules governing this institution are few, but mainly in the fact that existing norms contradict each other. For example, actions such as search and seizure of mail and telegraph correspondence are still carried out with the sanction of the prosecutor, although the Constitution requires a court decision to carry out these actions.

The secret in modern Russian legislation is not absolute; it can be violated if it is necessary for society. Such cases are expressly established in regulatory legal acts. For example, Art. 167-170, 174 Code of Criminal Procedure of the RSFSR, Art. 8 of the Law of the Russian Federation of 1992 "On operational-search activity in the Russian Federation" [7]. This law gave the ODS authorities the right to "control postal items" without initiating a criminal case with the sanction of the prosecutor, and in urgent cases without the sanction of the prosecutor, but with the subsequent notification and receipt of sanction within 24 hours. to abide by the federal laws "On operative-search activity" dated July 5, 199511 and the law "On bodies of the federal security service in the Russian Federation" dated April 3, 1995, adopted in accordance with the Constitution of the Russian Federation [8].

However, in this case we are talking about the existence of the possibility of access to secrets for bodies engaged in operational-search activities. Could such an opportunity exist for the media and journalists if the legislation does not provide for such an opportunity for individuals?

In the case of personal secrets, the restriction of the powers of journalists to receive such information is based on the same principles as those of private indi-

viduals and state bodies. If only the individual to whom this information directly relates does not arise the desire to voluntarily provide their media.

In this case, the media have an obligation to transmit the information received without distorting it, since otherwise it may qualify as defamation. Also, they should not disseminate the information about the person that they became aware of under the condition of their non-distribution.

However, there is also personal information of public interest. For example, information regarding public figures. It cannot be denied that certain information about them is necessary for a person, for example, in order to make a decision in elections. The ability to open access to such information is a kind of payment for their popularity, for the opportunity to conduct public or political activities. Abroad, public access to certain information about such personalities is legitimate, although abuse of access is an offense.

The type of information about political or public figures should be determined by the requirements for this category of persons established by law. For example, this may be information about the income of a person or his moral appearance.

The question of the possibility of access to information about public figures is one of the least regulated issues in the information sphere, not only in Russian legislation, but also in the laws of other states. For example, in Bulgaria, an attempt to resolve this issue was made in 1989 but ran into a protest from the media. Therefore, the only provisions governing this issue in Bulgaria are criminal law provisions establishing liability for defamation and defamation. Attempts to resolve this issue were made in Bulgaria in 1990-1991, but also did not bring a positive result [9, p. 86].

Journalists, like other subjects of informational relations, can have their secrets. For example, the right to keep secret the source of the information received. Such a right is recognized for journalists in many European countries, for example, in Austria, France, Germany, Spain, Sweden. In March 1996, such a right was enshrined at the European level by the European Court of Human Rights in the Goodwin v. United Kingdom judgment [1, p. 68].

The European Court, recognizing this right for journalists, stipulates that it is not absolute. Journalists may be required to indicate the source, if otherwise affected, the interests of the whole society. The court did not specifically specify these exceptional cases, but in European practice there is already such an exception in the case of a crime for which the legislation provides for imprisonment for at least 10-15 years or the death penalty [9, p. 285].

The opportunity for a journalist to keep a secret source of information is justified from both an ethical and a practical point of view, since if a journalist has once failed his source by revealing it, then it is quite possible that next time it will be much more difficult for him to get public meaningful information.

In any situation in which there is a clash of legitimate interests, it is quite difficult to find a solution that satisfies all parties. However, providing the public with information from an unknown source is often tantamount to spreading rumors. The information may turn out to be of poor quality, which could negatively affect the human rights in whose interests the mass media should operate. Therefore, securing the right of the media to keep the source of information secret, it is necessary to create an obligation for them to verify the accuracy of this information.

A specificity of the constitutional human right to information is that by its nature it can be attributed to both a group of personal and a group of political rights. And, in general, the peculiarity of the person as a subject of constitutional law is that, entering into relations regulated by him, she exercises her political legal capacity [10, p. 101]. Therefore, the possibility of obtaining high-quality information from the mass media is of great importance for the implementation of constitutional rights and freedoms, especially i political ones.

Thus, the media and journalists have a number of powers to search, receive, produce and disseminate information. Based on an analysis of the norms of both Russian and foreign legislation, we can conclude that there is a right of journalists and the media to information that is secondary to a similar human right. Media and journalists have the right to access information that is necessary for the public and access that is not restricted to individuals. The right of the media and journalists can be limited only in cases where the corresponding human right is also limited, although exceptions to this rule are possible, for example, if access is limited not to all persons, but only to certain categories of people or on the contrary, only certain categories of persons are allowed. All over the world, legislation distinguishes among information recipients not only individuals, state bodies and their officials, but also the media. At the same time, one should not forget that the media are just a source of necessary information for the public.

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营单位在披露非法移民组织方面的合作
COOPERATION OF OPERATIONAL UNITS IN THE DISCLOSURE OF THE ORGANIZATION OF ILLEGAL MIGRATION

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抽象。 本文探讨了在侦查和公开非法移民组织方面运营机构和调查机构合作存在的问题。
关键字。 非法移民，业务和调查活动，互动，信息。
Abstract. The article examines the problematic issues of cooperation of operational and investigative bodies in the field of detection and disclosure of the organization of illegal migration.

Keywords. Illegal migration, operational and investigative activities, interaction, information.

In the concept of regulation of migration flows, the need to protect national interests and ensure the security of Russia is noted, being that the massive migration of foreign citizens leads to a deterioration in the criminal situation.

Since the migration activity of the population in recent years has led to an increase in crime, measures to improve the forms and tactics of interaction between all subjects of operational-search activities are required to solve the problems of combating the organization of illegal migration. [1]

One of the most important elements of the systematic organization of the fight against illegal migration is the differentiation of powers of operational apparatuses, which is associated with the dynamic development of legal regulation of operational and investigative activities. [2, p. 45-46]

In the scientific literature, the interaction of the operative-search bodies is un-

derstood as the joint activity (cooperation) of entities that are not under the administrative subordination, which is based on the place, time, methods and other conditions, which ensures the optimal combination of their powers inherent to them specific means and methods of work, for solving intermediate tasks and achieving the ultimate goal of the investigation." [3, p.274]

Forms of interaction can be divided into procedural and organizational-tactical, which depends on the content side of the relations arising from this.

Procedural forms of interaction are characterized by the presence of certain procedural relations in the investigation of the investigated category of crimes and are regulated in detail by the criminal procedure legislation. But organizational and tactical forms of interaction, although inextricably linked with the process, have specificity and independent significance. Among the most significant forms of interaction can be noted: mutual information (consultation) and the use of forces, means and methods; harmonized planning and versioning; coordination of work within the framework of constantly operational and investigative and search groups; analysis and assessment of the results of joint work in the course of operational-search measures. From the perspective of the situational approach, the level of interaction can be active, productive and systematic.

The effectiveness of the interaction of the operational-search authorities to combat illegal migration is influenced by circumstances that have specific features. These include, first of all, conspiratorial and unspoken working methods; psychology of operational investigative activities; the secrecy of regulatory acts governing the organization and tactics of operational investigative measures, the use of information systems, technical and other means, the documentation of operational investigative activities.

The concept of the state migration policy of the Russian Federation for 2019-2025, approved by Decree of the President of the Russian Federation on October 31, 2018, № 662, on combating illegal migration, should be implemented in close cooperation and coordination of the actions of all operational-search agencies in the following main directions:

- the creation of a multi-level system of control (supervision) over entry and exit from the country, transit travel through its territory, stay (residence) of foreign citizens and their labor activities;

- the use of information, computer and modern biometric technologies for personal identification;

- expanding the capabilities of interdepartmental and international cooperation on border control (police, customs and border services);

- receipt (search, storage and use) of operational-search and intelligence information on the whereabouts of foreign citizens (illegal migrants) and their illegal actions. [4,]

It seems that to solve this problem it is necessary to create in our country a

unified system of operational-search information about organized criminal groups, communities and fraternities. Such information is concentrated in the databases of individual subjects of operational-search activity and may be contradictory. A significant part of the operational-search information contained in the cases of operational accounting, after they are submitted to the archive, is not used. Therefore, it should be agreed that in order to unify the collection of search information about a criminal situation, it is necessary to form a single federal automated database of all subjects of operational-search activity on persons committed crimes both in Russia and abroad, [5, p.733] with the possibility of its integration into the Interpol and Europol system. [6, p.7] It is proposed to include crimes committed abroad by immigrants from Russia in a single system of operational-search information about crimes in Russia, including those committed by migrants.

In accordance with the federal law on operative-search activities, operative employees, in order to improve interaction tactics in disclosing the organization of illegal migration, should actively and optimally conduct not only individual operational-search measures, but also promptly and consistently carry out the whole range of operational-search measures. For example, after the implementation of such an operational-search measure, such as a survey, inquiries, observation, operational experiment, etc. can be carried out. It is the complexity in the actions of operational workers that can effectively identify and disclose these crimes.

In order to obtain information about the organizers of illegal migration, the places of illegal residence of foreign citizens and their crimes, it is also necessary to involve migrant confidants in cooperation.

Thus, the basis of the process of counteracting the organization of illegal migration is intelligence and search information, which is confirmed by the operational development and documentation of criminal activity carried out by the organizer of ethnic criminal groups. [7, p.164]

In order to understand the essence and procedure for conducting operational-search measures by practical workers, in order to optimize the implementation of certain norms of operational-search legislation, it is necessary to fix the concept in Article 6 of the Federal Law on the OIA and disclose the contents of all operational-search measures, indicating the procedure and conditions for their implementation, with taking into account the operational-search situational approach.

In our opinion, taking into account the analysis of various points of view of scientists, an operational-search action should be understood as a complex of tactical, search and investigation actions carried out by operational devices to collect operational-search information that is significant for the disclosure and investigation of crimes, in accordance with the grounds and conditions, specified in articles 7 and 8 of the Federal law on operational-search activity.

As O.V. Firsov rightly notes, this "will facilitate the legalization of operational search

data obtained as a result of their use in the process of proving in a criminal case" [8, p.168], which will simplify the solution to the problem of obtaining a judge's permission to carry out operational-search measures restricting the constitutional rights of citizens.

The most effective form of interaction between the subjects of operational-search activities for the prevention of illegal migration is the organization and conduct of joint operational-search combinations and operations to combat the crime of foreigners. For example, in the course of the joint operations of the operative-search bodies of various departments according to the developed coordinated plans, operational work is carried out as part of the operational accounting of the suppression of criminal activity of organized criminal groups from among foreign citizens, their ties in the community. In addition, as part of the operational development of criminal groups of migrants, an analytical search is carried out for information confirming their criminal activity; there is a constant exchange of operational information about the actions of individuals and their relationships under operational monitoring; places of concentration and residence of suspected persons, as well as sources of cover for criminal activity are identified; objects of operational interest are monitored and their criminal activity is documented; regular communication with persons performing tasks of operational workers is carried out.

Since the title of Article 89 of the Code of Criminal Procedure of the Russian Federation "Use in proving the results of operational investigative activities" does not correspond to its content, which, on the one hand, allows the possibility of using the results of operational investigative activities in proving, and on the other hand, limits their use as evidence, Article 89 of the Code of Criminal Procedure of the Russian Federation should be brought into conformity with Article 11 of the Federal Law on the OIA "Use of the results of operational investigative activities". This will help to eliminate a gap in the legislation, thereby regulating the mechanism of using the results of operational investigative activities in evidence in criminal cases, including cases of organizing illegal migration.

In the course of conducting operational-search operations by operatives of various departments to neutralize the illegal activities of organized criminal groups from among foreigners, tactical interaction is carried out with the special services of foreign countries to suppress the criminal activities of specific foreign citizens located in these countries. [1.] In order to counter illegal migration, law enforcement agencies monitor and oversee compliance by foreign citizens and stateless persons, employers, and customers of work (services) with the migration legislation of the Russian Federation.

In order to improve the legal regulation of interagency cooperation between operational-search units, it is proposed to legislatively write down the creation of permanent inter-departmental operational-search groups to combat the organization of illegal migration.

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宪法创新–俄罗斯国家发展和立法体系的潜力
CONSTITUTIONAL INNOVATIONS - THE POTENTIAL FOR THE DEVELOPMENT OF THE STATE AND THE SYSTEM OF LEGISLATION OF RUSSIA

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抽象。 这篇文章专门讨论了俄罗斯的宪法改革问题，并介绍了"活着的"宪法学说。 作者分析了俄罗斯联邦总统提出的《宪法修正法》的内容，确定了积极和有问题的方面，确定了进一步有希望的宪法改革领域。
关键字：宪法改革，宪法修正案，"现行宪法"原则，实现均势

Abstract. The article is devoted to the issues of constitutional reform in Russia and the introduction of the doctrine of the "living" Constitution. The author analyzes the content of the Law on the Amendment to the Constitution introduced by the President of the Russian Federation, identifies the positive and problematic aspects, identifies further promising areas of constitutional reform.

Keywords: constitutional reform, amendments to the Constitution, the doctrine of the "living Constitution", achieving a balance of power

Issues of modernization of the current Constitution of the country (constitutional innovations) are one of the most relevant areas of modern legal science and law enforcement practice. In his Address to the Federal Assembly on January 15, 2020, the President of Russia outlined the main directions of constitutional reform; on January 20, 2020 he introduced to the State Duma a draft Law of the Russian Federation on an amendment to the Constitution "On improving regulation of certain issues of public authority organization".

The Russian Constitution of 1993 is a legal document that enshrines the value guidelines of state and social development, constitutional rights and freedoms of man and citizen, a mechanism for exercising state power, and principles for reconciling the interests of various social forces.

The ongoing processes of reforming the system of state administration and local self-government, the search for ways of sustainable socio-economic development of the constituent entities of the Russian Federation, the creation of conditions ensuring a decent life and free development of a person, the increasing role of Russia in the emerging polycentric world, the strengthening of its influence in

the global information space, actualize implementation problems Of the Constitution of the Russian Federation, the implementation of all state structures on the basis of the principles of democracy enshrined in it and constitutionalism.

Since the modernization of the Constitution affects the political stability of society, it must be timely. Constitutional innovations are designed to stimulate the disclosure of the development potential of the state and the system of legislation, and does not become a brake on social relations. It is on the basis of these parameters - timeliness, consistency and expediency that amendments to the Basic Law 2008 and 2014 were introduced.

An analysis of the proposed amendments to the Constitution of Russia allows us to draw the following conclusions:

Firstly, this project contains additional measures aimed at strengthening the sovereignty of Russia. State sovereignty, state integrity are the most important principles of Russian federalism and the constitutional system. In certain periods of the development of our country, ensuring sovereignty was associated with the preservation of the state itself, its integrity, and viability. Each federal government body has powers aimed at maintaining state sovereignty. Of course, the President plays a key role in the process of ensuring state sovereignty.

New edition of Art. 79 of the Constitution directly guarantee the priority of the Russian Constitution in our legal space, establishes that decisions of interstate bodies adopted on the basis of the provisions of international treaties of the Russian Federation in their interpretation, contrary to the Constitution of the Russian Federation, are not enforceable in the Russian Federation. At the same time, Russia does not refuse the provision of Part 4 of Art. 15 of the current Constitution of the Russian Federation 1993 that universally recognized principles and norms of international law and international treaties are an integral part of the legal system of Russia. Thus, defending its national interests in matters of principle (for example, in the event of a contradiction between the decision of the European Court of Human Rights and the Russian Constitution), Russia confirms its commitment to international law, remains an active participant in the international community and in compliance with the principle of conscientious fulfillment of international obligations.

In addition, the draft Law on Amendments to the Constitution of the Russian Federation involves empowering the Constitutional Court of the Russian Federation at the request of the President of the Russian Federation in the manner established by federal constitutional law, to verify the constitutionality of the laws of the constituent entities of the Russian Federation before they are signed by the highest official of the constituent entity of the Russian Federation, which is also aimed at ensuring single legal space and state sovereignty of Russia.

Secondly, the amendments proposed by the head of state in a new way determine the relationship between the legislative and executive powers in the state.

The issue of organizing power is one of the key issues of any Constitution. The improvement of the power system, the search for a balance of separation of powers, and related issues are often reflected in the program and political documents of the head of state. In the Addresses of the President of the Russian Federation, in particular, it was said: about the need to determine the forms and methods of effective interaction of the executive branch with other branches of state power (Message "Order in power - order in the country" 1997; about the need to develop and diversify the forms of dialogue between the legislative and executive branches authorities. Such a dialogue should be ongoing constantly and at different levels, with emphasis on legislative support for the recovery strategy. (Message "Together, to the rise of Russia" 1998; developed and political competition and the importance of democracy, the continuity of national development ("Message from President Vladimir Putin to the Federal Assembly of the Russian Federation" 2012; on strengthening the authority and influence of the State Duma as a representative body, and the need to support this authority ("Message from the President of the Russian Federation to the Federal Assembly" 2016) ; on the need for coordinated work of all branches of government in the implementation of national projects ("Message from the President to the Federal Assembly" 2019), etc.

The current Constitution provides for certain socio-political and socio-economic principles, the constitutional mechanism of power. The 25-year period of operation of the Basic Law showed us different models of interaction between the legislative and executive branches of government.

The initial stage of the formation of the new Russian statehood (from 1993 to 2008) was characterized by the strengthening of the executive branch. Often this was associated with the preservation of the state itself, its integrity, vitality. Maintaining the unity of the system in order to ensure basic, constitutional values has always been one of the conditions for the effectiveness of reforms.

Amending the Constitution of 2008, adoption of the Law of the Russian Federation on amendments to the Constitution of the Russian Federation dated December 30, 2008 № 7-FCL "On the control powers of the State Duma in relation to the Government of the Russian Federation" [1] (granting the State Duma the right to hear annual reports of the Government of the Russian Federation on the results of its activities, including on issues raised by the State Duma), the adoption in 2013 of the law on parliamentary control (Federal Law of May 7, 2013 №. 77-FL "On Parliamentary Control" [2]) another emphasis is placed on issues of interaction between the federal executive and legislative powers, and evidence of the strengthening of the latter's control functions in the state.

The proposed amendments provide for measures aimed at increasing the effectiveness of interaction between the representative and executive branches of government, strengthening the role of the State Duma and parliamentary parties, as

well as increasing the responsibility of members of the Government of the Russian Federation. In particular, it is proposed that candidates for the post of Chairman of the Government of the Russian Federation and his deputies will be appointed by the President of the Russian Federation after they are approved by the State Duma.

Thus, during the period of the Constitution of the country, the constitutional balance of the branches of government can be provided in different ways. These processes actualize the issue of widespread adoption, which has been developed in some foreign countries and our country, of the doctrine of the "living Constitution" [3] or the "living Constitution of development" [4].

The Living Constitution of Development – is a relevant concept of expanding the potential of the current Constitution of the country, on the basis of maintaining the basic, fundamental provisions, allowing for the possibility of its precise adjustments. This approach allows you to combine the stability of the current state structure and dynamism, the flexibility of management organization mechanisms.

The Constitutional Court of the Russian Federation plays a significant role in the process of building the constitutional system of power, ensuring the balance of powers, introducing the principle of their separation and developing the doctrine of the "living Constitution".

In a number of its decisions, the Constitutional Court formulated legal positions that relate to issues of modernization of power. In particular, he came to the conclusion that the Russian Federation at each specific stage in the development of its statehood independently adjusts the state-legal mechanism established by it.

The right of the state in the person of the legislator to determine a specific mechanism of power derives from sovereignty as a property inherent in the state. The main thing that the Constitutional Court drew attention to when choosing the organizational and legal mechanism is to ensure the achievement of such fundamental goals as the affirmation of human rights and freedoms, the inviolability of the democratic foundation of Russia, the revival of its sovereign statehood and the preservation of historically established state unity.

Thus, within the meaning of the provisions of the current Constitution of the Russian Federation and international legal acts that are an integral part of the legal system of the Russian Federation, the federal legislator has the right to choose the most effective and proportionate to constitutional goals mechanisms for organizing state power, and their interaction.

Such an interpretation determines the legitimate conditions of not only the implementation of constitutional innovations, but also the reform of the legislative system.

Balance - is an equilibrium that is achieved only through compromise and agreement; it is aimed at supporting the stability of the system. The stability of the system is necessary to ensure the inviolability of such foundations of Russian statehood, such as democracy, sovereignty, state integrity, federalism.

The strengthening of the role of representative power, primarily the lower house of parliament in the state will contribute to the consistent implementation of the principle of separation of powers and other foundations of the constitutional system, the further implementation of the system of "checks and balances", increasing the efficiency of public administration in ensuring the conformity of objective laws of social development to the interests and needs of the majority citizens of the country.

Thirdly, the constitutional amendments are aimed at developing the institutional component of the federal organization of state power, which is represented by the consolidation in the Constitution of the Russian Federation of the federal form of government (Art.1), the principles of Russian federalism (part 3 of Art. 5 of the Constitution of the Russian Federation), the constitutional delimitation of subjects of jurisdiction and powers between the bodies of state power of the Russian Federation and bodies of state power of the constituent entities of the Russian Federation (Art. 71-73). At the federal level, the institutional component is manifested: in the activities of the President of the Russian Federation, the bicameral federal parliament, in which the upper house - the Council of the Federation of the Federal Assembly of the Russian Federation represents the interests of the constituent entities of the Russian Federation and other bodies. The amendments propose raising the status of the State Council and the role of governors in the development and adoption of decisions at the federal level.

The appearance of the State Council in 2000 was associated with the need to take into account the interests of the constituent entities of the Federation when forming the main directions of state policy, building strong relations between the Russian Federation and the constituent entities of the Russian Federation, and strengthening the foundations of Russian federalism. For 20 years, the State Council has played a dual role in the system of state power of the Russian Federation: an advisory body that promotes the exercise of the powers of the head of state on ensuring the coordinated functioning and interaction of state authorities and the state coordinating body in the field of federal relations.

Along with the positive aspects, raising the status of the State Council may raise the issue of coordinating its activities with the Federation Council - the upper house of parliament representing the interests of the constituent entities of the Federation, as well as phased integration of this body into the constitutional system of government of the country.

We believe that for the further development of the state in the field of federal relations in the future, a large-scale reform may be required related to the unification and equalization of the state legal status of the subjects of the Federation, improvement of the delimitation of subjects of authority between the state public authorities of the Russian Federation and state authorities of the constituent entities of the

Russian Federation, the formation procedure and the competence of the Federation Council, the definition of the constitutional framework for delegation of authority. The need for constitutional reform in the future may also be determined by interstate unification processes with the participation of the Russian Federation.

Summing up, I would like to note that the achievement of a balance of power branches in the state is a long, multifaceted and non-linear process. It is influenced by many factors of both internal and external order. Balance is an equilibrium, but it is dynamic, and should be able to provide the necessary transformation of the mechanism of power in specific socio-political conditions, in order to achieve the main goals - the construction of a democratic, legal, social state that ensures a decent life and free development of a person.

The current Constitution of the Russian Federation establishes the constitutional principles of unity and separation of powers, but the optimal balance between the functions of the legislative and executive powers has not yet been found. Timely modernization of the Constitution, its adaptation to changing conditions, will contribute to the development of the enormous democratic and humanitarian potential inherent in it, as well as to the development of the state and the system of legislation.

Along with that, in the context of the doctrine of the "living Constitution", it seems important to leave the system of constitutional relations a certain scope of self-development and self-regulation, to ensure the preservation of the fundamental foundations of the constitutional system, the principles of democracy, state sovereignty and the rule of human rights.

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幽默理解方面现代学校空间中的交流互动
COMMUNICATIVE INTERACTION IN THE MODERN SCHOOL SPACE IN THE ASPECT OF HUMOROUS COMPREHENSION (BASED ON THE GERMAN JOKE SCHÜLERWORTWITZ)

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抽象。　Schülerwortwitz是一个德国儿童家庭笑话，嘲笑现代学校空间中师生之间的不平衡交流是一种实际的交流方式。　收件人对成年收件人陈述的蓄意的间接的柔和/或尖锐的幽默反应是一种有趣的语言游戏，它充满了日常教育的基调，使小学生过度饱和。　在这些情节中产生幽默效果的语义机制在于收件人讲话时使用的语言符号（情节的支持部分）的冲突，并由收件人创造性地解释。

关键字：Schülerwortwitz儿童语言的家庭笑话，现代学校空间，不平衡的交流，复杂的交流反应，成年演讲者，学生演讲者，有趣的文字游戏，产生幽默效果的语义机制。

Abstract. *Schülerwortwitz, a German language household joke for children, ridicules the imbalanced communication between teachers and students in the modern school space as an actual type of communication. The deliberate indirect soft / sharper humorous reaction of the addressee-student to the statement of the adult addressant is a fun language game of the schoolboy oversaturated with the tone of everyday edification. The semantic mechanism for creating a humorous effect in these plots consists in a clash-beat of the values of the language sign (the supporting component of the plot) used in the utterance of the addressee and creatively interpreted by the addressee.*

Keywords: *Schülerwortwitz language household joke for children, modern school space, unbalanced communicative interaction, complicated by an extraordinary communicative response, adult addresser, student addressee, fun wordplay, semantic mechanism for creating a humorous effect.*

Among German household jokes *for* children Schülerwitze an independent group of plots are German language household jokes ** *for* children Schüler-**wort**witze.

German **language** household jokes for children Schüler**wort**witze are distinguished by the indispensable presence in their textual canvas of such a linguistic sign (supporting component!), which demonstrates its semantic duality, encourages the recipient to comprehend the plot in two paradoxical perspectives, the awareness of which causes his laughter reaction.

In the German language household joke for children Schülerwortwitz, the recipient is offered a situation of communicative interaction between an adult addresser representing a school teaching staff and a student addressee at the time of discussion of a routine educational problem. ** «„Es gibt Millimeter, Zentimeter, Quadratmeter, Kilometer", erklärt der Klassenlehrer. „Was gibt es noch?" Darauf Tizian: „*Elfmeter* beim Fußball *und Siebenmeter* beim Handball."». **«Der Deutschlehrer hat auf seinem Pult die guten und die schlechten Aufsätze voneinander getrennt und sagt: „Hier auf dem Pult habe ich zwei *Haufen* gemacht." Alle Schüler beginnen lauthals zu lachen, worauf der Lehrer wütend schimpft: „Wenn ihr nicht aufhört, setze ich noch einen vor die Tür."». **«"Was ist das älteste Musikinstrument?", möchte der Musiklehrer wissen. „Das Akkordeon", sagt Lukas. „Wie kommst du darauf?" „Ist doch logisch", meint Lukas, „das hat die meisten *Falten*!"».

The communicative interaction realized by the characters in the German language everyday joke for children Schülerwortwitz does not fully correspond to the congenial communicative interaction aimed at achieving a communicative agreement [3, p. 7-8]. It is rather not harmonious and not ideal, but the unbalanced communication interaction of the addresser and the addressee.

The linguists studying this issue consider the originality of the interpreter's inner world [5], differences in personal life experience, imagination, associative abilities of the addresser and addressee [7], their different level of immersion in the realities of life [6], as the reasons for the imbalanced communicative interaction [6], mismatch "Semantic positions" [4, p. 206] and cognitive systems. "Communicative mistakes" [8, p. 56], introducing an imbalance in the communicative interaction, are also associated with diverging social, cultural and internal personality settings of the addresser and addressee [10, p. 9].

The study of the communicative interaction of the characters of the German language everyday joke for children Schülerwortwitz allows us to talk about the unbalanced communicative interaction realized in it, *complicated by the unusual humorous reaction of the addressee-student to the statement of the adult addresser.*

The reasons for the extraordinary humorous reaction of the addressee-student to the statement of the adult addresser are, in our opinion, primarily related to the personal settings of the addressee. We consider one of them the skeptical, nihilistic attitude of the student in relation to the entire authoritarian and overwhelming

world of adults and their value system. An equally important setting for the deliberate extraordinary humorous ("joking"!) Response of the schoolchildren to the replica of an adult addresser is his desire to affirm and improve his linguistic and intellectual status, relying on the ability to connect / disconnect meanings, and to manipulate language material extraordinary. This aspiration as a whole goes back to the psycho-emotional needs of the young man, and the student in particular, in non-standard interpretations of nominations, which, when highlighted, reflects the desire to show (at first only verbally) his life independence and ability to create. This attitude is fully supported by the "linguistic taste of the era" [9, p. 36, 49], which actively welcomes today the creative, extraordinary and humorous use of the potential of language units for the easy reorientation of the emotional mood of communicative interaction from a serious tone of communication to play and ludic.

Situations of unbalanced communicative interaction, complicated by an extraordinary humorous reaction of a student to an adult addresser, embodied in language everyday jokes for Schülerwortwitz children, evoke in the linguistic consciousness of a modern young recipient, a native German speaker, not only a feeling of surprise at freedom of association, but also a sense of semiotic pleasure from unconventionally selected means of its embodiment.

According to our data, among German language everyday jokes for children Schülerwortwitz, subjects predominate that make fun of situations of unbalanced communicative interaction, complicated by the *indirect mild humorous reaction* of a student student to an adult addresser. Let's look at some examples.

**«Der Deutschlehrer fragt Leon: „Nenne mir die Steigerung von `leer`." „Ganz einfach `Lehrer`!"». The communicative interaction of the addresser teacher and the student addressee takes place in a German lesson. To the teacher's demand to name the form of comparative degree from the adjective/adverb leer, the student is immediately ready to respond with correct - leerer! - answer. However, a cognitive "leap" to another subject-referential field – Lehrer! – opens a premonition of the possibility of a wordplay. The homonyms leerer and Lehrer, united by the similarity of their phonetic manifestation, turn out to be connected in its cognitive sphere by a system of cognitive comparisons (oppositions) within the boundaries of one associative field. Two overlapping semantic motifs found in the leerer - Lehrer homonymous pair provoke the student addressee in a veiled form to explicate their skeptical, nihilistic attitude towards the teacher as a representative of the authoritarian and overwhelming world of adults. In this plot, there is a deliberate rapprochement and playing on the background of each other by the addressee-school student of two equally sounding, but essentially related to different subject-reference areas, homonymous lexemes. The clash-upplaying of their remote values against each

other's background is unexpected, which causes a bright humorous effect and the laughter of the recipient of the plot.

** «Der Mathelehrer fragt den coolen Kelvin: „Kelvin, was *hatten* wir denn gestern *auf*?" „Sie nichts, Herr Lehrer, und ich eine Baseballkappe."». This story offers a laugh at the unbalanced communication interaction of the addresser teacher and the student addressee at the beginning of the math lesson at the time of discussion of the issue of the prepared homework. In his question addressed to Kelvin, the teacher uses the polysemantic token *aufhaben* in its second meaning «(Hausaufgaben) aufgetragen bekommen» (DU). A student, no doubt familiar with this meaning of the lexeme *aufhaben*, demonstrates a reluctance to develop the topic in the proposed direction. He seeks to gently and naturally reorient the emotional mood of communicative interaction from a serious tone of communication to a playful. At the same time, he relies on his ability to manipulate the meanings of a polysemantic word. Unusually manipulating linguistic material, he reacts with an unexpected answer „Sie nichts, Herr Lehrer, und ich eine Baseballkappe.", in which the *aufhaben* lexeme implements its first meaning «aufgesetzt haben» (DU). In the story, the addressee student, driven by the desire to make fun of responding to the teacher's question, turns to the intentional rapprochement and beating against one another of the usual meaning of the language sign *aufhaben* against the background of its other usual meaning. In the linguistic consciousness of the modern young plot recipient, this fact causes not only a feeling of admiration for the freedom of cognitive associative bounds of the addressee-student, but also creates a humorous effect and initiates the laughter of the plot recipient.

Among the German language everyday jokes for children Schülerwortwitz, we found stories suggesting a good laugh at an imbalanced communicative interaction, complicated by the *indirect, more harsh, humorous reaction* of a school student to an adult addresser.

**«"Wenn ich fünf *Eier* auf den Fenstersims *lege* und du *legst* fünf *Eier* dazu, wie viele Eier sind es dann, Markus?", fragt der Mathelehrer. „Tut mir leid, aber ich kann keine *Eier legen*." ». The communicative interaction of the addresser teacher and the addressee student is again associated with a math lesson when the student tries to disguise an ignorance of the correct answer to the question posed. The teacher tries to explain the mathematical effect of "addition" by immersing the content of the task in a trivial everyday situation. Moreover, it relies on independent (not united by phraseological meaning) lexemes «legen», «Eier». However, the addressee student who is not diligent in mathematics is in line with the psycho-emotional need for non-standard interpretations of nominations. He follows the desire to show his life independence and ability to create. Therefore, the cognitive leap from the literally understood and literally inter-

preted tokens "legen", "Eier" stimulates him to their phraseological processing within the boundaries of the semantics of the common phrase *Eier legen* and "revitalization" in its cognitive sphere of the semantics of the phrase *Eier legen*. Based on its semantic potential, the student manages to give a negative answer Tut mir leid, aber ich kann keine *Eier legen*." to the teacher's question "how many eggs will be five eggs plus five eggs?". In the plot, the addressee student resorts to a sharper playful reaction to the question of the adult addresser, while there is a clash-playing out of the semantic potential of the ordinary phraseological unit and the semantic potential of its components that have not undergone a metaphorical rethinking.

Schülerwortwitz, German language household jokes for children, offering to laugh at the communicative interaction in the modern school space, complicated by the extraordinary *humorous reaction of the addressee-schoolchild to the statement of the adult addresser,* emphasizes primarily their humorous component. **«Hannes kommt ohne Hausaufgaben in die Schule. Der Deutschlehrer schimpft: „Weißt du, was du jetzt *verdienst*?"   Da meint Hannes schlitzohrig: „Aber Herr Lehrer, ich bin doch nicht in der Schule, um etwas zu *verdienen*, sondern um etwas zu lernen!"».   **«"Was haben eine Wolke und ein Lehrer gemeinsam?", fragt Jonas. Als ihn alle erwartungsvoll anschauen, erklärt er: „Wenn sie *sich verziehen*, wird es schön!"». The plots do not adjust the recipient to the condemnation of verbal and behavioral reactions of an extraordinary and creatively reacting character-student.

Summing up, we note the following.

Schülerwortwitz German language everyday children's joke for children is generally aimed at ridiculing the imbalanced everyday communicative interaction of teachers and students as an actual type of communication in a modern communicative school space.

In the German language everyday joke for children Schülerwortwitz, the situation of unbalanced communicative interaction, complicated by the deliberate indirect soft/sharp extraordinary humorous (with the aim of "joking") reaction of the addressee student to some language expression in the statement of an adult addresser, is actualized. The deliberate extraordinary humorous reaction of the addressee student to the statement of the adult addresser is a fun wordplay, a kind of carnival speech mask of a student oversaturated with the tone of everyday edification [2].

The semantic mechanism for creating a humorous effect in such stories is a clash-upplaying of the meanings of a certain language expression (the supporting component of the plot) used in its statement

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由于去匿名而提名人体的私密部位
NOMINATION OF INTIMATE PARTS OF THE BODY DUE TO DE-ONYMIZATION

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抽象。 本文讨论了取消匿名化或将专有名称转移到已经在该语言中使用中性名称的新引用对象的情况。 它涉及人体的近亲部位的语名称，这些名称来源于人类的名字。
关键字：人类学名，去匿名化，个人名字，in亵的身体亲密部分的名字，押韵语

Abstract. the article deals with cases of de-onymization or transfer of a proper name to a new referent which already has a neutral designation in the language. It concerns slang names of intimate parts of the body derived from anthroponyms.

Key words: anthroponyms, de-onymization, personal names, slang names of intimate parts of the body, rhyming slang

The article considers cases of de-onymization, that is, the transfer of a proper name to a new referent which already has a neutral designation in the language. We shall focus on slang and colloquial designations of the intimate parts of the body, derived from anthroponyms. Before turning our attention to the problem raised and to the analysis of the material at hand, we deem it necessary to state that we adhere to the generally accepted terminologies in the fields of sexology, medicine and sociology and give preference to euphemisms as they allow us not to go beyond the linguist's competence. We would also like to mention what is understood by "the intimate parts of the body".

According to the ethics of society, we do not open the intimate parts of the body for display and they are not to be touched by anyone without special permission. It is believed that the intimate parts of the body are covered with panties or briefs and a bra. Thus, the intimate parts of the body include the buttocks, genitals (penis and testicles, vagina and pubis) and (female) breasts. In the article, we restrict ourselves to describing the designations of male genitalia as the most representative slang and colloquial designations of the intimate parts of the body created with the participation of de-onymization. We shall touch, in passing, upon some sexual practices in which the referents described in the article are involved.

The designations of the intimate parts of the body analyzed here are emotionally evaluative synonyms for the neutral designation of the male genital organ, the testicles and scrotum. The author's card index contains about 900 slang, colloquial and euphemistic designations of male genitals, of which about 70 words and phrases created by de-onymization are derived by anthroponyms or contain personal names.

Researches dealing with the problems of de-onymizing usually pay attention to the transfer of the name to the names of objects, products (types of clothes, weapons, fabrics, drinks, etc.), the names of units formed from the names of scientists, the names of people (the transfer is usually carried out according to traits of character and behavior, associated with a particular historical person, literary or mythological character) and the like. [6].

It is customary to distinguish several lines along which proper names develop common meanings 1) the name of a person → a person: hercules in the meaning of "a strong man"; 2) the name of the person → a thing: *mac* from *mackintosh* in the meaning of "a (rain) coat"; 3) the name of the place → a thing: *burgundy* in the meaning of "wine"; 4) the name of the person → an action: *boycott* in the meaning of "termination of relations"; 5) the name of the area → an action: panama in the meaning of "*fraud, deception*"; 6) the name of a person → a unit of measure: ampere, pendant, angstrom; 7) the name of the area → a place: Kamchatka in the meaning of "a remote place"; 8) the person → a place: *penates* in the meaning of "one's home". [1].

Designations of the intimate parts of the body of slang and colloquial nature formed by de-onymizing go beyond this classification as they combine the characteristics of the first and second type of transitions. As parts of the human body and its organs belong to a living organism (person), they are often animated and perceived as animated entities. Men, for example, can relate to their genitals in the way they treat a friend, a companion, an ally whom they value and patronize, to whom they are respectful, friendly, condescending, mocking, caring, ironic, as if the penis was a male person, for example: *dear member , dearest member, jolly member, chum, old chap, old fellow, wife's best friend, father confessor, foreman, gardener, girl chaser, little brother, master of ceremonies, one-eyed brother, junior, little man, large lad, big daddy* and many others. The penis designations that contain personal names fit well into this group: *little Davy, little Willie (penis, particular little boy), tricky Dick, long John (large-size penis) = long Tom (large-size penis), old blind bob* and some others.

Friendly and informal communication between men is characterized by such forms of address as *old chap, old fellow, old gent, old man, old bean, old sport* and some others containing the adjective *old* in their composition. It indicates a manifestation of sympathy and friendliness. The forms of address

correspond to Russian forms like "starina", "starikan", "bratets", "druzhische", "golubchik" etc., which are natural in communication between men who are on friendly terms (the choice of an acceptable equivalent depends on the degree of intimacy and the communication situation), and convey a special patronizing or friendly attitude towards the person. The designation of the "*old + Word*" formula is also found in the arsenal of patronizing and affectionate designations of the penis: *old chap* and *old fellow*, *old blind bob*, *old Bill*: My *old bill*'s up and pointing at me again now (cited from [7, p. 126]). The last two designations, as we see, contain diminutive forms of the names *Robert* and *William*. In the course of the presentation, we would like to note that the playful designation *old blind bob* is as pragmatically effective as the designations *one-eyed brother* and *one-eyed Willie*.

We regard the designations *little Davy* and *little Willie* as manifestation of a patronizing and friendly-ironic attitude towards one's penis. A special connotation of warmth and irony is created not only due to the evaluative adjective *little*, but also due to the diminutive forms *Davy* and *Willie*. In general, with respect to the penis, many popular diminutive forms of names are used, for example, *archie* (Archibald); *bob* (Robert), *charley / -ie* (Charles), *dick, dicky* (Richard), *jack, jackie* (John), *Jackie Robinson* (the name of an American baseball player, the first black player in Major League Baseball in the 20th century), *jim, jim johnson* (extension of johnson), *jimmy, Jimmy Wonkle* (James), *johnny, hanging johnny* (John), *tom, tommy* (Thomas), *willie / -y* (William). Along with diminutive forms, full, unabbreviated names are used, as well as names with a surname, for example, *abraham, adam, felix, hector, herman, horace, jacob, jack robinson, jesabel, john, john henry, john thomas, Dr Johnson, Johnson Ronson* (I had to put down the damn book because *Johnson Ronson* was ripping through my cheap underwear (cited in [Dalzell, 2008: 96]), *kennedy, lionel, nimrod, Oscar, peter, richard, roger, rupert, St Peter, william*, both independently and as part of idioms (for example, *herman the one-eyed German, hector the meat injector* (apparently, an ironic allusion to the Trojan hero in the Iliad, Hector, killed by Achilles).

In relation to the penis, as we see, the names of biblical, mythological, historical and literary characters are used: jacob (an allusion to the biblical story of Jacob's staircase connecting Earth and Heaven: the penis 'climbs up' the vagina) [8, p. 651]; jezabel (Jezebel is the name of the wife of the king of Israel, Ahab, who was distinguished by profligacy and a penchant for paganism → an insidious and vicious woman, a libertine, a lecherous woman); nimrod (Nimrod is the name of the biblical character who is credited with the construction of the Tower of Babel, extreme cruelty, idolatry, persecution of Abraham, rivalry with God; there is also an allusion to the rod); Cyclops (Cyclops is a one-eyed giant in

Greek mythology: a giant with one eye in the middle of the forehead, who forged lightning for Zeus. The penis also has an "eye".); Long Dong Silver (dong + pun on the name of the pirate John Silver from the novel Treasure Island by R. L. Stevenson) [8, p. 743].

The author of the authoritative slang dictionary, J. Green, commenting on the headword *abraham* the penis, points to its etymological connection with the name of Abraham, the first biblical patriarch, the ancestor of the chosen people, who made a covenant with God. He also notes the role the penis plays in procreation. [8, p. 3]. For comparison, J. Green refers to the dictionary entries *charley*; *jack*; *Jackie Robinson*; *jack robinson*; *jacob*; *jim johnson*, *john*, *john henry*, *johnnie*, *john thomas*, *john willie*, *Julius Caesar*, *oscar*, *percy*, *roger*, *tom*, *william*, descended from anthroponyms and serving as penis designations. The name of the patriarch is also included in the designation of the penis *father abraham* (cf. *father-of-all*) [8, p. 407]. The Old Testament Adam, who evokes associations of the sinful nature of man, is not ignored either: *adam's arsenal = adam's dagger = adam's whip = old adam*. The expression *the old adam* means an erection.

Personal names naturally serve as the name of a male contraceptive or are part of the condom designations: *jim, jimmy protector, jimmy cap, john, johnny, johnnie bag, rubber johnny, Casanova's rubber sock*. The latter designation exploits the name of Giovanni Giacomo Casanova (1725 - 1798), an Italian adventurer who portrayed the morals of his contemporaries and the adventurous impressions of the author of the Memoirs himself.

Many anthroponyms are part of phraseological combinations. *Archie*, e.g., is part of the expression *aim Archie at the Armitage* - to urinate [5, p. 12] (where *Armitage Ware* is the trademark of toilets), used in humorous contexts. Likewise, *point Dennis at Doulton* (of a male) to urinate (Doulton is a manufacture of china). The name *percy* appears in the expression *point percy at the porcelain* [8, p. 934] with the same meaning. It is included in humorous expressions *let Percy in the playpen* (of a woman) - to give consent to sex, *punish percy in the palm* - to masturbate.

Concluding our coverage of the topic, we would like to note samples of rhyming slang encoding the slang names of the penis: *bob and dick, mad Mick* (common in Australia), *Pat and Mick, uncle / Uncle Dick* and *Graeme Hick* rhyme with *dick* and *prick* (the new rhyme *Graeme Hick = dick* or *prick* exploits the name of a successful cricket player who played for Zimbabwe in his youth); *Uncle Bob = knob, Uncle Silly = willie, Kerry Katona = boner* (as in: 'She gave me a right *Kerry*.' The new rhyme exploits the name of the former soloist of the musical pop group "Atomic Kitten"), *Tommy Tucker = fucker* (allusion to the nursery rhyme "Little Tommy Tucker"), *Micky Blisser = pisser*. [2, p. 83-88].

Impressive is a set of rhymes to indicate the testicles: *Max Walls = balls* (the rhyme is based on the name of the English comedian Max2 Wall); *Nobby Halls = balls* (*Nobby Hall* is the character of a vulgar song + *James Hall*, better known as *Seaman Nobby Hall* - the Scottish boxer who was a lightweight champion in the 1922- 1923 season); *Sammy Halls = balls* (a funny traditional song); *rollocks = bollocks* (the reduced form of the rhymes *Jimmy Rollocks, Johnny Rollocks* and *Tommy Rollocks*) [2, p. 88-93].

Outside the scope of the article are numerous rhymes related to the designation of the intimate parts of a woman's body and sexual practices. We refer the interested reader to the monograph [2] and the article [4], in which, in the context of rhyming slang, the topics of woman's anatomy, physiological processes, sexual orientation [2], sexual practices [4] and some other taboo topics are treated. Cases of secondary nomination based on de-onymizing and concerning slang and colloquial names derived from anthroponyms and referring to people of non-traditional sexual orientation are dealt with in [3].

To summarize. The slang and colloquial designations of male genitalia and some sexual practices descending from anthroponyms or containing proper names in their composition have been considered. It is noted that the analyzed units fit into the traditional classification of transitions of proper nouns into common nouns only conditionally, as they combine the characteristics of two types and are perceived as animated entities, being emotionally-valued synonyms of neutral designations and conveying a protective, friendly, ironic or other warm attitude to genitals.

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和平政策与神经科学
PEACE POLICY AND NEUROSCIENCE

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抽象。 我们包括了H. Berger和M. N. 的两个神经元常数。 利万诺夫进入了新的心理学定律。 预测人类行为的准确性大大提高。 心理学现已转变为精确的科学，例如物理学，化学和遗传学。 提出了一种新的方法来打开新的精确的人们的集体行为规律。 在某种程度上，世界领导人选举的简单新技术以一种讨论的方式进行了讨论，目的是将国家之间的军事危险冲突排除在外。
关键词：神经科学，和平政策，神经元常数，心理规律，选举。

Abstract. *We included two neuronal constants of H. Berger and M.N. Livanov into new laws of psychology. The exactness of prognoses of human's behavior is significantly increased. Psychology is transformed now into exact science like physics, chemistry and genetics. A new way is proposed to open new exact laws of collective behavior of milliards of people. In partial, the simple new technology of elections of world leaders darts out on a discussion with the purpose of exception of military dangerous conflicts between the states.*

Keywords: *neuroscience, peace policy, neuronal constants, psychological laws, elections.*

The world has entered a period of cardinal transformations. "The collapse of the USSR is a major outcome of the first global hybrid war. Now the world is in a state of a second hybrid war. Russia is at its epicenter. A number of US strategic centers are already openly predicting the de facto collapse of the Russian

Federation between 2025 and 2030. It is at the expense of Russia that the main world centers will for some time (until 2040-2045) try to resolve their internal and external contradictions", said on April 11, 2018 in the newspaper "Zavtra" № 14 (1270), p. 1 and 4, President of the Center for Strategic Studies Russia - Islamic World Shamil Zagitovich Sultanov. Another high-class specialist, Doctor of Technical Sciences, professor of the Department of Global Processes at Moscow State University, mathematician Sergei Yurievich Malkov added: "The Third World War was already there - it can be called the collapse of the USSR. Yes, in this case there was no "hot phase", but wars are changing along with humanity. Yes, and this time, I would not call it particularly peaceful: all the classical phases of the global confrontation are evident. I hope that politicians are smart enough not to bring matters to the armed phase", says Ekaterina Golovina in her article "Formula of War" in the newspaper "Vechernyaya Moskva" on April 19-26, 2018, No. 16 (27916) in the section "Science", p. 33.

Not only wars, but also many other disasters of mankind are fanned by specific leaders in politics and in the economy. How to save humanity from such leaders? Psychologists state the fact that science has not yet matured to solve such a complex problem, although the psychologists themselves are well aware of the urgent need to solve it. The famous journalist and writer V.I. Artamonov, working with psychologists, summarizing the situation, writes: "I am deeply convinced that all outstanding achievements - in any craft, in politics, government, science, etc. - based on the high morality of a person who constantly calls for self-improvement, puts on the highest pedestal of professionalism. Without morality there can be no personality, without personality there cannot be a professional, without a professional there cannot be any significant achievement, all the more outstanding. I think that it is precisely this height that will need to be overcome first of all by Russian psychological science in the person of all its representatives. And then a radically new countdown will begin in the development of domestic psychology" [1, p. 395].

A similar situation has developed not only in psychology, but also in world politics as a whole. To get out of the global crisis, you need to know the exact laws of behavior not only of each individual person, be it a politician or psychologist, but also the laws of collective behavior of people. Concrete help of psychologists is required for state leaders in such situations. The solution to the problem has ripened in the bowels of neuroscience [3-6, 15].

Let us first consider the initial prerequisites for the solution that everyone wants. About three hundred years ago, the Englishman Harlley David, admiring Newton's discoveries, suggested that the human soul, in essence, is just some kind of physical waves. The German doctor Hans Berger did record two hundred years later the predicted waves [10] and proved that they are directly related to the psy-

che. Following him, our compatriot M.N. Livanov together with V.M. Ananyev invented the world's first multichannel device for recording many electric waves in different zones of the cerebral cortex [7, p. 103-115] and revealed the direct relationship of these waves to the formation of codes of the inner world of man and animals. The idea of wave coding has proven extremely attractive. It was proved that the waves of the electroencephalogram and the associated electrical impulses generated by each neuron adequately reflect a variety of psychological indicators [3-7, 10, 15, 16].

We further found that an accurate calculation of human behavior in a variety of situations known to psychologists is provided by only two neural constants, similar to the fundamental constants in the laws of physics. The first of these is the alpha rhythm frequency that dominates in humans (F = 10 Hz). It is called the constant of Hans Berger. The second constant (R = 0.1) was named after our teacher M.N. Livanova. Livanov's constant is equal to the step difference between the periods of alpha waves, taken in relation to their average value [3, p. 81], [7, p. 276-282, p. 375-384]. Both universal neural constants are able to turn psychology into an exact science, similar to physics, chemistry and genetics.

As a result, a new path has been paved for the discovery of equally precise laws of collective behavior of people. We will list further what exactly shows the accuracy of the laws of psychology arising from new ideas about the mechanism of wave neural processes, and then consider how new ideas are related to solving acute world political problems.

First law. Let's start with linguistics. Once Zipf [19] discovered an amazing relationship, later called the law. For some reason, on average, ten other words are placed between two identical words in a connected text, at least twenty words, even less often - thirty, forty words, etc. in the form of a series (R / 1, R / 2, R / 3, ... R / M), where M is the volume of the dictionary, i.e. number of different words. It is easy to guess that in this series (R = 0.1) this is the very one Livanov's neural constant found above. Based on neurophysiological ideas about the wave codes of human memory and previously published data from other researchers [5] on the relationship between the real sizes of dictionaries (S) and the known volumes (V) of fourteen texts from nine different authors, we calculated the values of the neural constant (R) and theoretical sizes of dictionaries (T) for each volume of a given text. The results are presented in table 1.

For iterative calculation of the size (T) of the dictionary and Livanov's constant (R) by the volume of the text (V) in this table, we used the following simple formula:

$$T=V-R*V*(\ln(R*V)+0.577216)+R*V. \quad (1)$$

The values of the Livanov constant for different volumes of the text calculated in the last column differ little from its typical value (R = 0.1), calculated from the

biopotentials of the human brain. So, the calculation of the volumes (T) of dictionaries and the values of the neural constant (R) for different volumes of texts (V) is possible.

Table 1. *Calculation of the constant (R) and the size of the dictionary (T) by the volume of text (V)*

Text author	V	T	S	T/S, %	R
Miscavige	6587	2254	2257	100	0.1071
Camus	14330	2531	2533	100	0.1174
Dante	14392	2275	2275	100	0.1197
Shakespeare	25471	3386	3391	100	0.1146
Dante	33386	6265	6274	100	0.1049
Dante	34042	6444	6450	100	0.1044
Dante	34126	6575	6598	100	0.1040
Miscavige	34280	6807	6823	100	0.1033
Lermontov	40364	5890	5925	99	0.1073
Pisarev	48354	6307	6348	99	0.1069
Paustovsky	57000	7828	7829	100	0.1042
Dante	101554	12998	13004	100	0.0991
Gladkov	127917	12807	12821	100	0.0996
Byron	130745	14366	14411	100	0.0984

Second law. Gustav Fechner discovered the famous "golden section" (Q = 0.618) for psychologists by comparing the height (a) and width (b) of many paintings by different artists. The golden ratio equation (Q) is really simple: Q = (a / b) = b / (a + b), where (a + b = 1). We have proved that this law is also predetermined by the Livanov constant, namely,

$$Q=0.5+F(0.677/sqrt((N+1)/2))=0.618, \quad (2)$$

where (N=1/R-1), and the symbol (F) in this formula reflects the value of the known probability integral in the law of the normal Gaussian distribution. In particular, for (N = 1) we obtain the well-known Gregor Mendel constant (Q = 0.75). Everything is simple. Everything is connected.

Third law. Volume (H) operational, i.e. short-term, human memory depends on the size of the alphabet (A) of memorized elements according to the formula

$$H=(1/R-1)*log(1/R-1)/log(A). \quad (3)$$

Here and below (R = 0.1) is the Livanov constant, log - the logarithm, asterisk - is multiplication sign. The third law predicts experimental data much more accurately [15, p. 332] than Miller's rule known in psychology [17].

The fourth law. A person is often forced to choose. The solution time t (N) required for the choice is found by the equation

$$t(N)=(1/FR)*((1-(1-R)/N)**2)/2, \quad (4)$$

where (N) is the number of equally possible solutions, a single asterisk is a sign of multiplication, and a double asterisk is a sign of raising to a power. The neural

constant (F = 10 Hz) is a typical frequency of the alpha rhythm dominant in humans, discovered by Berger [10].

The fourth law predicts experimental data [3, p. 86] more accurately than the well-known Hick law [14]. In particular, according to the new formula for (N = 1), we obtain the Geissler constant [12], which is equal to rounded five milliseconds (G = 5). For (N >> 1) from equation (4), the following neural constant C = t (N) / 2 = 250 ms is derived [3, p. 18]. This constant provides an accurate calculation of the search time of any given element in the short-term memory of a person [11].

Fifth law. The famous Stevens formula [18] allows one to calculate the power of sensation caused by light, sound, or some other stimulus as a power function of the physical value (I) of the intensity of the perceived stimulus. The accuracy of calculations using this formula is significantly increased if we use the formula of our fifth equation to calculate the exponent (n) in the Stevens formula

$n = \ln(T_{max}/T_{min})/\ln(I_{max}/I_{min})$. (5)

Here, the indices (min) and (max) correspond to the lowest (min) and highest (max) intensities (I) of the perceived stimuli, ln is the sign of the logarithm. The ratio of perception delays (Tmax) and (Tmin) is calculated taking into account both neural constants according to the sixth formula, which also follows from the fourth law:

$T_{max}/T_{min} = (1/FR)/G = 1000/5 = 200$, (6)

where G is the Geissler constant [12]. Equation (5) with constant (6) provides a more accurate calculation of the dependence of sensory strength (S) on the intensity of stimuli of different modalities according to the Stevens formula [3, p. 20]. In all equations, both neural constants turned out to be highly informative. So, psychology has turned into an exact science with its simple constants and laws resembling the classical laws of I. Newton, D. Mendeleev and G. Mendel.

The foundation of the new laws of neuroscience is a simple initial regularity that explains the origin of neural waves. It is expressed by a nonlinear differential equation with a delayed argument [6]. Consider the origin of the pattern found.

Cells, including neurons, are the simplest units of living matter. Any neuron lives many times longer than any other cell. Why? The reason is simple. As the cell grows and its mass increases, the ratio between the volume and the surface area of the cell increases nonlinearly. The metabolism between the cell and the environment for this reason is inevitably difficult. As a result, the cell is clogged with slag and falls apart. Cell fragments, healing their wounds, i.e. restoring their surface, they turn into newborn cells.

Neurons come from the smallest, rapidly dividing cells of the outer germinal sheet (ectoderm). The difference in charges (electrical impulse) preceding the division provides a quick timely removal of accumulated toxins from the body of the neuron and the division for this reason is postponed. Generating impulses, i.e.

by purifying themselves in time, each neuron lives surprisingly long, for many decades.

External influences affect the generation of impulses, since all neurons come from the external germinal sheet. In addition, neurons are connected to each other from birth, also affecting each other with their impulses. Therefore, ensembles of synchronously pulsating neurons arise. Corresponding wave packets and bundles of neural pulses associated with them are formed.

It is such packets of waves that reflect the activity of neural ensembles that all the elements of our inner world are encoded, i.e. of our soul, as Harlley David once suggested. Of the many ensembles, neural pyramids are inevitably formed.

Ordinary families known to each of us (parents, children, grandfathers, grandmothers, grandchildren), as well as other simplest small groups of people are similar to neural ensembles. We will call such associations of people cells (or groups) and try to find out how giant human pyramids can be formed from such cells that can ensure the survival of mankind without massive bloodshed. To do this, you need to know the structure of power.

Consider the simplest structure. First, let several people voluntarily get together in one cell who want to choose the leader of their cell, for example, from 5 to 15 colleagues, party members, housemates, relatives, or just acquaintances. After the interview, each person on a separate piece of paper writes down two or three candidates for the post of leader, including, possibly, himself. All leaflets come together right away, and it is openly calculated which of those gathered is mentioned in the records most often. This is the leader, of course, with his consent. In case of equality of votes for each of two or more possible leaders, a second vote is held or lots are cast. The leader then himself appoints as his deputy any of the members of his cell.

The selected leaders of the primary cells in the next second stage of the election campaign are united by their own choice into secondary cells, each of which also has 5-15 people. The leaders of the secondary cells are likewise united again into small cells, creating a higher one, i.e. third floor of the pyramid. Each member of the tertiary cell continues to lead its secondary cell, which elected it in the previous step. The next floors of the pyramid are formed in a similar way at each next stage of the election campaign. Intervals between stages (approximately one month) are set in advance.

In the final, at the end of a multi-stage election campaign, a multi-story human pyramid with a single leader at its top is obtained [3, p.132-138]. Each selector at each stage consists of only one cell. This is the law.

Any cell can exist for many years, accepting its new members between elections. At the same time, between elections, someone can leave the previous cell and voluntarily go to another cell necessarily on the same floor of the pyramid. We will name the

pyramid of all leaders elected precisely from below in stages, i.e. step by step, the state pyramid of the first kind. Of course, such a pyramid consists of many smaller pyramids.

We emphasize that in each cell of the pyramid of the first kind, its participants always choose their leader face to face, taking into account the morality, conscientiousness, decency, efficient and other qualities of their leader. The duty of the leader is to help his constituents in everything. The experience of such elections (always from below) has long been known in the ancient (religion, zemstvo) and in the new [3, p. 169] the history of mankind. The labor of any cell leader is rewarded by the state. To do this, it is enough to slightly reduce (for example, by 5%) the income of highly paid citizens.

Voluntary transitions of voters from one cell to another are possible only on their floor and only between elections at each stage of the election campaign. As a result, a small vertical chain of just 7-10 leaders selected on different floors will provide a quick, coordinated solution to any problems in any state.

Exactly so, according to our project, a truly peaceful, acceptable globalization of the world that excludes bloody conflicts, terrorism, corruption and other troubles of our time should look like [3, p. 132-193]. Each state, and then all of humanity, turns voluntarily, quickly and painlessly into one gigantic family. For example, for Russia with its 140 millionth population, an eight-story pyramid is enough. At the top of such a pyramid is the president of the country, elected eye-to-eye for a certain period in this case with only 80 of his voters, about 10 people at each of the eight stages of the election campaign, i.e. on each floor of the state pyramid. So, in fact, it's what the party of the president of our Russia will actually look like.

In the end, the leaders of different states also voluntarily, of their choice, unite in this way in the cells of a more powerful world interstate pyramid. In this pyramid, cells consisting of state leaders can be small, each with 3-5 people (instead of 5-15) on any floor of the pyramid, since the number of all states is much less than the number of inhabitants of the earth.

The only world leader (it is not necessary at all that he will be the president of the most powerful state on earth) is elected for a certain term, like all the leaders of any state pyramids in the composition of a giant world pyramid. Interstate problems are solved collectively like intrastate problems. If the votes are 'for' and 'against' in any cell, the decision of its leader is final. We emphasize that any interstate unit is the result of the voluntary unification of several peaceful states.

Let's go back to the state pyramids. Of course, in every state numerous and well-known pyramids of various managers are preserved. Let us denote them by the power state pyramids of the second kind, in contrast to the state pyramids of the first kind created from below (see above).

Pyramids of the second kind are created, as is customary, from above. For example, once the President of Germany Paul von Hindenburg, yielding to per-

suasion, appointed precisely on top of January 30, 1933 the Reich Chancellor of Germany Adolf Hitler [2, p. 204]. The power pyramids created from above can be called the pyramids of the nomenclature, the pyramids of professionals or otherwise, unlike the pyramids of the people's representatives, always created according to our project, starting from the bottom.

At the same time, from now on, the only amendment is introduced everywhere in the traditional mechanism for the formation of power pyramids from above, which simplifies and at the same time facilitates the management of the selection of its personnel. Namely, each specific professional is appointed to his position from above, taking into account the number of the floor to which he managed to rise from below in the first pyramid. It is always useful to take into account the position of each individual employee in the first state pyramid. By the way, we note that it is much easier to form the councils, presidiums, and other collective bodies of power that are leaders among the first state pyramid.

Both giant state pyramids of power, created separately from above and from below, interact peacefully. Forever there is no need for violent changes of any power. Each request from below from any cell with any wishes, suggestions, requests always quickly reaches its specific sovereign addressee, placed on the corresponding floor of the power vertical in the pyramid of professionals. Modern information technologies easily provide such a fast connection. Therefore, the need for gigantic collective protests, Maidan and revolutions disappears. Corruption, bribery, terrorism are disappearing. They cease to be profitable. The tragic decay of various elites, familiar to all, is ruled out. Power is concentrated in the hands of a full-fledged elite, not only ruling, as it is now, but also regularly re-elected from below, eye to eye, within the framework of the first state pyramid.

It is useful to look, at least briefly, at the psychological portraits of political leaders elected and appointed from above. In the past, the psychological portraits of Hitler and Goebbels devoted to him were most justified. "Hitler openly declared in a narrow circle," People who have come to power must receive something from this for themselves. " Encouraging the vices, base interests and instincts of those in whom he was interested, and protecting them from punishment, Hitler closely linked their fate with his own, making them even more dependent on himself "[8, p. 212].

Goebbels's words addressed to his own doctor are also known: "Doctor, I will be very grateful to you if you help my wife kill children" [8, p. 86]. As a result, Goebbels's six children were killed on the same day, one after another, with their own mother's own hand. Such were the leaders at the top of the pyramid of power created from above by Hitler. The world knows that two leaders (Hitler in Germany and Stalin in the USSR) very strictly cleaned the pyramids of their power from

above. Did not help. Only those states in which at least elements of the old step-by-step election procedure from below have been preserved exist for hundreds of years. For the same reason, religious associations persist even longer.

We believe that the old technology of step-by-step elections, restored from our day from below, eye to eye, in its new modern modification, will save the world from decay of its ruling elites and from the premature suicide of mankind.

It is interesting to know what features the state leaders of our time value most in their assistants. There is a joking answer to this question by US President Lyndon Johnson: "I need no loyalty at all. I need such fidelity when they kiss my butt in full light and exclaim - it smells like a rose "[9, p. 13]. President of Russia Vladimir Vladimirovich Putin, answering the same question, stressed that he values professionalism and decency above all [3, p. 200, p.208] of his assistants. Our proposed new simple information technology of step-by-step elections from below, eye to eye, is aimed at taking into account precisely the decency and professionalism of leaders selected in both pyramids of power.

A new way to smoothly change political leaders will also neutralize the sometimes fatal processing of people's minds by the media. Hitler, for example, taught his elite how to behave with the Russians: "No print media. The simplest broadcasts. We must wean them to think. In each village, in the square, there is a loudspeaker post to broadcast news and entertain listeners. Yes, to entertain and distract from attempts to acquire political, scientific and generally any knowledge. Radio should transmit as much simple, rhythmic and fun music as possible. It invigorates and increases working capacity" [2, p. 249].

If the nations of the world do not come together in one family, the world will quickly approach its sad future predicted in the old church anthem: "Day of anger, this day will incinerate the world ... Dies irae, dies illa solvet saeclum in favilla" [13, p.128]. There is no third.

Conclusion

Neuroscience with its new laws of human behavior provides a solution to acute global problems. A broad discussion of the proposed simple technology for the formation of peaceful political elites, followed by its voluntary implementation throughout the world, is required. Humanity will finally turn into one family of nations, similar to the multi-billion family of neurons in the human brain.

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俄罗斯联邦公共服务利益冲突的典型情况及其解决程序。
TYPICAL SITUATIONS OF CONFLICT OF INTEREST IN PUBLIC SERVICE IN THE RUSSIAN FEDERATION AND THE PROCEDURE FOR THEIR SETTLEMENT

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抽象。 本文讨论了公务员利益冲突的典型情况，并为公务员和雇主代表提供了预防和解决此类冲突的建议。

关键字：利益冲突，公共服务，公务员，公共当局，俄罗斯联邦。

Abstract. *This article discusses typical situations of a conflict of interest in the civil service, as well as provides recommendations for their prevention and settlement for civil servants and representatives of the employer.*

Keywords: *conflict of interest, public service, public servants, public authorities, Russian Federation.*

Conflict of interest in public service is a fairly new phenomenon in modern Russian law. Recently, the emergence of a conflict of interest has been a key problem in various areas of public life. Of course, this problem has the greatest significance for society precisely in the political sphere. In the Russian Federation, according to the Federal Law of 25.12.2008 № 273 "On Combating Corruption", a conflict of interest is defined as a situation in which the personal interest (direct or indirect) of a person who is filling a position, the replacement of which provides for the obligation to take measures to prevent and resolve a conflict of interest, affects or may affect the proper, objective and impartial performance of his official duties (exercise of authority).[1] Also, this law considers the concept of personal interest, which is understood as the possibility of obtaining income in the form of money, other property, including property rights, property-related services, results of work performed or any benefits (advantages) of a person and those who are with close kinship or property by persons (parents, spouses, children, brothers, sisters, as well as brothers, sisters, parents, children of spouses and spouses of children),

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[1]FL №273 "On Combating Corruption" of December 25, 2008. – Art. 10.

citizens or organizations with which the person is related in terms of property, corporate or other close relationships[2].

Analyzing the above definitions, it is worth noting that there are various specific situations that a public servant faces in the process of fulfilling his official duties. But the complexity of this problem lies in the fact that it is impossible to take into account the diversity of personal interests of public servants and to develop a detailed list of all possible situations. However, we can distinguish the main areas of regulation in which the possibility of a conflict of interest is high:

• receipt of gifts and services by public servants;
• possession of securities and / or bank deposits;
• violation of prohibitions imposed on public servants;
• litigation and / or property obligations;
• interaction with the former employer and employment after the dismissal from public service.

For all the areas of regulation described above, certain typical situations of conflict of interest in the civil service are described, for this first full information about the situation is given, and then a recommendation for its prevention and settlement for government employees and representatives of the employer is considered.

Considering the situation associated with the receipt of gifts, services or other benefits from individuals or legal entities, it is worth noting that public servants or his relatives should not accept gifts of a different nature, regardless of their value and occasion for giving. But if the gift was accepted, then the representative of the employer should find out the effect of the received gift on the proper performance of official duties and take certain measures in relation to the public servant.

The first situation: a public servant accepted a gift or a service for exercising public administration functions, then disciplinary measures will be taken against him, which will depend on the nature of the corruption offense committed by him (circumstances, compliance with restrictions, prohibitions and performance of official duties are taken into account).

Situation two: a public servant accepted a gift or service that has no connection with his official duties. The representative of the employer must:

• explain that the gift received may lead to a conflict of interest and contribute to the loss of reputation of a state body;
• recommend returning the gift or compensating for its value;
• remove the official from the performance of official duties in relation to the individuals or legal entities who presented the gift until the conflict of interest is resolved.

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[2]FL №273 "On Combating Corruption" of December 25, 2008. – Art. 10.

Situation Three: When a public servant does not accept a gift or a service, but he still needs to inform the representative of the employer and his immediate superior about the existence of a personal interest in writing. And they should determine how much this situation can cause biased performance by civil servants of official duties. If the probability is high, then the official is suspended from the performance of official duties in relation to individuals or legal entities with which a personal interest is connected.

Summing up the results of this sphere of regulation, it should be said that there is a ban on receiving remuneration from individuals and organizations by civil servants for the exercise of public administration functions. But it is worth noting that there is an opportunity to circumvent this ban, which is established in the legislation of the Russian Federation. A gift can be given in connection with a generally accepted occasion (birthday), then it will not be considered received in connection with the performance of official duties.

Next, we examine the situation related to litigation and property litigation. The first situation: a public servant exercises the functions of public administration in relation to an organization to which he or his relatives have property obligations (to pay a debt, to terminate a lease agreement). In order to avoid a conflict of interest, the public servant is obliged to inform in writing the representative of the employer and the immediate superior about personal interest. And they, in turn, must remove the civil servant from the performance of official duties until the settlement of the property obligation.

It is also necessary study the situation with litigations when relatives or other persons involved in the personal interest of a public servant participate in them. The civil servant is obliged to inform in writing about the personal interest of the representative of the employer and the immediate superior, and they should remove him from the performance of official duties for the duration of the trial.

It is also important to consider the problems that are associated with the violation of the prohibitions prescribed in the legislation of the Russian Federation. Firstly, the ban on receiving civil servants awards, honors and special titles, except for scientific, without the written permission of the representative of the employer in accordance with Federal Law-79 on the state civil service of the Russian Federation. Secondly, a civil servant is prohibited from performing paid work in organizations financed by foreign funds without the written consent of the representative of the employer. Thirdly, it is impossible for a public servant to use the information that he received in the process of performing official duties and is not available to the public for performing commercial operations. Summing up the results of this sphere of regulation, we can say that if a public servant does not comply with the prohibitions listed above, he will be brought to disciplinary action.

Let us examine another case in which there is interaction with the former employer and employment after leaving the public service. An official is prohibited from negotiating further employment with legal entities with which cooperation has been carried out and the functions of public administration have been carried out until the moment when he has not yet left the civil service. But in the event that such negotiations have already begun, the civil servant must inform the representative of the employer and his immediate superior in writing. And they, in turn, need to remove the civil servant from the performance of official duties in relation to this organization, in order to avoid a conflict of interest. In addition, when entering the civil service, an official is obliged to report on his previous place of work if the functions of public administration are entrusted to this organization. And the representative of the employer needs to analyze how much these relationships can affect the proper performance of their duties. If so, the official shall be suspended from their duties.

Next, we consider the case when an official has securities and bank deposits. If a public servant has a personal interest in those legal entities in which he or his relatives have securities, bank deposits or mutual obligations, he needs to inform the representative of the employer and his immediate superior in writing.

Summing up, it should be said that at present in the legislation of the Russian Federation a fairly small number of typical conflict situations in the civil service are described, and those that are present are not fully analyzed. Another problem is that the methods for preventing and regulating conflicts of interest in the public service have not been worked out in detail, which leads to an increase in corruption offenses in the public service in the Russian Federation.

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维管植物的菌根形成及其生物多样性
MYCORRHIZA FORMATION OF VASCULAR PLANTS AND THEIR BIODIVERSITY

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抽象。休耕地的药用植物种类（占Pitirim Sorokin Syktyvkar国立大学植物园总面积的24%）被鉴定出来。鉴定出29个家的77属92种，其中64属的77种药用植物覆盖24个家庭，总体投射覆盖范围为5%到80%，沃土母质岩石上为梯形土壤。

维管植物的同养异养程度为2.15至3.58点。记录到高度碎片化（发生频率为50%）。药用植物的营养菌种中的菌根感染强度为19.5%至47.9%。该菌病的平均菌根感染强度为30.4%。发现了非菌根的植物科：石竹科，藜科，十字花科，紫草科，Poly科，玄参科。我们的分析表明，在该社区中，菌根感染的发展水平与植物的总射影覆盖率之间没有正相关关系。在绝大多数的营养型药用植物中，囊泡是罕见的。这种状况与植物的生存状况有关。研究区的休闲地通风不良和土壤温度低对真菌菌丝体的生长没有贡献。

关键词：休耕地，生物多样性，维管植物，菌根

Abstract. *The variety of medicinal plants in fallow plots (24% of the total area of the Botanical Garden of the Pitirim Sorokin Syktyvkar State University garden was considered. 92 species from 77 genera of 29 families were identified, including 77 species of medicinal plants from 64 genera of 24 families. General projective cover varies from 5 to 80%, podzolic soil on loamy parent rocks.*

The degree of mycotrophicity of vascular plants range from 2.15 to 3.58 points. High fragmentation was noted (the frequency of occurrence is 50%). The intensity of mycorrhizal infection in mycotrophic species of medicinal plants ranges from 19.5 to 47.9%. The average intensity of mycorrhizal infection in this phytocenosis is 30.4%. Non-mycorrhizal plant families were revealed: Caryophyllaceae, Chenopodiaceae, Brassicaceae, Boraginaceae, Polygonaceae, Scrophulariaceae. Our analysis showed the absence of a positive relationship between the level of development of mycorrhizal infection and the total projective cover of the plant in this community. In the vast majority of mycotrophic medicinal plants, vesicles

are rare. This condition is associated with the living conditions of the plants. Poor aeration of fallow plots and low soil temperatures of the studied region do not contribute to the development of fungal mycelium.

***Keywords:** fallow plots, biodiversity, vascular plants, mycorrhiza*

At present, the problem of obtaining medicinal raw materials is very urgent. The production of cultivated medicinal plants lags behind the needs of pharmaceutical production in its development. An increase in the need for medicinal raw materials is reflected in the reserves slightly represented by them in the composition of natural flora. The extinction of certain types of medicinal plants is facilitated by economic activities, air pollution and soil degradation. In this regard, the need for artificial cultivation of medicinal plants is growing, which will expand the range of species used, to ensure the production of benign raw materials. Pharmacological associations attach great importance to the study of not only the chemical composition and activity of their constituent components, but also the mechanisms of adaptation of medicinal plants to growing conditions. One of the ways to enhance adaptation is the symbiosis of the roots of a medicinal plant with fungi.

Mycorrhiza – an adaptation in most terrestrial plants, allowing them to absorb mineral elements and water from the soil. Considerable material has been accumulated characterizing structural differences in the root systems of arbuscular-mycorrhizal and mycorrhizal plants in communities of different plant zones [1, 2, 3, 4, 5, 6]. The most common type of mycorrhiza of herbaceous plants is arbuscular. The morphological picture of the root transformation during the formation of arbuscular mycorrhiza (AM) consists in the penetration of the hyphae of arbuscular-mycorrhizal fungi into the primary root cortex and the formation of specialized structures: arbuscules (tree-like branching hyphae in the cells of the cortex) and visicles (round extensions of hyphae). Typological and quantitative characteristics of mycorrhiza depend on the life forms and ecological and physiological properties of plants [7, 8, 9, 10, 11]. Mycosymbiotic connections of herbaceous medicinal plants with mycorrhizal fungi on the territory of the Komi Republic are very poorly studied.

The purpose of the work was to assess the biodiversity and mycorrhiza formation of certain species of vascular herbaceous plants in fallow areas of the Pitirim Sorokin Syktyvkar State University Botanical Garden.

Objects and methods

The studies were carried out on fallow plots of the Pitirim Sorokin Syktyvkar State University Botanical Garden (61° 64′ N and 50° 74′ E) with a total area of 4.0 ha. A geobotanical description of plant species was given in [12]. In the study area, standard test geobotanical sections of 10x10 m were laid and species composition and total projective cover (TPC) were evaluated. Material was collected in

the summer of 2016 and 2017. Plants were dug in characteristic habitats for each species. To study mycorrhiza of medicinal herbaceous plants, the roots of the plant were selected in tenfold repetition, which were then dried and processed according to the generally accepted method [2, 13]. The following parameters characterizing mycorrhiza formation were studied: the degree of mycotrophy, the intensity of mycorrhizal infection, the frequency of occurrence of mycorrhiza infection. The degree of mycotrophy (D, score) characterizes the abundance of fungi in the root. According to [2], plants are divided into 3 groups: high-mototrophic (3.6-5.0), medium-mototrophic (1.8-3.5) and weakly mycotrophic (0.1-1.7 points). The intensity of mycorrhizal infection (C,%) is a value that reflects the distribution of the scribed sections of the root, as well as the abundance of mycorrhizal fungus in it. The frequency of occurrence of mycorrhizal infection (F,%) characterizes the ratio between the ridged and unburied sections of the root system of the plant [2]. Statistical processing of materials was carried out using the software package Statistica 6.0.

Results and discussion

The surveyed fallow site is located on the border, the cultivated and natural uncultivated territories of the Botanical Garden of SSU. The mesorelief of the site is almost flat; only small tussocks and depressions are observed, which reflects the agricultural history of its use. In the flora of the studied area, 92 plant species from 77 genera of 29 families were identified, including 77 species of medicinal plants from 64 genera of 24 families [14]. The average species richness of the genus 1.18, the family - 3.15; the average number of genera in the family is 2.62. A complete absence of species of *sem. Cyperaceae,* as well as the extreme rarity of *Equisetum sylvaticum* (in the absence of other species of horsetail), which may indicate a good cultivation of the territory: low acidity of the soil of the site and its good drainage, was observed. The composition of the flora is absolutely dominated by seed plants (98.9%); spores are represented by one species (1.1%).

The grass cover is thick. TPC ranges from 5 to 80%. At TPC - 80% (cop$_3$) it is dominated by *Elytrigia repens* (L.) Nevski. At TPC – 70-50 % (cop$_2$) it is dominated by – *Epilobium adenocaulon* Hausskn, *Rumex acetosa* L., *Rumex acetosella* L., *Rumex crispus* L., *Sonchus oleraceus* L. At TPC – 50-30 % with an abundance of (sp.) present are: *Capsella bursa-pastoris* (L.) Medikus, *Lupinus polyphyllus* Lindl., *Leonorus quiinqelobatus* Gilib., *Artemisia vulgaris* L., *Taraxacum officinale* F.H. Wigg. The dominance of certain plant species is limited in time: *Anthriscus sylvestris* (L.) Hoffm. acts as a dominant in June.

The decrease in species diversity in the fallow areas of the garden is explained, on the one hand, by the fact that the vegetation demutation on them has not yet reached the stage of a closed stand of small-leaved woody plants, and the tillage carried out for agricultural work did not allow forest plants to survive here from

the previously growing spruce. On the other hand, the influence of weed-field and adventive plants, causing an increased role in the formation of plant cover, of families such as *Fabaceae, Lamiaceae* and *Polygonaceae*, is noticeable. The soil was diagnosed by us as podzolic on loamy parent rocks.

The normal microflora of plants is represented by rhizospheric and epiphytic microbes. The number of species inhabiting the rhizosphere depends on the age and physiological state of the plants. The bulk of the basal microflora is represented by bacteria of the genus Pseudomonas, mycobacteria and fungi - basidiomycetes, less often ficomycetes, axomycetes [15]. These fungi form a symbiosis (mycorrhiza) with the roots of plants, including medicinal ones. The importance of mycorrhizal fungi for plants, including medicinal ones, is to improve water-mineral nutrition and protect root systems from phytopathogenic organisms. In the presence of mycorrhiza, plants successfully develop, increasing their phytocenotic status, reducing intra- and interspecific competition, thereby increasing the species richness of plant communities [16].

Materials characterizing some aspects of the mycorrhiza formation of medicinal plants in the studied area are presented in Table 2. In the roots of herbaceous plants, zygomycetous vesicular-arbuscular endomycorrhiza represented by unsepted fungal hyphae, vesicles, and arbuscules was revealed. The degree of mycotrophy of the studied plants ranges from 2.15 to 3.58 points. Basically, all studied medicinal plants are moderately mycotrophic. This indicator in plants of one species practically does not differ. According to [17], in natural populations, plant variability in the degree of mycotrophy varies from 2 to 5, which does not contradict our studies.

Medicinal plants of the family *Ranunculaceae, Hypericaceae* have a high frequency of occurrence on the roots of mycorrhiza - from 72 to 84%. In plants of the family *Valerianaceae, Apiaceae, Fabaceae, Asteraceae* with medicinal properties, an average incidence of mycorrhizal infection was found to be from 28 to 58%. In medium- and high-trophic plants, the share of mycorrhizal plots accounts for 35%. On average, the incidence of mycorrhizal infection is 50%. The uneven population of root systems with endophytes is associated with a low population density of these fungi in the soil and their reduced activity due to natural conditions [18].

We found that the intensity of mycorrhizal infection in mycotrophic species of medicinal plants ranges from 19.5 to 47.9% (table). The average intensity of mycorrhizal infection in this phytocenosis is 30.4%. Our analysis of medicinal plants of different status showed the absence of a positive relationship between the level of development of mycorrhizal infection and the total projective cover of the plant in this community. It should be noted that the differences between these two indicators are unreliable (p> 0.05) and are within random fluctuations.

Studies have confirmed information on the different representation of mycorrhizal infection among different families [6]: *Asteraceae* families of mycorrhiza are 13 out of 13 species studied, in *Ranunculaceae* - 2 out of 2, in *Fabaceae* - 4 out of 4, *Apiaceae* - 2 out of 4 plant species. Mycorrhiza was not found on the roots in plants from the families of *Caryophyllaceae*, *Chenopodiaceae, Brassicaceae, Boraginaceae, Polygonaceae, Scrophulariaceae,* which confirms the results obtained previously [1, 19].

Table

Characterization of mycosymbiotrophism of vascular plants of fallow plot of the botanical garden

Family/species name	C, %	D, point	F, %
Valerianaceae			
Valeriana wolgensis Kazak.	23,7	2,54	46
Apiaceae			
Aegopodium podagraria L.	25,7	2,21	32
Anthriscus sylvestris (L.) Hoffm.	23,8	2,62	28
Eryngium planum L.	0	0	0
Heracleum sosnowskyi Manden.	0	0	0
Caryophyllaceae Juss.			
Dianthus deltoids L.	0	0	0
Dianthus superbus L.	0	0	
Chenopodiaceae Vent.			
Chenopodium album L.	0	0	0
Brassicaceae Butnett.			
Barbarea vulgaris R. Br.	0	0	0
Boraginaceae			
Myosotis arvensis	0	0	0
Scrophulariaceae			
Veronica chamaedrys L.	0	0	0
Fabaceae Lindl.			
Trifolium repens L.	35,2	3,04	58
Vicia hirsute (L.)	19,5	2,15	38
Vicia cracca L.	20,3	2,21	36
Vicia sepium L.	22,8	2,31	40
Hypericaceae Juss.			
Hypericum quadrangulum L.	47,9	2,65	72
Ranunculaceae Juss.			
Ranunculus acris L.	40,2	2,96	78
Ranunculus repens L.	44,8	3,58	84
Asteraceae			

Family/species name	C, %	D, point	F, %
Artemisia vulgaris L.	32,4	2,22	54
Carduus crispus L.	35,3	2,16	52
Cirsium arvense (L.) Scop.	30,8	2,08	50
Cirsium heterophyllum (L.) Hill	25,6	2,57	46
Echinops sp.	21,3	2,34	40
Erigeron acris L.	32,1	2,76	48
Lepidotheca suaveolens (Pursh) Nutt.	31,8	2,64	44
Omalotheca sylvatica (L.) Sch. Bip. & F.W. Schultz	35,1	2,04	41
Pilosella aurantiaca (L.) F.W. Schultz & Sch. Bip.	22,3	2,64	42
Sonchus oleraceus L.	30,5	2,15	53
Taraxacum officinale F.H. Wigg.	33,8	2,36	56
Tussilago farfara L.	42,7	2,55	57
Tripleurospermum perforatum (Merat) M. Lainz	36,8	2,32	56
Polygonaceae Juss.			
Rumex acetosa L.	0	0	0
Rumex acetosella L.	0	0	0
Rumex crispus L.	0	0	0

In non-mycotrophic representatives of herbaceous medicinal plants, the root endings are thinner (up to 160 microns) than mycotrophic ones (up to 220 microns). According to published data [6, 20, 21], the differences between mycotrophic plants compared with non-mycotrophic ones are due to the presence of flavonoids. The authors argue that flavonoids regulate the balance of relationships between symbionts.

Analyzing the development of mycorrhiza in various families, we are convinced that in the vast majority of mycotrophic vascular plants, vesicles are rare. This condition can probably be associated with the living conditions of plants. Poor aeration of fallow plots and low soil temperatures of the studied region do not contribute to the development of fungal mycelium.

Conclusion

1. The vegetation cover of fallow plots of the Botanical Garden is assessed as a multi-grass fallow with individual tree-shrub plants. In the flora of the studied object, 92 plant species were identified, including 84% of medicinal plants, 77 genera - 83%, 29 families - 83% of medicinal plants. The grass cover is thick. The total projective coverage varies from 5 to 80%. The edificatory strength of a species is determined by its life form and characteristics of the phenological state.

2. It was established that 23 plant species (77%) enter into symbiosis with fungi, 11 species (23%) do not have mycorrhiza. Mycorrhiza was not found on the roots of plants from the families of *Caryophyllaceae*, *Chenopodiaceae*, *Brassicaceae*, *Boraginaceae*, *Polygonaceae*, *Scrophulariaceae*.

3. In the distribution of the fungus in the roots of medicinal plants, a high fragmentation is noted (the average frequency of occurrence is 50%). The average intensity of mycorrhizal infection is 30.4%. The degree of mycotrophy in the range of 2.15-3.58 points.

4. The presence of endomycorrhiza and the level of its development are not associated with the relative density of the projection of certain types of medicinal plants of phytocenosis.

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北部地区光周期变化条件下高等学校学生的表型
THE CHRONOTYPE OF STUDENTS OF THE HIGHER SCHOOL IN THE CONDITIONS OF THE CHANGED PHOTOPERIOD OF THE NORTHERN REGION

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抽象。 北方医科大学的学生使用Horn-Ostberg问卷调查了双节律性刻板印象。 该研究涉及105名男孩和231名女孩。 我们比较了一年中冬季和夏季的答案，确定了表型对光周期变化的抵抗力。 在男性和女性组中比较了表型的光周期稳定性。 与性别有关的生活安排中，早晚偏好的差异在冬季更为明显，而在夏季则几乎没有。 与女孩的机能相比，年轻男子的生活组织受日光时间等外部影响的影响较小。 被检查的学生表现出刻板僵化的倾向，在年轻人中更为明显。 在北部地区的情况下，社会活动的模式胜于自然的起搏器–光。

关键字：学生，表型，光周期。

Abstract. *Biorhythmic stereotype was studied with students of the Northern Medical University using the Horn-Ostberg questionnaire. The study involved 105 boys and 231 girls. We compared the answers for the winter and summer seasons of the year, determined the resistance of the chronotype to a change in the photoperiod. The photoperiodic stability of the chronotype was compared in the male and female groups. Differences in the morning-evening preferences in the organization of life related to gender are more pronounced in the winter season and practically absent in the summer. The organization of life of young men is less susceptible to such exogenous influences as the duration of daylight hours than the functioning of girls. The examined students showed a tendency to chronotype rigidity, more pronounced among young men. In the conditions of the northern region, the mode of social activity prevails over the natural pacemaker - light.*

Keywords: *students, chronotype, photoperiod.*

Introduction

Rhythmic activity is a fundamental property of living organisms [1]. The organization of biological rhythms is determined by endogenous (production of melatonin) and exogenous factors (photoperiod, organization of social activity). The organization of the educational process, as a rule, takes into account the hygienic requirements for the schedule of studies. However, the regulation of educational activities of students may come into certain contradictions with their chronotype [7]. So, the early morning rise is uncomfortable for students with an evening chronotype, classroom and extracurricular mental activity in the evening hours is often ineffective for the "larks". The connections of the chronotype with cognitive functions [3], with the functional state of the central nervous system [6] were established. In the northern territories, individual biorhythms of students are under combined pressure of social and natural factors. One of the factors specific to the north is an altered photoperiod: the light regime undergoes significant changes in annual dynamics. The location of Khanty-Mansiysk at 61° north latitude determines the range of daylight hours from 5 hours 32 minutes (December 22) to 19 hours 17 minutes (summer, the period of "white" nights) [4].

Thus, the **purpose** of our study was to identify the effect of the altered photoperiod on individual morning and evening preferences in the organization of life activities of students of the Northern Medical University in the winter and summer seasons.

Materials and methods

Students of the Khanty-Mansiysk State Medical Academy were interviewed using the Horn-Ostberg questionnaire [8]. We compared the answers for the winter season of the year (short daylight hours) and summer time (long daylight hours). 105 boys and 231 girls, medical students, were examined. Volunteers gave voluntary informed consent. According to the interpretation of the Horn-Ostberg questionnaire, 16–30 points correspond to the *definitely evening* type, 31–41 points correspond to a *moderate evening* type; 42–58 points - to an *arrhythmic (intermediate)* chronotype; 59–69 points - *moderate morning* chronotype, 70–86 points - *definitely morning* chronotype [8].

According to the differences between the answers in the winter and summer versions, *Photoperiodic Stability of the Chronotype,* (**PSC**) was determined using the computer program "Calculator of photoperiodic stability of the chronotype" [5]. The range of *normal* PSC values, according to the results of statistical tests, is from 4 (5% probability) to 16 cu (95% probability). The value PSC <4 cu is interpreted as a *rigid* chronotype, without pronounced adaptive behavioral reactions to exogenous factors, including the photoperiod; PSC> 16 cu indicates a *labile* chronotype that is overly dependent on external factors.

The following characteristics were also identified: - a score for the chronotype for the winter season; - scoring of the chronotype for the summer season; - the difference in the scoring of the chronotype in summer and winter; - the sum of the absolute differences in the answers to the test questions; - the number of nonzero differences; - the average value of the absolute differences in the answers to the test questions; - volatility coefficient - the average number of questions changing the difference by 1 point, as a percentage of 19.

Statistical processing

The study is instantaneous (transverse). The sampling method is non-randomized. The results of descriptive statistics are presented by the average value (M), median (Me), interquartile range $(Q_1 - Q_3)$. Verification of the normality of the distribution of the trait was carried out according to the Kolmogorov-Smirnov method with the correction of Lilliefors and Shapiro-Wilkie. For comparative analysis of numerical data, non-parametric Kolmogorov-Smirnov and Mann-Whitney criteria were applied. When testing statistical hypotheses, the critical significance level (p) was taken equal to 0.05 [2].

Results

According to the results of the survey, in groups of boys and girls, the average characteristics of the chronotype scoring corresponded to the arrhythmic (intermediate) chronotype: 45.70 / 46.00 points for boys and 46.05 / 46.00 points for girls (M/Me) for winter and respectively 46.71 / 47.00 and 46.61 / 46.00 points for the summer.

When comparing morning and evening preferences in the groups of boys and girls for the winter period, statistically significant differences were revealed on a number of issues (table 1). The differences concerned the preferred time for going to bed at night and well-being in the evening (questions №2, 10, 12), and well-being during physical exercises at different time intervals (question 9). Differences trends were identified for issues related to well-being in the morning awakening (question № 7) and periods of well-being (question № 18).

According to the results of the questionnaire for the summer season, gender differences were largely leveled. Statistically significant differences persisted only on question № 9: for young men, the indicators were 3.01 / 3.00 (2.00–4.00), for girls - 2.71 / 3.00 (2.00–3.00) points (M / Me $(Q_1 - Q_3)$). As it turned out, the young men demonstrated a subjectively better state of health for exercising in the morning (p = 0.011, Mann-Whitney test).

When analyzing gender differences in morning and evening preferences, we found that the girls had more *total differences* in answers to questions in the winter and summer variants, the *number of non-zero differences* and the *average of absolute differences* (table 2). The PSC was also higher in girls, that is, the *photoperiodic stability of the chronotype* was more pronounced in boys.

Table 1

Results of the Horn-Ostberg questionnaire among students of the Khanty-Mansiysk State Medical Academy in winter

№ of questions	Young men (n=105) M / Me (Q$_1$–Q$_3$)	Girls (n=231) M / Me (Q$_1$–Q$_3$)	P$_1$	P$_2$
1	2,51 / 2,00 (2,00–3,00)	2,35 / 2,00 (2,00–3,00)	>0,10	0,196
2	2,50 / 3,00 (2,00–3,00)	2,80 / 3,00 (2,00–3,00)	<0,10	**0,010**
3	1,37 / 1,00 (1,00–2,00)	1,29 / 1,00 (1,00–2,00)	>0,10	0,392
4	2,28 / 2,00 (2,00–3,00)	2,17 / 2,00 (2,00–3,00)	>0,10	0,335
5	2,64 / 3,00 (2,00–3,00)	2,48 / 3,00 (2,00–3,00)	>0,10	0,150
6	2,03 / 2,00 (1,00–3,00)	1,95 / 2,00 (1,00–3,00)	>0,10	0,389
7	2,07 / 2,00 (2,00–2,00)	1,91 / 2,00 (1,00–2,00)	>0,10	*0,089*
8	2,28 / 2,00 (2,00–3,00)	2,44 / 2,00 (2,00–3,00)	>0,10	0,228
9	2,61 / 3,00 (2,00–3,00)	2,14 / 2,00 (1,00–3,00)	**<0,025**	**0,0001**
10	3,14 / 3,00 (2,00–4,00)	3,50 / 3,00 (3,00–5,00)	<0,10	**0,011**
11	3,05 / 4,00 (2,00–4,00)	3,03 / 4,00 (2,00–4,00)	>0,10	0,961
12	1,96 / 2,00 (2,00–3,00)	2,25 / 2,00 (2,00–3,00)	>0,10	**0,041**
13	2,27 / 2,00 (1,00–3,00)	2,30 / 2,00 (1,00–3,00)	>0,10	0,774
14	2,44 / 2,00 (2,00–3,00)	2,38 / 2,00 (2,00–3,00)	>0,10	0,456
15	2,44 / 2,00 (2,00–3,00)	2,40 / 2,00 (2,00–3,00)	>0,10	0,796
16	2,03 / 2,00 (1,00–3,00)	2,22 / 2,00 (2,00–3,00)	>0,10	0,126
17	2,96 / 3,00 (2,00–3,00)	3,03 / 3,00 (3,00–4,00)	>0,10	0,516
18	2,72 / 3,00 (2,00–3,00)	2,86 / 3,00 (2,00–3,00)	>0,10	*0,098*
19	2,80 / 2,00 (2,00–4,00)	2,56 / 2,00 (2,00–4,00)	>0,10	0,319
CT	45,70 / 46,00 (41,00–52,00)	46,05 / 46,00 (41,00–51,00)	>0,10	0,934

Note: P$_1$ – Kolmogorov-Smirnov test, P$_2$ – Mann-Whitney test; CT – chronotype

In young men, the dynamics of winter / summer is most pronounced in answers to questions № 7, 4, 2, 3, 5 (in decreasing order): morning health is most variable with a stable assessment of cognitive abilities after waking up in the morning.

In the female group, the greatest seasonal differences were identified for questions № 10, 7, 2, 4, 9 (in decreasing order): girls are more likely to experience fatigue and desire to go to bed in the evening with a more stable assessment of morning well-being in relation to physical exercises.

Photoperiodic stability of the chronotype according to the results of the Horn-Ostberg questionnaire among students of the Khanty-Mansiysk State Medical Academy, winter/summer periods

Indicators	Young men (n=105) M / Me (Q₁–Q₃)	Girls (n=231) M / Me (Q₁–Q₃)	P_1	P_2
CT winter (points)	45,70/ 46,00 (41,00–52,00)	46,05 / 46,00 (41,00–51,00)	>0,10	0,934
CT summer (points)	46,71 / 47,00 (42,00–51,00)	46,61 / 46,00 (41,00–53,00)	>0,10	0,813
The difference in the amount of points (summer - winter)	1,01 / 1,00 (−1,00–3,00)	0,51 / 0,00 (−3,00–4,00)	>0,10	0,482
Sum of absolute differences	10,69/ 11,00 (6,00–15,00)	13,23 / 13,00 (9,00–17,00)	**<0,05**	**0,001**
The number of nonzero differences	7,75 / 8,00 (5,00–11,00)	9,30 / 10,00 (7,00–12,00)	**<0,01**	**0,002**
Mean absolute differences	0,56 / 0,58 (0,32–0,79)	0,70 / 0,68 (0,47–0,90)	**<0,05**	**0,001**
Volatility coefficient	24,10/ 12,00 (7,00–32,00)	22,11 / 11,00 (7,00–24,00)	>0,10	0,638
PSC (cu)	3,72 / 3,00 (1,00–6,00)	4,42 / 4,00 (2,00–6,00)	>0,10	**0,044**

Note: P_1 – Kolmogorov-Smirnov test, P_2 – Mann-Whitney test; CT – chronotype

Conclusion. Under the conditions of the altered photoperiod of the northern region, when the daylight hours vary significantly between the winter and summer seasons, more than half of high school students discovered a rigid chronotype. As it turned out, the organization of life of young men is less susceptible to exogenous influences than the functioning of girls, that is, the *photoperiodic stability of the chronotype* depended on gender. It is possible that the limitation of behavioral adaptation to light "swings" in the form of a significant reduction in the duration of daylight hours in winter and "white" nights in summer is associated with the need to maintain a dynamic stereotype. In the conditions of the northern region, the mode of social activity prevails over the natural pacemaker - light.

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狗的巴贝病和哈巴罗夫斯克地区向人类传播病原体的风险
BABESIOSIS OF DOGS AND THE RISK OF TRANSMITTING THE PATHOGEN TO HUMANS ON THE TERRITORY OF KHABAROVSK

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抽象。 本文专门介绍哈巴罗夫斯克市的犬幼犬病，这是一种通过媒介传播的危险的原生动物自然病灶之一，其中Dermacentor，Rhipicephalus和Haemaphysalis属的ixodid are是犬和人的犬幼虫的携带者。 给出了犬支原体病（巴贝西斯病）的检查分析。 显示了这种疾病对哈巴罗夫斯克市的紧迫性。
关键字：巴贝虫病，虫，子孢子体，B。microti。

Abstract. *The article is devoted to babesiosis of dogs in the city of Khabarovsk, as one of the dangerous protozoal natural focal diseases with a vector-borne transmission, where ixodid ticks of the genera Dermacentor, Rhipicephalus and Haemaphysalis are carriers of babesia for dogs and humans. The analysis of the examination of dogs with pyroplasmosis (babesiosis) is given. The urgency of the problem of this disease for the city of Khabarovsk is shown.*

Keywords: *babesiosis, Ixodes, sporozoites, B. microti.*

Currently, babesiosis (pyroplasmosis) in dogs is constantly recorded in many cities of Russia, and the epizootological characteristics of this disease have changed over the past decades. This parasite is widespread throughout the globe and affects not only domestic animals and related species, but also humans. To date, human babesioses are registered in North and South America, Europe, Asia and Africa, becoming increasingly important as new human diseases [2].

Babesiosis (pyroplasmosis) is a protozoal, natural focal disease with a vector-borne transmission, where babesia is transmitted for pets by ticks of the genus *Dermacentor, Rhipicephalus* and *Haemaphysalis,* for humans mainly ticks of the genus Ixodes, group *I. ricinus-I. persulcatus* [3]. The causative agent belongs to the type of protozoa, the class of sporozoans, the family *Babesiidae*. The complex cycle of development of babesia takes place partly in vertebrates, partly in ticks - car-

riers. The invasive stages of babesia are small mononuclear sporozoites, the development process of which occurs in the salivary glands and is stimulated by tick nutrition. Mature sporozodites are also found in the salivary glands of hungry ticks [2].

Of particular interest to us are ixodid ticks (*Ixodes persulcatus, Haemaphysalis concinna, H. japonica, Dermacentor silvarum*), whose range covers a vast territory in the forest zone of the Far East (Khabarovsk Krai), which take part in the babesiotic epizootic process. The largest number of cases of human babesiosis is associated with *B. microti.* Many authors note that due to a certain similarity between babesia and plasmodium malaria, babesiosis is often mistakenly diagnosed as malaria, especially in cases when trophozoites of the parasite in the affected erythrocyte take a ring-like shape resembling *P. falciparum* (Fig. 4) [1].

The severity of the course of babesiosis in dogs depends on the type of babesia and the physiological state of the animal.

Purpose of the study: to give an epidemiological analysis of the incidence of babesiosis among dogs in Khabarovsk and assess the likelihood of people becoming infected with this parasite.

Materials and methods

To achieve this goal, we conducted a blood test of dogs for the presence of babesia in 2017 (n = 17), ticks taken from animals (n = 23), performed a retrospective analysis of the incidence of pyroplasmosis in dogs for three years from 2015 - 2017 (n = 390). Maps of sick animals are provided by the Beethoven Veterinary Clinic of Khabarovsk. The diagnosis of piroplasmosis in dogs was made taking into account the history, clinical manifestations and microscopic examination of peripheral blood smears.

Fig. 1. *Blood test tube, stained preparation, tick vial*

Smears were prepared on defatted glass from the blood of dogs, dried in air and fixed with alcohol, then stained according to Romanovsky-Giemsa (Fig. 1). The study of ticks taken from dogs was examined under a microscope in order to determine the species. In total, 23 ticks were identified, of which 12 were identified as *Ixodes persulcatus*, 3 specimens. - *Haemaphysalis concinna* and 8 - *Dermacentor silvarum*.

The results of the study.

390 cards of sick animals that were admitted to the clinic in three years were studied and analyzed. Among them, 175 females and 215 males, the main age group was sick dogs from 6 to 10 years old (172 cl. - 44%), in second place from 1 to 5 years old (148 cl. - 38%) and the smallest number of infected were dogs older than 10 years (70 words - 18%). All animals lived in the territory of Khabarovsk. It was found that dogs over 6 years old are most affected by babesiosis. The smallest susceptibility was found in animals under the age of 1 year and older than 10 years. After studying the age dynamics, it was found that dogs suffer from babesiosis at any age and almost equally by sex (Fig. 2,3).
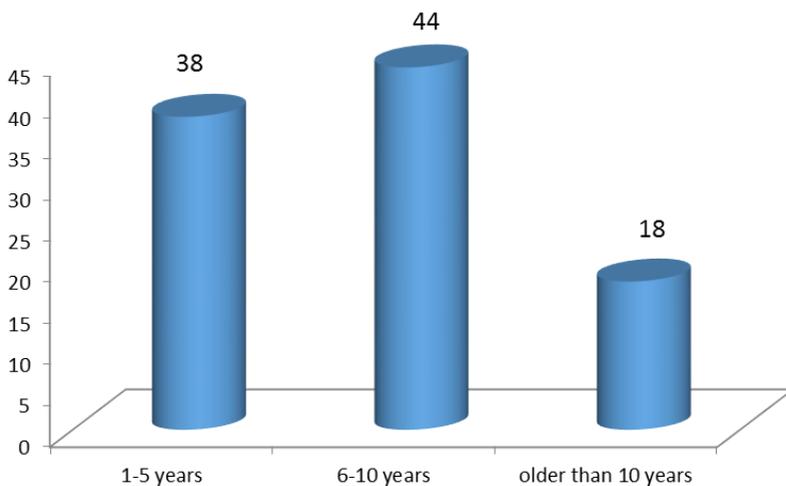

Fig. 2. *The intensity of invasion by babesiosis depending on age (%)*

Diagnosis of trophozoites and merozoites of babesia to the appearance of stained blood smears is rather difficult, therefore our task was only to detect parasites.

The preliminary diagnosis of pyroplasmosis was made comprehensively on the basis of clinical signs and further laboratory confirmation, the study of blood smears in which babesias were detected. A change in the morphology of red blood cells was manifested in a change in the shape, size and intensity of staining, in-

clusions within blood cells were noted. It should be noted that such a deformation is also observed in case of damage to red blood cells by malarial plasmodiums, Fig. 4.
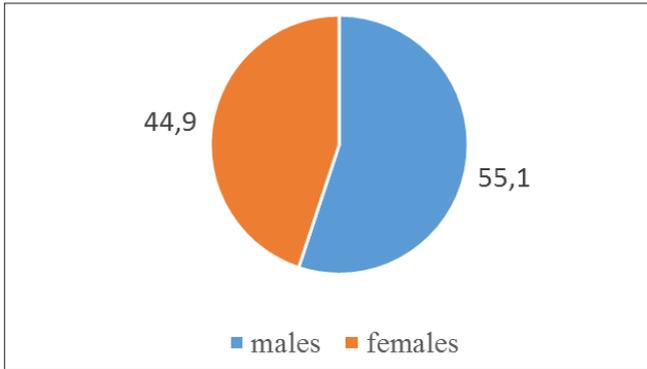

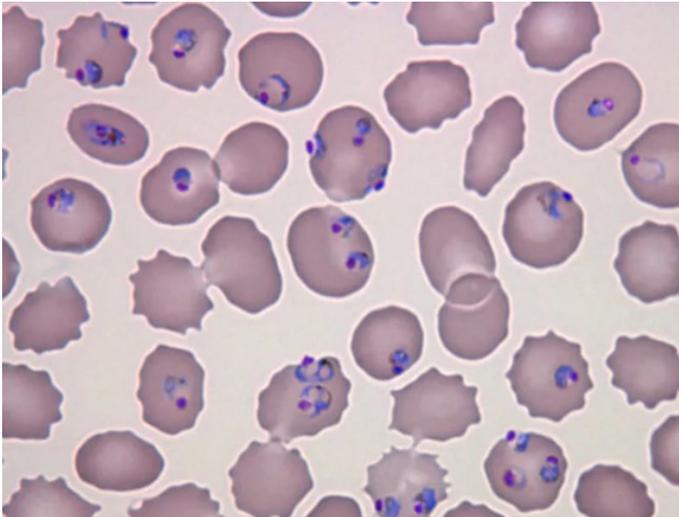**Fig. 3.** *Distribution of sick dogs by gender (%)*

Fig. 4. *P. falciparum in the blood of a patient with malaria*

As can be seen from Fig. 5, red blood cells of various sizes and shapes appear in sick dogs. The edges are uneven, jagged. Since babesias absorb hemoglobin from blood cells, they become less stained. Clinically manifested by anemia of sick dogs with babesiosis.

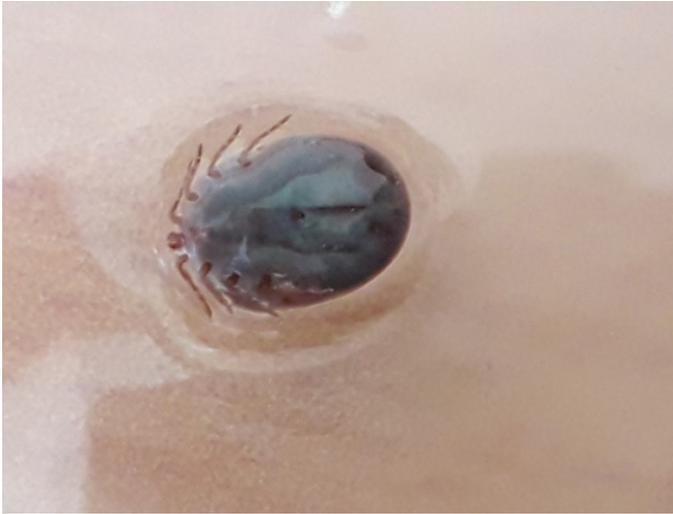***Fig. 5.*** *Babesia in a blood smear of a dog*

Fig. 6. *Tick Dermacentor silvarum, taken from a sick dog*

Conclusion

Currently, babesiosis is attracting more and more attention not only of researchers, but also of practicing doctors as a new, ubiquitous common zoonotic disease in humans. This becomes especially obvious given that in some areas of the Russian Federation in rodents' blood in 45.2% of cases the *Babesia microti* pathogenic for humans are detected by polymerase chain reaction, and in the larvae of ixodid ticks, the genetic material of babesia is found in 10.7% of cases [3].

Thus, it can be noted that dog babesiosis remains an important veterinary problem in the city of Khabarovsk. Based on the data received, the following recommendations are proposed:

1. Owners of dogs located in areas endemic for these blood-borne diseases should carry out a set of measures to prevent the attack of ixodid ticks.

2. Since, according to the phylogenetic analysis of the 18S ssRNA gene during PCR diagnostics of all human and wild isolates of *Pl. falciparum* and *Babesia sp.* are closely related, it is necessary to introduce the PCR method in laboratory diagnostics in order to detect the pathogen DNA. In one person, not one, but several species can parasitize [3].

3. Continue the study of the species composition of babesias pathogenic for humans in ticks of the Khabarovsk Krai using modern molecular diagnostic methods to assess the risk of infection.

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逐步增加负荷的滑雪运动员股四头肌的研究
THE RESEARCH OF THE QUADRICEPS FEMORIS OF SKIERS-RACERS WITH STEPWISE INCREASING LOAD

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抽象。对训练滑雪者的要求不断提高，迫使教练寻找新的方法来改进运动训练的计划。这方面最重要的问题之一是培训过程的质量管理。同时，应该合理地进行管理和控制，并需要专家和运动员。本文介绍了使用" CALLIBRI MUSCLE TRACKER"肌谱学系统从滑雪运动员获得的结果。该设备旨在记录运动员在进行不断增加的体育锻炼过程中股四头肌的基本参数。研究了股四头肌的平均和最大收缩幅度。我们还考虑了在一分钟内的肌肉收缩次数，研究了收缩面积的平均值和肌肉收缩的平均时间。在熟练滑雪者中观察到大腿外侧肌肉的活动是在大众滑雪者和其他体育活动中的1.5倍。

关键词：滑雪者，股四头肌，肌电图，自行车测功负荷，收缩。

Abstract. *Increasing requirements for training skiers-racers are forcing coaches to look for new approaches to improve the planning of sports training. One of the most important problems in this is the quality management of the training process. At the same time, management and control should be reasonably accessible and in demand for specialists and athletes. The paper presents the results obtained from skiers-racers using the "CALLIBRI MUSCLE TRACKER" myographic system. The device is designed to record the basic parameters of the quadriceps femoris in athletes in the process of performing increasing physical activity. The average and maximum amplitude of contraction of the quadriceps femoris of riders was studied. We also studied the average value of the contraction area and the average time of muscle contraction, taking into account the number of muscle contractions in one minute. The activity of the lateral thigh muscle (musculus vastus lateralis) is observed among highly skilled skiers-racers by 1.5 times than among mass-skiers and other sports.*

Relevance

The modern level of development of skiing constantly requires control over changes in the volume and intensity of applied training loads. On the one hand, this is necessary due to the increasing influence of physical and mental stress and on the other, the need to increase the effectiveness of sports training management in connection with the growing trend of accelerating the process of sports training of riders. In this regard, many experts in the field of sports training conducted multiple studies of the functional state and reserve capabilities of the body of athletes, depending on the age, fitness and typology of the manifestation of indicators [1,2,3,5,6].

In the process of systematic training, adaptive changes in the body system occur. Human muscles are the main motor mechanism of the controlled autonomic nervous system. The muscular system with increasing physical activity works in tandem by the circulatory and respiratory system. Therefore, in studies it is very important to consider all these indicators in combination.

The study of the role of muscle activity in physical activity was carried out by many experts. For example, the functionality and contractile and relaxation capabilities of the quadriceps femoris were studied in studies conducted by Yu.V. Vysochin and his students (2007). The rate of voluntary relaxation of skeletal muscles was found, proving a connection with the functional activity of the central unequal system. It has been established that the rate of muscle relaxation must be taken into account when studying the formation of long-term adaptation of athletes to physical activity of various capacities. Works of Yu.V. Vysochin, and his students are the rationale for further research on the inclusion of the quadriceps femoris muscle at work and recovery periods [1, p. 50-58].

Stickland, (2003) studied the dependence of muscle functionality on the maximum heart rate during exercise [10, p. 291-298]. In modern studies by authors such as Polat, (2016); Ettema, (2017); Dahl, (2017) conducted on ski riders testing them at high heart rate in the submaximal power zone, recorded the maximum oxygen consumption by the muscles, as an indicator of the dependence of work on oxygen transport to working muscles [7,8,9].

In modern sports of the highest achievements, the study of muscle activity under loads of stepwise increasing power is also relevant. It is this approach that allows you to adjust the training impact to improve the management of sports training of skiers-racers.

R.E. Petrov et al. (2018) conducted a series of studies aimed at assessing the potential capabilities of the hearts of riders with stepwise increasing bicycle er-

gometric load. The power of the aerobic threshold of the muscles of the legs, the relative power of the aerobic threshold of the muscles of the legs, the heart rate of the aerobic threshold of the muscles of the legs, the power of the maximum aerobic capabilities of the muscles of the legs was noted when the heart rate reached 180 beats/min. Further, the relative power of the maximum aerobic capabilities of the leg muscles, taking into account the body weight of the riders and the relative potential power of the heart system [4, p. 198-206].

The aim of this work was to study the electromyogram of the quadriceps muscle of skiers-racers when performing bicycle ergometry.

Research methods

The CALLIBRI MUSCLE TRACKER myographic system was used to record the work of the quadriceps femoris muscle (shin extensors) when performing a bicycle ergometric load of increasing power. Physical load was set on a "Kettler E3" type bicycle ergometer, where the initial load was 30 watts. After 1 minute of execution, the load was increased by 15 watts. This continued until the level of heart rate achievement was reached at 170 bpm.

Results

Figure 1 shows the window for recording an electromyogram (EMG) of the quadriceps femoris of skiers-racers, where the average and maximum amplitudes of the extensors of the lower leg were recorded.
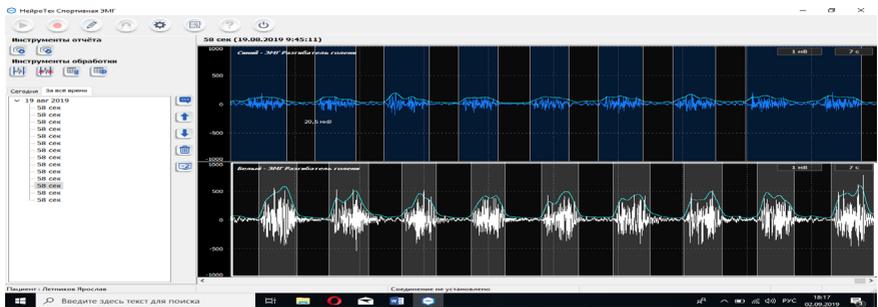

Fig. 1 *Example of recording an electromyogram of the quadriceps femoris*

The four-headed muscle of the thigh (musculus quadriceps femoris), the strongest muscle of the musculoskeletal system of a person, has four heads and is involved in the extension of the lower leg. The muscle is the rectus femoris (musculus rectur femoris); medial thigh muscle (musculus vastus femoris); lateral thigh muscle (musculus vastus lateralis); middle (intermediate) broad muscle of the thigh (musculus vastus intermedius). The main function of the quadriceps femoris muscle is through the reduction of all the heads produces extension of the lower leg and participation in flexion of the thigh.

Table 1 presents the indicators of the electromyogram of the contraction of two heads of the quadriceps femoris.

Table 1. *Indicators of the electromyogram of the straight (musculus rectur femoris) and lateral quadriceps femoris (M. Vastus lateralis)*

The investigated performance parameters of musculus quadriceps femoris	A (av), µV	A(max), µV	S, µV*ms	T(av), s	N
Musculus rectur femoris	94	203	46	0,5	71
Musculus vastus lateralis	328	670	136	0,4	74

Note: A (av) – average contraction amplitude of the quadriceps femoris; A (max) – the maximum amplitude of contraction of the quadriceps femoris; S – the average value of the area of contraction of the quadriceps femoris; T (av) – the average time of muscle contraction; N – the number of muscle contractions in one minute.

The amplitude of contraction of the rectus femoris muscle in skiers-racers was 94 µV, and the lateral of the broad muscle was 328 µV. These indicators can be considered as a manifestation of muscle strength during physical exertion. The maximum amplitude of contraction of the quadriceps femoris was twice as large as the average amplitude of contraction of the muscles. If for skiers-racers, the maximum amplitude of contraction of the rectus femoris muscle was 203 µV, and the lateral of the broad muscle was 670 µV and fluctuated to 987 µV.

It was noted that the functional and contractile capabilities of the muscle depend on the orientation of the training process. When training skiers-racers in two modes, a change in the manifestation of muscle strength muscles was revealed, which was characterized by the maximum amplitude of contraction of the quadriceps femoris.

According to the electromigram, we determined the proportion of participation in the work of all the heads of the quadriceps femoris. It is noted that the inclusion of all the heads in the work proceeds differently and sequentially depending on the preparedness and genetic predisposition of the body to the manifestation of a source of energy supply.

Figures 2 and 3 show the percentage of inclusion in the work of the heads of the quadriceps femoris muscle when performing bicycle ergometric load, moderate and maximum power. It is noted that the specific weight of including each head of the quadriceps femoris in the work varies and depends on the power of the work performed and the preparedness of the athletes. It is known that the endurance of skiers-racers largely depends on the physiological characteristics of the muscles, which is determined by structural changes in the process of sports training.
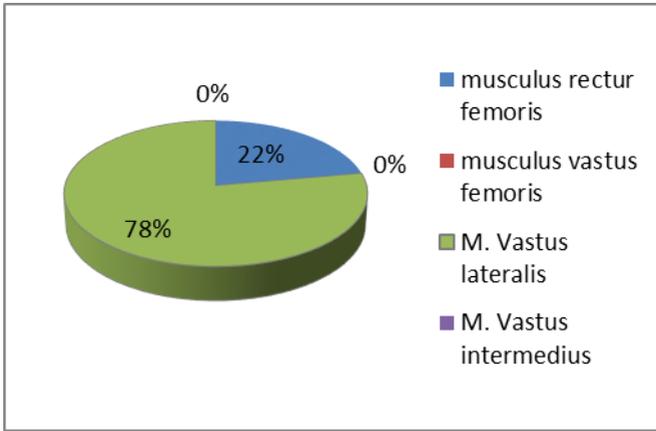
Fig. 2 The shares of the heads of the quadriceps femoris under moderate power exercise.
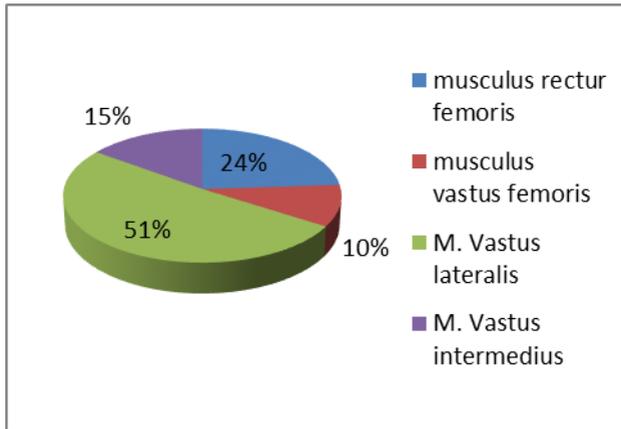

Fig. 3 The shares of the heads of the quadriceps femoris muscle with a bicycle ergometric load of maximum power.

In our example, among skiers-racers, the share of participation of the heads of the quadriceps femoris with moderate ergometric load differs from the share in the load of maximum power. The gradual inclusion of the quadriceps femoris muscle with an ergometric load of increasing power shows the predominance of slow muscle fibers, as a characteristic adaptation of the leg muscles to long loads, with a pronounced aerobic type of energy source for muscle activity.

The activity of the lateral thigh muscle (musculus vastus lateralis) is observed among highly skilled skiers-racers by 1.5 times higher than among mass-skiers and in other sports.

Conclusion

Thus, as in the theory and practice of sports training, there is a contradiction between the need to use equipment to determine the effectiveness of the functioning of body systems in the course of their many years of training and the absence or incomplete use of scientifically based technologies for integrative control and assessment of the effectiveness of training effects on the body of sportsmen.

The information obtained is necessary to solve the problem, aimed at determining the rational ratio of the volumes of funds of various kinds for the implementation of micro-meso - and macrocycles for training skiers - racers within the framework of one lesson.

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SELENIUM CONTENT IN SURFACE WATERS OF THE WHITE AND BARENTS SEAS

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Abstract. *In this work, the selenium content in the surface waters of the White and Barents Seas was determined by the method of fluorimetric determination of selenium content with 2,3-diaminonaphthalene. For the first time, a scale was developed for standardizing the content of selenium in marine ocean waters. A comparison and generalization of the distribution of levels of selenium in the White and Barents Seas was made, and the prevalence of the average level of selenium was revealed. In the Barents Sea, there is a diversity in the frequency distribution of selenium levels in water samples.*

Keywords: *selenium content level, rationing scale, White Sea, Barents Sea.*

Arkhangelsk Oblast is located in the far north of the European part of Russia. In the north it is washed by the seas of the Arctic Ocean - the Barents and Kara, in the west - the White. The White Sea is the inland sea of the Arctic Ocean, occupies a space between 68 ° 40 ′ and 63 ° 48 ′ north latitude, 32°00′ and 44°30′ east longitude, and is a semi-enclosed body of water. The White Sea is connected by a narrow strait with the Barents Sea, there is a conditional border between these seas, in the north along the line of Cape Svyatoy Nos - Cape Kanin Nos [3, 9]. The Barents Sea - the marginal sea of the Arctic Ocean, is located beyond the Arctic Circle between the northern coast of Europe, the islands of Novaya Zemlya, Franz Josef Land and Spitsbergen. In the west it borders with the Norwegian Sea basin, in the south - with the White Sea, in the east - with the Kara Sea, in the north - with the Arctic Ocean [2, 8].

Sea water samples were taken at hydrological stations from various depths using the SBE 32c sounding system equipped with twelve five-liter bathometers. If the selected sample was not delivered within 48 hours, it was preserved using 1.5 ml concentrated nitric acid per 500 ml of water and stored in the refrigerator. The analysis of the samples was carried out on land in the laboratory of biogeochemical studies of the INSaT. As a sample preparation method, the method of

wet burning of samples with a mixture of concentrated HNO$_3$ and HClO$_4$ (3: 1) or (4: 1), which quickly destroy biological materials, organic substances, and tissues, was chosen. This mixture is the best for decomposition [1,5].

Based on the data indicated in the literature, it can be noted that selenium is a rare chemical element. Therefore, in determining selenium, the sensitivity of the method should be 0.01 μg/g [4]. After analyzing the accuracy of the methods, the capabilities of the laboratory, for the quantitative determination of selenium, the method of fluorimetric determination of the content of selenium with 2,3-diaminonaphthalene was chosen [6,7].

To assess the levels of selenium in seawater, we proposed a standardization scale presented in Table 1. According to published data, the median or average selenium content in seawater is 0.2 μg/L. Water samples, in which the concentration of selenium is less than average, corresponds to a low selenium content in the samples. Samples with a selenium content above 0.2 μg/L to 1 μg/L correspond to the average level. The MPC of selenium in seawater is 2 μg/l, which is the boundary between the high and very high levels of selenium in seawater samples. The selenium content from 1 μg / L to 2 μg/L corresponds to a high level, but above 2 μg/L corresponds to an excess of the MPC and corresponds to pollution.

Table 1 - *Scale for standardization of selenium content in marine ocean waters*

Content and Pollution Levels		C_{Se}, mcg/l	Color code
level	low	≤0,2	
	medium	0,2 - 1	
	high	1 – 2	
pollution		≥2	

The location of sampling points in the White Sea is shown in Figure 1.

The results of the chemical experiment are presented in table 2.

Table 2 - *Results of the study of surface waters of the White Sea*

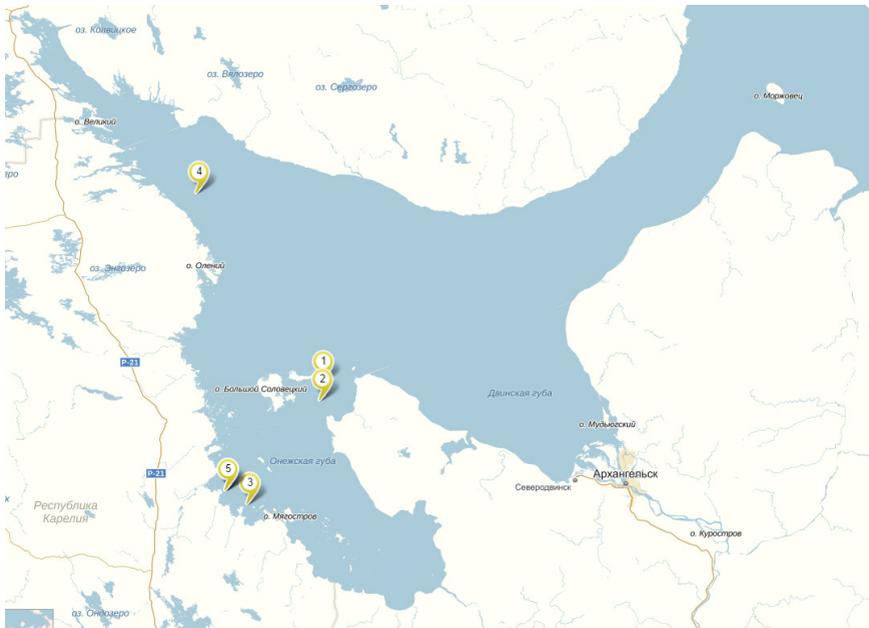| Object name	Geographical position	$C_{Se, μg/l}$
White Sea		
Gulf of dvina (point 1)	65°12',36°35'	0,33±0,06
Gulf of dvina (point 2)	65°02', 36°34'	0,34±0,04
Onega Bay (point 3)	64°42', 35°35'	0,35±0,04
Kandalaksha (point 4)	66°18', 34°66'	0,4±0,09
Point 5	64°50', 35°06'	0,68±0,04

Figure 1 - *Location of sampling points in the White Sea*

The selenium content in the surface waters of the coastal territory of the White Sea differs insignificantly, and ranges from 0.33±0.06 to 0.68±0.04 μg/l. Only point 5 has the highest selenium concentration compared to all water samples. The reason for this may be the proximity of the city of Belomorsk and the White Sea - Baltic Canal.

To assess the ecological state of seawater samples, we used the scale of environmental standardization of selenium content in marine ocean waters, proposed by the author of this work. The results are presented in table 3.

Table 3 - *Assessment of levels of content and pollution of surface waters of the White Sea*

Object of study	Levels of content and pollution,% of samples			
	low ≤ 0.2 μg /l	medium 0,2 – 1 μg/l	high 1 – 2 μg /l	pollution ≥2 μg /l
White Sea water samples	-	100	-	-

The table can be illustrated using Figure 3.

All water samples of 100% of the White Sea are characterized by an average selenium content. But five water samples are clearly not enough to give an accurate assessment of the distribution and content of selenium in the waters of the White Sea.

The location of the sampling points in the Barents Sea is shown in Figure 2.
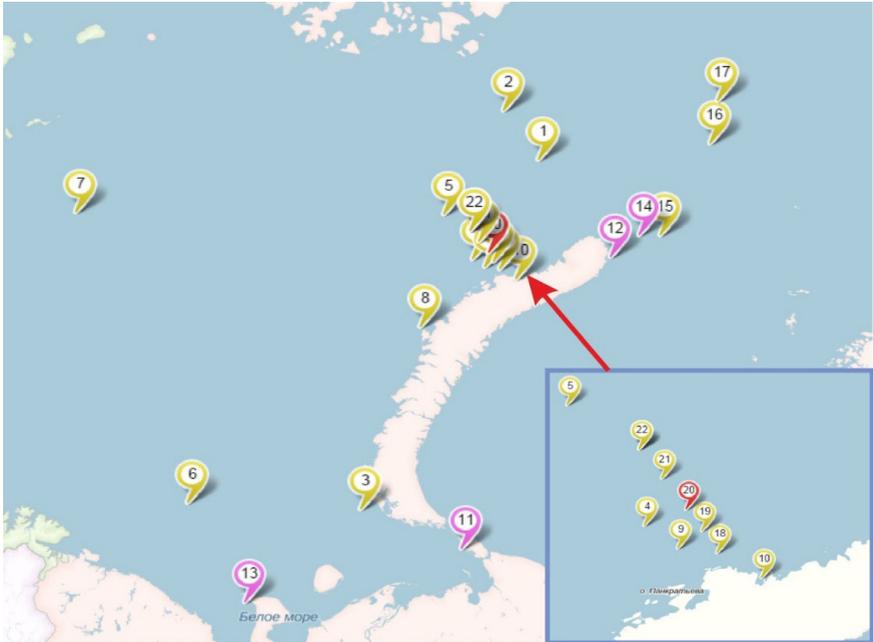

Figure 2 - *Location of sampling points in the Barents Sea*

The results of the chemical experiment are presented in table 4.

Barents Sea		
The deepest (point 1)	78°30', 64°05'	0,48±0,04
FJL (point 2)	79°07', 61°58'	0,31±0,04
Kolguev Island (point 3)	71°00', 51°48'	0,34±0,04
Russian harbor (point 4)	76°57', 59°42'	0,53±0,09
Russian harbor (point 5)	77°38', 57°40'	0,46±0,06
Severomorsk (point 6)	71°17', 33°29'	0,32±0,04
Point 7	77°42', 31°35'	0,71±0,04
Point 8	75°24', 55°70'	0,41±0,04
Russian harbor (point 9)	76°41', 60°29'	0,58±0,05
Russian harbor (point 10)	76°11', 62°37'	0,9±0,04

Continuation of Table 4

Barents Sea		
Vaigach Island (point 11)	70°02', 60°24'	1,8±0,04
Cape Zhelaniya (point 12)	76°56', 68°34'	1,17±0,05
Cape Kanin Nos (point 13)	68°39',43°32'	1,08±0,1
Point 14	77°00', 71°22'	1,02±0,07
Point 15	77°00', 72°70'	0,88±0,07
Point 16	78°57', 76°20'	0,93±0,05
Point 17	79°22', 76°75'	0,65±0,05
Point 18	76°38', 61°32'	0,9±0,06
Point 19	76°53', 60°94'	0,7±0,05
Point 20	76°68', 60°52'	2,73±0,11
Point 21	76°89', 59°88'	0,52±0,07
Point 22	77°09', 59°28'	0,78± 0,07

The selenium content in the surface waters of the Barents Sea ranges from 0.31±0.04 to 2.73±0.06 μg/L.

To assess the ecological state of seawater samples, we used the scale of environmental standardization of selenium content in marine ocean waters, proposed by the author of this work. The results are presented in table 5.

Table 5 - *Estimation of levels of content and pollution of surface waters of the Barents Sea*

Object of study	Levels of content and pollution,% of samples			
	low ≤ 0,2 μg/l	medium 0,2 – 1 μg/l	high 1 – 2 μg/l	pollution ≥ 2 μg/l
Barents Sea water samples	-	77,27	18,18	4,55

The table can be illustrated using Figure 3.

Most water samples in the Barents Sea are characterized by an average level of selenium in them. Water samples with a high level and even contaminated with selenium appear. There are no obvious reasons for explaining the pollution, since out of 9 water samples taken (approximate figure 2 in the lower right corner) taken in this area, eight water samples correspond to the average selenium content and only one is out of the general row. At this stage, there is still little data to assess the selenium status of the surface waters of the Euro-Arctic region.

Comparing the distribution of selenium levels in the White and Barents Seas, we observe a predominance of the medium selenium content. Low levels were not observed in any of the seawater samples. In the Barents Sea, there is a diversity in the frequency distribution of selenium levels in water samples.
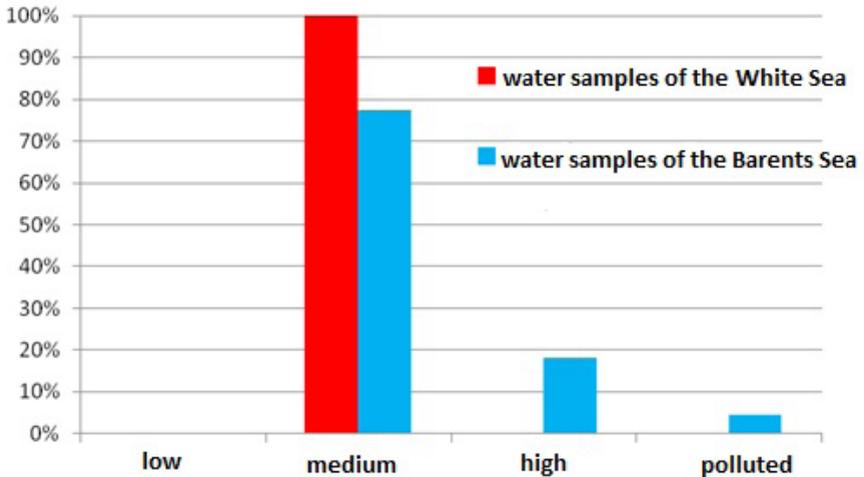
Figure 3 - *Frequency distribution of levels and selenium pollution in the surface sea waters of the Euro-Arctic region*

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非创伤性脑出血患儿血流动力学参数昼夜节律的结构
THE STRUCTURE OF CIRCADIAN RHYTHMS OF HEMODYNAMIC PARAMETERS IN CHILDREN WITH NON-TRAUMATIC CEREBRAL HEMORRHAGE

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抽象。 作者发现，在新生儿非创伤性脑出血的第一天，第3组儿童的SBP昼夜节律水平相对于第1组指标显着提高了15%。 顶峰相的夜间变化是心脏功能适应不良状态的不利征兆。 在第3、8、9、10天的儿童中，DBP的昼夜波动范围似乎最为明显。 DBP的明显昼夜差异是新生儿期脑出血期间外周血管音调不稳定的特征。
关键词：昼夜节律，血液动力学，非创伤性出血，脑，新生儿。

Abstract. The authors revealed a significant increase in the level of the SBP circadian rhythm mesor in children of group 3 by 15% relative to the indicator in group 1 on the first day of non-traumatic cerebral hemorrhage in newborns. The shift of the acrophase peak by night is an unfavorable sign characterizing the maladaptive state of heart function. The range of diurnal fluctuations of DBP seemed most pronounced in children of the 3rd group at 1,8,9,10 days. The pronounced diurnal differences in DBP characterize the instability of the tone of the peripheral vessels during cerebral hemorrhage in the neonatal period.

Keywords: circadian rhythm, hemodynamics, non-traumatic hemorrhage, brain, newborns.

Relevance. Using amplitude-phase analysis, it was found that in the relationship between the sympathoadrenal and parasympathetic divisions of the ANS, "critical points" form at certain hours of the circadian daily biorhythm, when the sympathoadrenal mechanisms are already losing their functional activity and

parasympathetic mechanisms are not yet implemented. In critical periods in the circadian daily biorhythm It is 01-05 hours of the morning and 13-17 hours of the day [5]. In these periods, individual displacements of critical points in the process of life support are possible. These provisions are adequately covered in the physiology of children (3), however, in pathology, this condition requires confirmation [1,2] It has been established that the depth of the violation of the temporal organization of physiological functions correlates with the severity of the disease [4]. Numerous works have proved that cyclic diurnal fluctuations in heart rate and respiratory rate are established by 1.5-2 months of life. Mortality in non-traumatic cerebral hemorrhage reaches 29–41% [2.5]. Given the high mortality rate, the problem of detecting early signs of an objective assessment of the severity of a condition with hemorrhagic stroke in children remains relevant.

Purpose of work. Study and evaluate changes in the structure of circadian hemodynamic fluctuations in children with non-traumatic cerebral hemorrhage.

Material and research methods. 53 patients were divided into 3 groups: 1 group - non-operated, 2 - operated, 3 - children who died in ICU with non-traumatic hemorrhage in the brain. The age of children of the 1st group at the time of the operation was 44.3 ± 9.9 days, 2 group - 48.2 ± 14.5 days, 3 group - 49.1 ± 10.8 days. The length of stay in the ICU for children of the 1st group was 8 ± 2.8 days, 2 group - 11.6 ± 4.5 days, 3 group - 10.5 ± 4.5 days. In the preoperative and postoperative periods, hemostatic therapy was carried out, deficiency of BV components (hemo-, plasmotransfusion), barbiturates, nootropic, membranotropic drugs, decongestant therapy were compensated. Nutritional support was primarily enteral. Along with monitoring the vital systems of the body, systolic (SBP), diastolic (DBP), mean (MBP) blood pressure were recorded with an interval of 1 hour. The research data were processed by the method of variation statistics using the Excel program by calculating arithmetic mean values (M) and mean errors (m). To assess the significance of differences between the two values, Student's parametric criterion (t) was used. The critical level of significance was taken equal to 0.05.

A comparative analysis of deviations in the groups of non-operated (group 1), operated children (group 2) with a favorable and fatal (group 3) outcome was carried out. The first group consisted of 18 babies with effective conservative therapy. The second group included 29 operated children and the third - 11 with an unfavorable outcome that occurred in 4 children on the first day of admission to the clinic, 7 - by 9 - 10 days.

Research results and discussion. As shown in Table 1, only on the first day a significant increase in the SBP circadian rhythm mesor was revealed in children of the 3rd group by 15% relative to the indicator in the 1st group.

Comparative evaluation of the circadian rhythm mesor of systolic blood pressure in non-traumatic cerebral hemorrhage (mmHg)

Days	1 group	2 group	3 group
1	86,6±5,7	89,5±10,6	96,3±1,4*
2	82,7±6,1	91,3±10,4	88,6±7,8
3	80,6±7	90,6±7,2	79,6±10,1
4	83,9±5,7	90,1±5,2	79±8,6
5	86,8±3,3	85,9±7,4	88,4±6,1
6	86,9±3,2	84,7±4,8	86,6±5,7
7	88,3±3,1	87,8±4,3	82,3±9,7
8	90,2±4,8	88,1±3,9	86±6,7
9	90,2±3,4	87±3,8	79±8
10	87,5±2	88,1±9,3	78,6±9

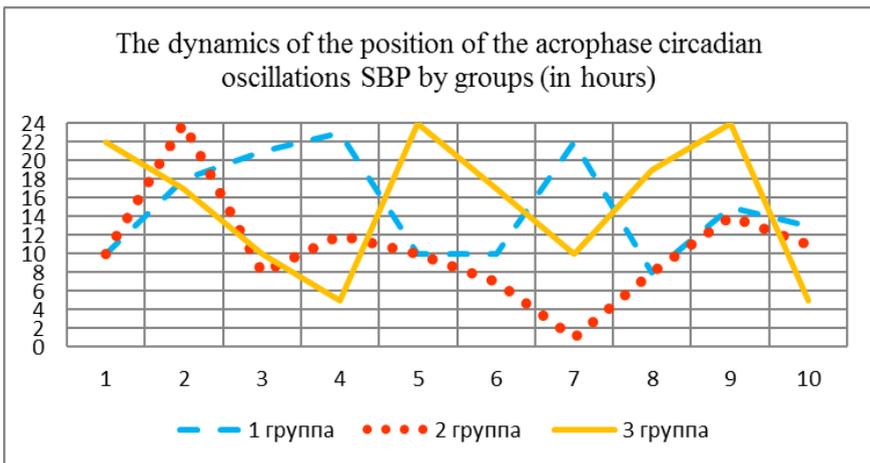*- the difference is significant in groups 1 and 3.

Fig.1

As can be seen from the presented figure in group 1, the peak of the acrophase SBP was within the physiological range of 9 - 10, 15.13 hours in 1, 5,6, 8,9,10 days. A pathological shift in the peak of acrophase by night hours (23.22 hours) was observed on 4.7 days. That is, in group 1 for 6 out of 10 days of observation, the peak of acrophase was normal or close to normal. In group 2, physiological parameters of acrophase (10.8, 11, 10, 7, 8, 11 hours) were detected on days 1, 3, 4,5, 6, 6, 8, 10. Thus, the normal position of the peak of the acrophase SBP in group 2 was observed within 7 (out of 10) days, in unoperated children at 6 (out

of 10) days of observation. In group 3, the normal position of the peak of the acrophase SBP was detected on days 3, 7, i.e. within 2 out of 10 days. The most pronounced shift of the acrophase peak of the heaviest children (group 3) by night hours was detected on 1,5,8,9 days. Thus, the shift of the acrophase peak by night hours can be considered an unfavorable sign characterizing the maladaptive state of heart function.
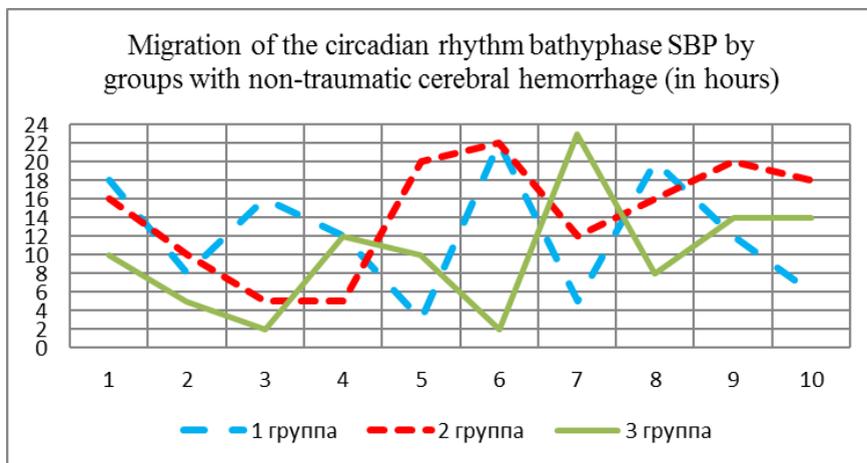

Fig.2

As you know, the SBP bathyphase is normally projected at night (0-3 hours). In group 1, only on the 5th day the position of the bathy phase was projected and at 3 a.m., the shift to the daytime was noted on the 1,2,3,4,6,8,9,10 day. In group 2, the normative values of bathyphase were not detected. In group 3, the projection of the peak of the bathyphase corresponded to 2 hours on 3.6 days, on the remaining days of non-observation, the peak of the bathyphase was projected in the daytime. Thus, no significant distinguishing features of the migration of the peak of the bathyphase depending on the severity of the condition have been identified.

The feature of group 3 was the amplitude of diurnal fluctuations of SBP on day 1, when SBP in group 3 was 36, in 2 - 12, in 1 - 20 mmHg. That is, the amplitude of the daily fluctuation of SBP at 1 day more than 20 mmHg can be taken as an indicator of the instability of SBP under conditions of excessive stress response of the body to acute hemorrhage in the brain and the most serious condition of the patient. In the following days, no distinctive features of the dynamics of the range of SBP circadian oscillations were revealed.

The mesor of the circadian rhythm of the newborn in group 1 on the first day was 43.6 ± 5.3 mmHg, group 2 - 44.5 ± 3.6 mmHg, group 3 - 46 ± 7.1 mmHg. Throughout the observation, there were no significant changes in the indicator.
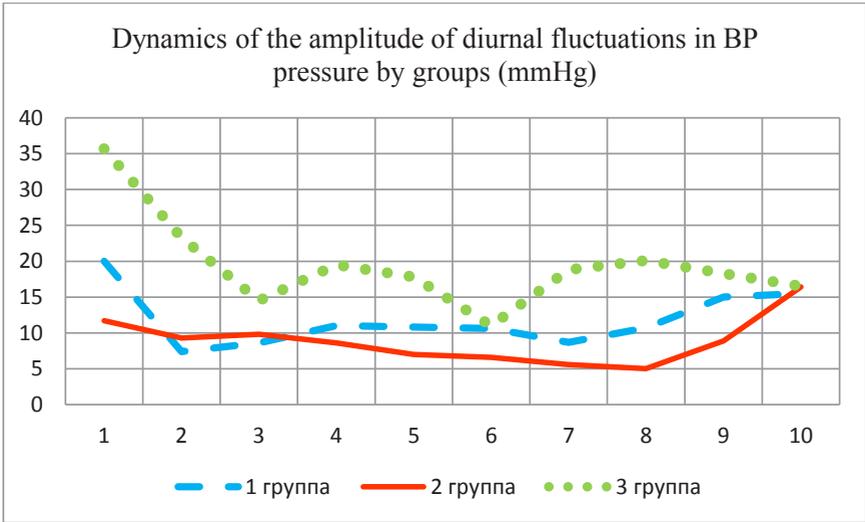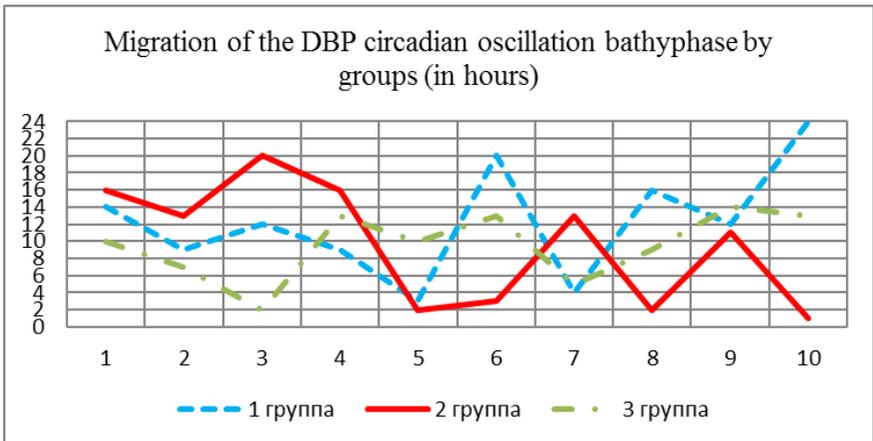

Fig.4

Fig.5

The closest to the standard values of the projection of the peak acrophase DBP was observed in groups 1 and 2 of children. So, in group 1, normal or close to normal values were detected on 1, 5, 6, 7, 10 days, that is, in 5 out of 10 days. In group 2, acrophase peak migration occurred within normal limits or during normal hours on days 1,3,4,5,6,8,9,10, amounting to 11,10,15,13,8,8,8,13 hours. That is, in the operated children in 8 out of 10 days of observation, the peak of the acrophase DBP was close to normal. While in group 3 at 2,3,4,7,9 the peak position of the acrophase DBP was close to the normative. Thus, group 3 was distinguished not only by the most pronounced displacements of the acrophase peak, projection at night. The least pronounced displacements of the peak acrophase of DBP circadian rhythm were observed in 2 groups of children.

No significant distinctive features of the migration of the peak of the DBP circadian rhythm bathiphase between the three groups were revealed. So, in group 1, the projection of the bathyphase at night was detected on 5,7,10 days, in group 2 - on 5.6.8.10 days, in 3 - only on days 3 and 7. The position of the peak of the bathyphase was closest to normal in the 2nd group of children.
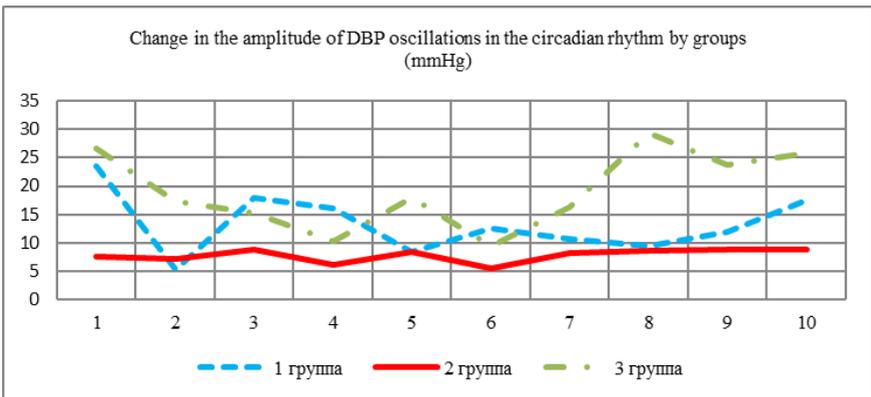

Fig.6

The range of diurnal fluctuations of DBP was most pronounced in children of the 3rd group at 1,8,9,10 days. The least significant changes in the amplitude of diurnal BP fluctuations were observed in group 2 of infants (within 7–9 mmHg). We regarded the latter as the most favorable state of peripheral vascular tone in non-traumatic hemorrhage in children. The pronounced diurnal differences in DBP characterize the instability of the peripheral vascular tone in group 3 due to the stress state caused by a systemic inflammatory response to the intracerebral hematoma, increasing intoxication on the 8,9,10 days of observation.
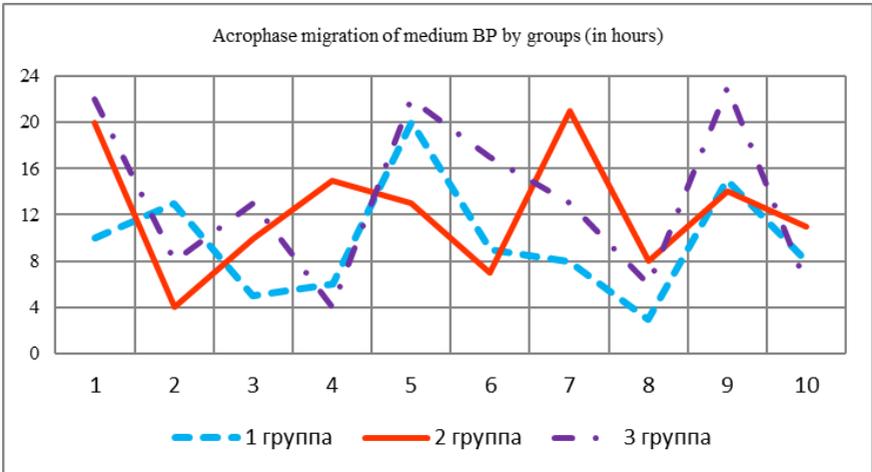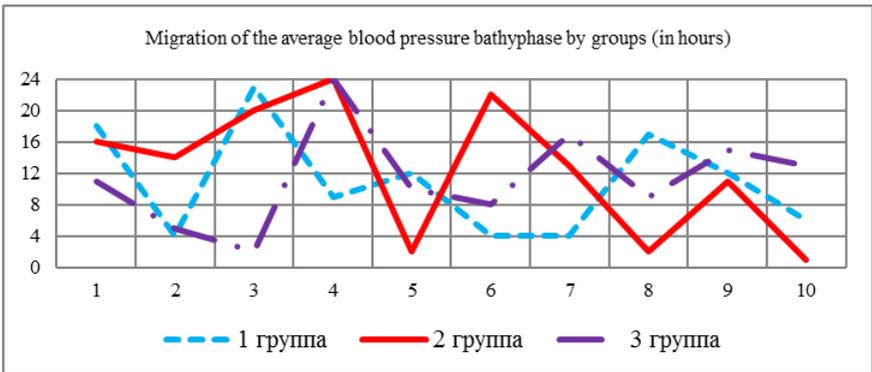
Fig.7

Fig.8

The meson index of the circadian rhythm of the average blood pressure in the 1st group was 62.9 ± 11.7 mmHg, 2 - 63.1 ± 7.9 mmHg, 3 - 71 ± 9.1 mmHg. There were no significant differences between the studied groups, as well as in dynamics. The closest to the normal projection of the mean BP acrophase was the migration of group 2 acrophase, in which the projection of the acrophase corresponded physiological for 7 days out of 10, in group 1 the position of the acrophase was blisch to normal at 5 points and in group 3 - 5 points. Thus, there were no significant differences in the position of the peak acrophase of the daily rhythm of MBP in groups 1 and 3. Only in the operated children for 7 days, the position of the peak acrophase of the daily rhythm of MBP was found close to the normative values.

The normal projection of the bathyphase at night (0-3 hours) in the 1st group was not found, a close position to the normative - by 2,3,6,7 days, that is, within 4 days. In group 3, the normal projection of the bathyphase was noted only on the 3rd day, close to normal on the 4th day. On the remaining days, the bathyphase was shifted in the daytime. In group 2, the normal projection of the bathyphase was detected on days 4,5,6,10 (Fig. 8).
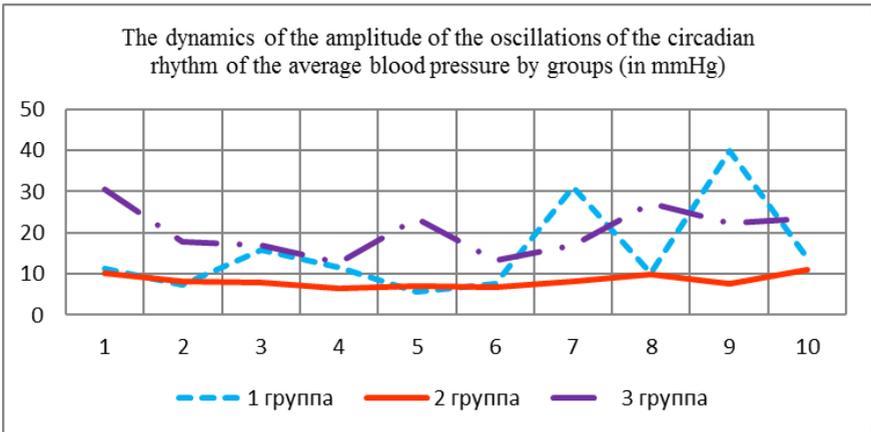
The dynamics of the amplitude of the oscillations of the circadian rhythm of the average blood pressure by groups (in mmHg)

Fig.9

The amplitude of diurnal changes in the circadian rhythm of the MBP was most pronounced in group 1 and slightly less in group 3. In the operated children, the amplitude of diurnal fluctuations in MBP was the smallest, which characterizes the relative stability of hemodynamics during surgical treatment of patients (Fig. 9).

Conclusions. A significant increase in the SBP circadian rhythm mesor was revealed in children of group 3 by 15% relative to the indicator in group 1 on the first day. The shift of the acrophase peak by night is an unfavorable sign characterizing the maladaptive state of heart function. The range of diurnal fluctuations of DBP was most pronounced in children of the 3rd group at 1,8,9,10 days. Pronounced diurnal differences in DBP characterize instability of the peripheral vascular tone in group 3.

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非创伤性脑出血患儿窦房结功能昼夜节律和血氧饱和度的幅相分析
AMPLITUDE-PHASE ANALYSIS OF THE CIRCADIAN RHYTHM OF SINUS NODE FUNCTION AND OXYGEN SATURATION IN CHILDREN WITH NON-TRAUMATIC CEREBRAL HEMORRHAGE

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抽象。 根据对心率，血氧饱和度，呼吸频率的监测结果的研究，作者表明，每分钟30次心律以上的昼夜节律中，HR波动幅度的增加表明，心律自主调节的明显不稳定 ，表明出现不良后果的风险增加。 非创伤性脑出血患儿的永久性氧气注入Fi02不超过0.4，即使在最严重的患者中，非创伤性脑出血患儿的红细胞也具有足够的氧结合水平。 对身体的压力作用越明显，非创伤性脑出血患儿的顶峰相，浴相变化峰的位置，HR的昼夜节律波动幅度，呼吸作用和血氧饱和度越高。
关键词: 昼夜节律, 窦房结, 血氧饱和度, 儿童, 严重颅脑损伤

Abstract. Based on the study of the results of monitoring heart rate, oxygen saturation, respiratory rate, the authors showed that an increase in the amplitude of HR fluctuations in the circadian rhythm above 30 beats per minute indicates a pronounced instability of the autonomic regulation of heart rhythm, indicating an increased risk of an adverse outcome. Permanent insufflation of oxygen in children with non-traumatic cerebral hemorrhage FiO2 no more than 0.4 in children with non-traumatic cerebral hemorrhage provides a sufficient level of oxygen binding by red blood cells even in the most severe patients. The more pronounced the stressful effect on the body, the more the position of the peak of acrophase, bathyphase changes, the amplitude of fluctuations in the circadian rhythm of HR, respiration, and oxygen saturation in children with non-traumatic cerebral hemorrhage increase.

Keywords: circadian rhythm, sinus node, oxygen saturation, children, severe traumatic brain injury

Relevance. In childhood, biological rhythms are still unstable and easily change. Numerous studies have established that stable biorhythms are characteristic of healthy babies, these children are much less sick. One of the objective evidence of improvement is the restoration of the physiological rhythm of cardiac function and respiration. As is known, under physiological conditions, the highest oxygen saturation prevail in the morning and afternoon hours, at night there is a decrease in accordance with the biorhythmic activity of the autonomic regulation of tissue respiration. [1,2,3,4]. However, in the literature there is no information about the effect on the circadian rhythms of the functional activity of the sinus node, respiration of non-traumatic cerebral hemorrhage in children of the first months of life, which served as the premiss for this study.

Purpose of work. Study and evaluate the amplitude - phase structure of heart rhythm, respiration, oxygen saturation in children with non-traumatic cerebral hemorrhage.

Material and research methods. Using a long-term monitoring method (over 10 days) with an interval of one hour in 58 children (boys-30, girls-28), heart rate (HR) and other generally accepted parameters (blood pressure, oxygen saturation rate, respiratory rate, body temperature were recorded) A comparative analysis of deviations in the groups of non-operated (group 1), operated children (group 2) with a favorable and fatal (group 3) outcome was carried out. The first group consisted of 18 babies with effective conservative therapy. The second group included 29 operated children and the third - 11 with an unfavorable outcome that occurred in 4 children on the first day of admission to the clinic, 7 - by 9 - 10 days. The research data were processed by the method of variation statistics using the Excel program by calculating arithmetic mean values (M) and mean errors (m). To assess the significance of differences between the two values, Student's parametric criterion (t) was used. The critical level of significance was taken equal to 0.05.

Results and discussion. All infants received intensive therapy generally accepted by standards, including hemostatic, replacement, antibacterial, anti-inflammatory, neuro-vegetative protection, anti-edematous, nootropic, according to indications, respiratory apparatus support. As can be seen from the data presented in table 1, significant differences between the daily average values of the heart rate in the groups of non-operated (1), operated (2) and dead (3) were not detected.

Comparative evaluation of the mesor of the circadian rhythm of heart rate by group (beats per minute)

Days	1 group unoperated	2 group operated	3 group deceased
1	138,6±12,3	138,8±7,7	137,7±12,6
2	143,3±6,7	139,5±6,5	139,6±13,1
3	141,7±5,8	144,5±7,5	149,6±20,4
4	133,1±5,1	147,8±12,5	141,8±16
5	134,2±5,9	144±8,4	141,3±8,2
6	132,1±4,6	138,3±10,6	133,6±19,3
7	129,5±2,8	143,1±11,8	136,3±18,2
8	136,1±4,3	137,3±14,9	129±16,8
9	130,1±4,8	138,5±11,6	131,4±17,7
10	125,9±6,5	132,9±9,4	130,2±10,2

The authors of [1,2,3] established the normal position of the acrophase peak of the HR circadian rhythm at 9–11 hours and the bathyphase at 1–4 hours. In children of group 1 (Fig. 1), the normal position of the acrophase peak was found at 1, 4.10 days, the shift of this indicator by night hours was observed at 6.7 days, on the remaining days, the acrophase HR circadian rhythm migration occurred within 20 (2 days), 15 (3), 18 (5), 20 (8), 15 (9) hours. That is, in non-operated patients for 5 days the acrophase shift was limited in the light period of time, was relatively small. Surgery somewhat reduced the severity of acrophase peak shifts. So, the normal projection of the indicator was observed on 2,6,7,8 days, insignificant migration in the daytime occurred on 3,4,5,9,10 days. A pathological shift in the peak of acrophase HR at night in children of group 2 was found only at 1 day.
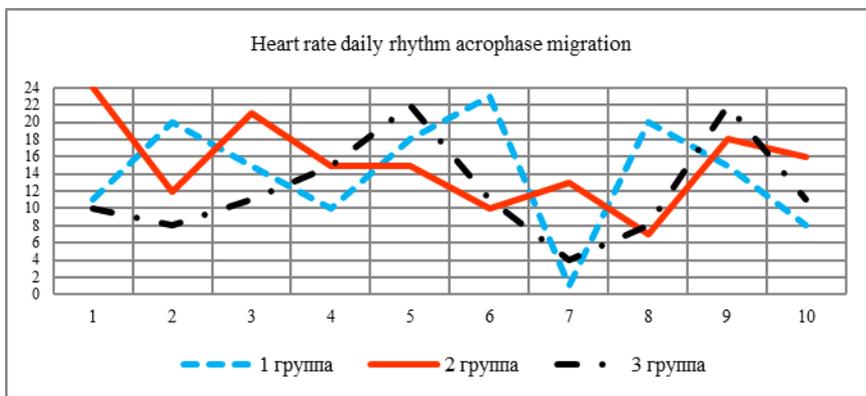

Fig.1

Thus, surgical removal of the hematoma contributed to a decrease in the degree of peak acrophase HR shifts, indicating the clinical effect of radical therapy. In the 3rd group of children, the normal position of the peak of acrophase HR was observed on days 1,2,3,6,8,10, shift to night hours occurred on 5,7,9 days. Taking into account that life support was provided to patients of group 3 by hardware prosthetics of breathing, the maintenance of hemodynamics by the use of cardiovascular drugs, according to hormones, it can be concluded that the artificial maintenance of the functional activity of life support systems contributed to the correction of changes in the position of acrophase, phase structure of the circadian heart rhythm, even in the most severe patients.

The projection of the peak of the bathyphase (Fig. 2) at night (normal) in unoperated children was detected at 1.5.6.9 days, the pathological shift of the bathyphase in the light period of time occurred on 2,3,4,7,8,10 day. In the 2nd group of children, the physiological position of HR circadian rhythm bathyphase was detected on 2,3,4,5,10 days, shift to daytime hours - 1,6,7,8,9 days. In group 3, the normal projection of the HR circadian oscillation bathyphase was detected only on day 5.6; the rest of the time, a shift by the light period of the day was observed (Fig. 2). Thus, the most pronounced deviations of the projection of the bathyphase were detected in the most severe children of group 3.
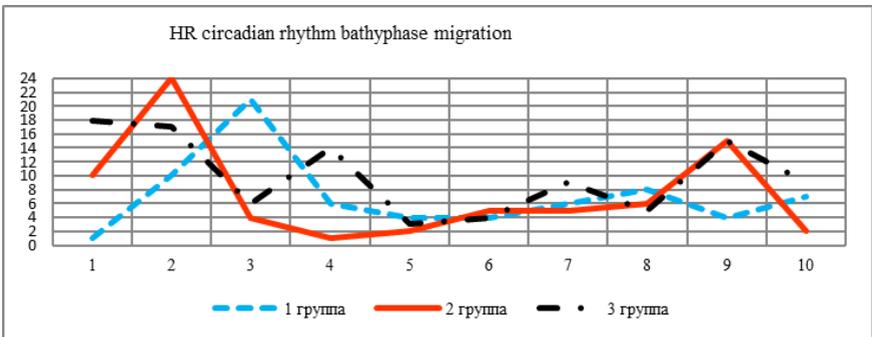

Fig.2

The range of HR daily fluctuations in groups 1 and 2 of the children did not differ significantly, amounting to 18-27 beats per minute. In a comparative assessment, the amplitude of HR circadian oscillations (Fig. 3) was most different in children of the 3rd group, where in the first two days the most pronounced instability of the heart rhythm was observed, when the amplitude of oscillations reached 56.9 and 36.7 beats on the first and second days per minute, and on the following days of observation, HR remained prone to relatively large drops during the day compared to surviving children. Thus, an increase in the amplitude of HR fluctua-

tions during the day above 30 beats per minute indicated a pronounced instability of hemodynamics, indicating an increased risk of failure of autonomic, humoral regulation of cardiac function.
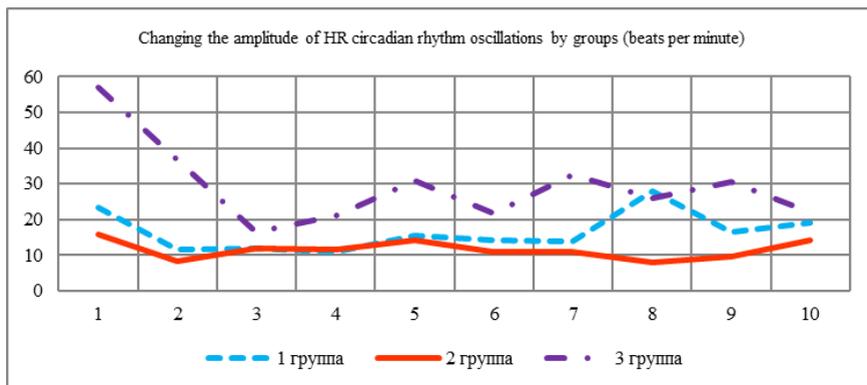

Fig.3

During the whole observation, the circus rhythm mesor of the oxygen saturation indicator was above 97% in all patients. In the 1st group of children, the peak of the acrophase of oxygen saturation migrated in the daytime for 1,3,4,5,7,8,9,10 days. In the second, a normal projection of acrophase in the light period of the day was also noted during 1,2,4,5,6,7,8,9,10 days. In group 3, only on days 3, 4, and 6 showed a shift in the peak of the acrophase of oxygen saturation to the dark period of the day (Fig. 4.5). Thus, prolonged insufflation of oxygen by FiO2 to no more than 0.4 children with non-traumatic cerebral hemorrhage provided a sufficient level of oxygen binding by red blood cells even in the most severe patients.
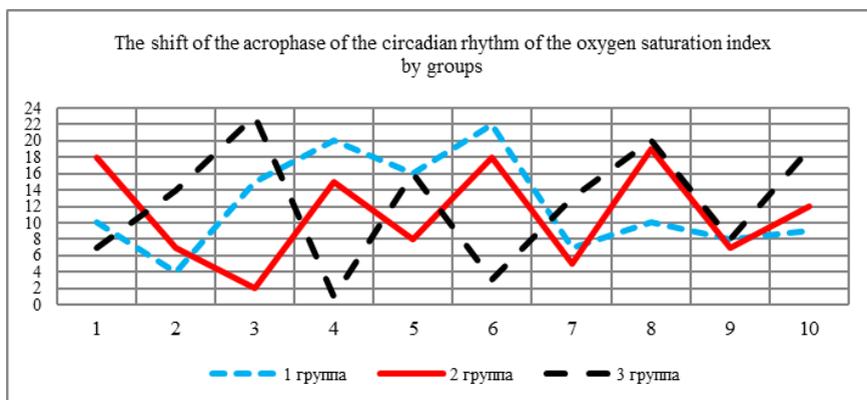
Fig.4
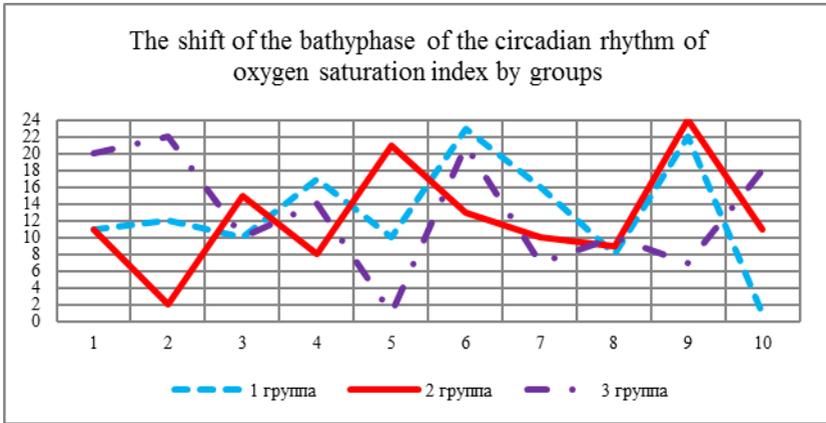
Fig.5
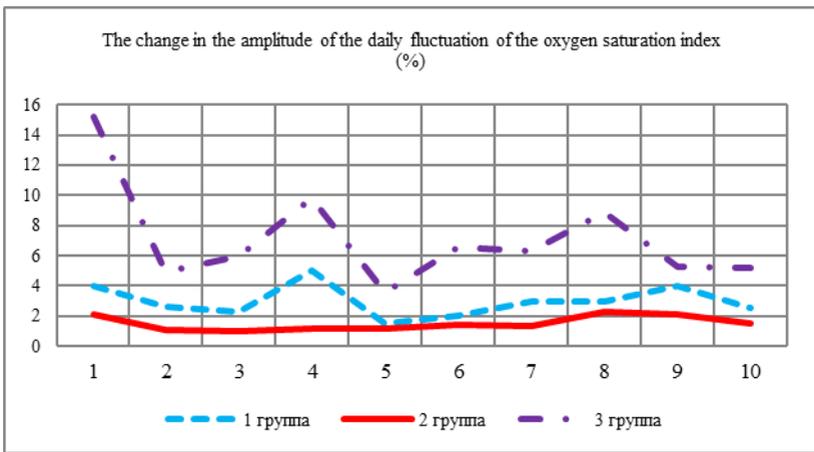
Fig.6

A shift of the bathyphase to daytime was found in all patients for 9 (out of 10) days (Fig. 6). And only on the 10th day, the circadian rhythm bathyphase HR was localized at 1 hour (night time) in group 1. In the 2nd group of operated children, the bathyphase was projected at 2 o'clock on the 2nd day, at 9th at 24 o'clock. The migration of the bathyphase also had a wave-like pattern, which is probably one of the adaptive characteristics of changes in the erythrocyte affinity for oxygen (an indicator of oxygen saturation). In group 3, the projection of the bathyphase at night was detected only on day 5. Thus, the migration of the circadian rhythm bathyphases of the oxygen saturation index (the minimum level of hemoglobin

affinity for oxygen) changed in all patients in a wave-like fashion with localization of the minimum values during the daytime, which characterizes the stress state of tissue metabolism in children with non-traumatic cerebral hemorrhage. A comparatively large amplitude of fluctuations in the circadian rhythm of the oxygen saturation index in children of group 3 draws attention.

Table 2

Comparative assessment of daily average respiratory rate per minute
in non-operated and operated children

days	1	2	3	4	5	6	7	8	9	10
1 group	42,8±6,3	44±6,3	41,2±4,7	41,1±5,3	38,4±5	39,3±4,5	39,1±5,2	40,6±5,3	40,9±4,4	40,5±6
2 group	35,3±6	34,1±5,4	34±4,7	33,1±4,9	34,3±4,6	35,2±6,5	36,8±4,7	36,4±4	37,7±3,7	34,6±5,4

As can be seen from table 2, figure 7, in children of group 2 throughout their stay in the ICU there was a tendency to a decrease in shortness of breath. The difference is not significant due to the large scatter in the average daily RR in both groups of children. The amplitude-phase data of the respiratory rate (RR) of children of the 3rd group are not presented, since the ventilation of the lungs was carried out from the first day throughout the treatment.

Fig.7

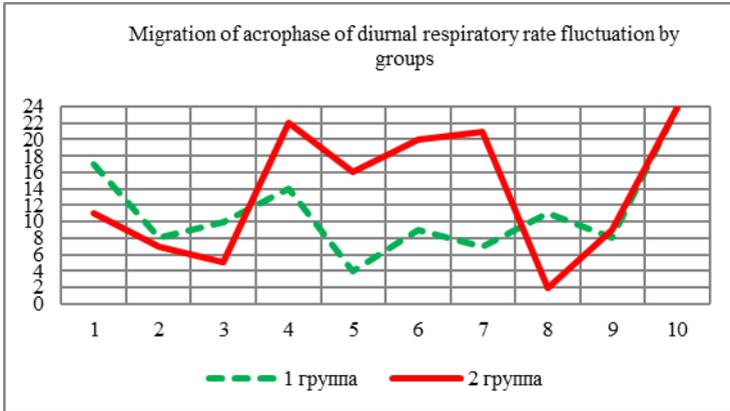The acrophase of the circadian rhythm of the respiratory center is normally located in the daytime [1,2]. In non-operated children, acrophase migration occurred within 4 (5 days) and 17 hours (1st day) (Fig. 7). The oscillations of the acrophase shifts covered only 12 hours of the daytime. While in the operated children, the shift of the acrophase peak in the dark period of the day took place at 4 points (on

4,7,8,10 days). That is, the stressful nature of changes in the shifts in the acrophase of the circadian rhythm RR is possibly due to the restoration of breathing after removing the child from the mechanical ventilation (after surgery) at different periods of observation. Children of group 1 did not have hardware ventilation. After surgery, prolonged mechanical ventilation or auxiliary mechanical ventilation did not exceed 1 day. Thus, the stressful (postoperative) reaction of the respiratory system was manifested by a shift in acrophase by night hours.
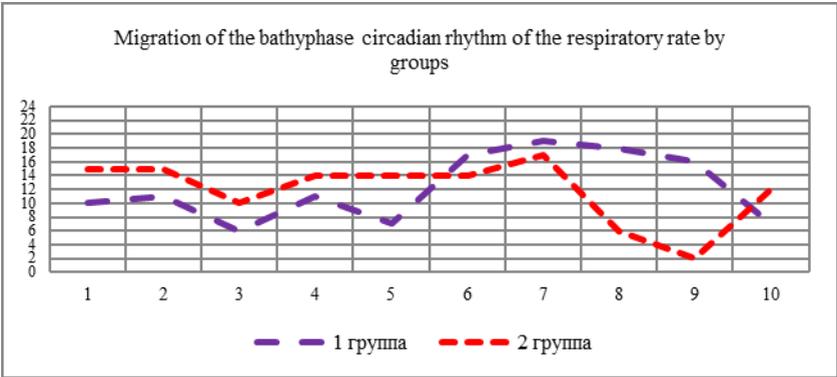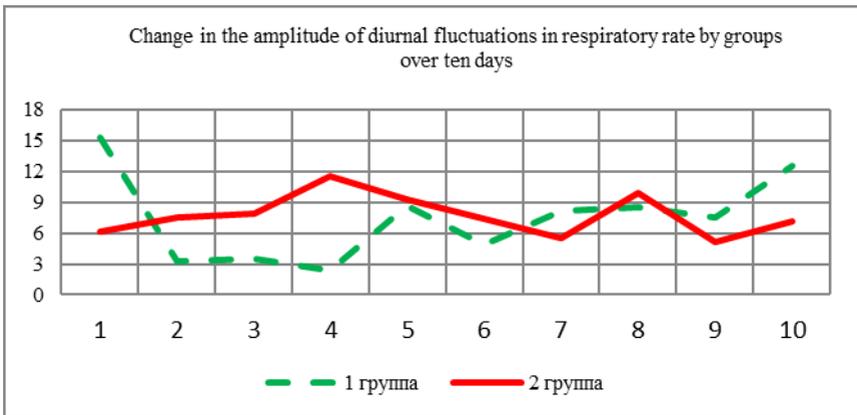

Fig.8

Fig.9

Migration of the circadian rhythm bathyphase RR was detected in group 1 during the daytime all days, in group 2 the physiological projection of the bathyphase at 2 a.m. was detected only on day 9, on the remaining days, the shift occurred in the daytime, which characterizes the stressful state of the biorhythms of the

respiratory center and 1 and 2 groups of children (Fig. 8). The largest amplitude of RR fluctuations was observed at 1 day in unoperated children (Fig. 9). On the following days of observation in groups 1 and 2, the range of daily RR drops did not exceed 3 breaths per minute. The revealed features, apparently, are associated with the use of barbiturate drugs, tranquilizers, anticonvulsants according to indications in order to reduce the intensity of brain tissue metabolism, increase the effectiveness of decongestant and anticonvulsant therapy.

Thus, changes in all parameters of the phase characteristic of the circadian rhythms of life support systems occur in waves, which, apparently, is a reflection of adaptation to the new conditions of existence of central and peripheral biological rhythm drivers of the organs and systems under study. The more pronounced the stressful effect on the body, the more the position of the peak of acrophase, bathyphase changes, the amplitude of fluctuations in the circadian rhythm of HR, respiration, and oxygen saturation indicator changes. The stress response of the respiratory system in infants with non-traumatic cerebral hemorrhage is manifested by a shift in acrophase by night, and by a basifase by daytime, circadian rhythms of the respiratory rate. The revealed patterns can be used for a dynamic assessment of changes in the severity of the condition, monitoring the effectiveness of intensive care.

Conclusions. An increase in the amplitude of HR fluctuations during the day above 30 beats per minute indicates a pronounced instability of the autonomic regulation of the heart rhythm, increasing the risk of an adverse outcome. Permanent insufflation of oxygen in children with non-traumatic brain hemorrhage FiO2 no more than 0.4 children provides a sufficient level of oxygen binding by red blood cells even in the most severe patients. The more pronounced the stressful effect on the body, the more the position of the peak of acrophase, bathyphase changes, the amplitude of fluctuations in the circadian rhythm of HR, respiration, and oxygen saturation in children with non-traumatic cerebral hemorrhage increases.

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臭氧疗法在糖尿病足综合征的综合治疗中
OZONE THERAPY IN THE COMPLEX TREATMENT OF DIABETIC FOOT SYNDROME

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抽象。研究的相关性：糖尿病（DM）通常由于下肢脓性坏死性病变的发展而变得复杂，不仅导致由于肢体截肢导致的早期残疾，而且缩短了预期寿命。糖尿病足综合征（DFS）是糖尿病足的一种病理状况，以周围神经，血管，皮肤，软组织，骨骼和关节受损为背景，并伴有破坏性和化脓性坏死过程。 SDS在20-80％的DM患者中以各种形式发生，并使下肢出现坏疽的风险增加20倍。与没有DM的患者相比，这些患者的下肢截肢的频率高15-20倍。该研究的目的是评估臭氧溶液在糖尿病足综合征的综合治疗中的有效性。研究方法：将所有患者分为2组。主要研究组包括34例DM患者，他们于2017年1月至2018年12月期间入院并发展为DFS（根据F.Wagner分类为III-V度）。临床，血液学，细菌学和细胞学研究均在治疗前入院时和术后1-3-5-7-10天进行。作为对照组，研究对象是2015年至2016年同期接收的37例患者的病历数据。对照组接受传统治疗。在主要人群中，传统治疗辅以局部和常规臭氧治疗会议。研究结果：分析了71例发展为DFS（根据F.Wagner的分类为III-V度）的DM患者的治疗结果，并探讨了化脓性该病的臭氧治疗的成果和前景对手术进行了评估。在主要人群中，从炎性退化过程向再生过程迅速过渡，并迅速，彻底消除了微生物菌群。在主要组的患者中3-5天，观察到红细胞沉降率，白细胞总数，刺伤和分段白细胞减少，淋巴细胞和单核细胞数目增加，卧床天数减少正常化到对照组。研究的意义：我们的研究表明，静脉内和局部使用含臭氧的药物对急性化脓性外科疾病患者进行综合治疗具有明显的积极治疗和经济效果。

关键词：臭氧治疗，糖尿病足综合征，化脓性手术。

Abstract. *Relevance of the study*: diabetes mellitus (DM) is often complicated by the development of purulent-necrotic lesions of the lower extremities, which lead not only to early disability due to amputation of the limb, but also to shortening of life expectancy. Diabetic foot syndrome (DFS) is a pathological condition of the feet in diabetes mellitus that occurs against the background of damage to peripheral nerves, blood vessels, skin, soft tissues, bones and joints and is accompanied by destructive and purulent-necrotic processes. SDS occurs in various forms in 20-80% of patients with DM and increases the risk of developing gangrene of the lower extremities by 20 times. And amputations of the lower extremities in these patients are performed 15-20 times more often than in people without DM. *The aim of the study* was to evaluate the effectiveness of ozonated solutions in the complex treatment of diabetic foot syndrome. *Research methods*: all patients are divided into 2 groups. The main study group included 34 patients with DM who were admitted between January 2017 and December 2018 and developed DFS (III-V degrees according to the F. Wagner classification). Clinical, hematological, bacteriological, and cytological studies were performed on admission before treatment and on the 1-3-5-7-10 postoperative day. As a control group, the objects of the study were data from the medical records of 37 patients received in the same period of 2015-2016. The control group received traditional treatment. In the main group, traditional treatment was supplemented with local and General ozone therapy sessions. *Results of the study*: the results of treatment of 71 patients with DM who developed DFS (III-V degrees according to the classification of F. Wagner) were analyzed, and the outcomes and prospects for the development of ozone therapy for this pathology in purulent surgery were evaluated. In the main group, there was a rapid transition from inflammatory-degenerative processes to regenerative ones, and rapid, complete elimination of microbial flora. For 3-5 days in patients in the main group were observed normalization of the erythrocyte sedimentation rate, total number of leukocytes, reduction of stab and segmented leukocytes, increase in the number of lymphocytes and monocytes, decrease in the number of bed-days compared to the control group. *Significance of the study*: our research has shown that the addition of complex treatment of patients with acute purulent surgical diseases with intravenous and topical use of ozone-containing medications has had a pronounced positive therapeutic and economic effect.

Keywords: *ozone therapy, diabetic foot syndrome, purulent surgery.*

Introduction

Diabetes mellitus (DM) is often complicated by the development of purulent-necrotic lesions of the lower extremities, which lead not only to early disability due to amputation of the limb, but also to shortening of life expectancy.

Diabetic foot syndrome (DFS) is a pathological condition of the feet in diabetes mellitus that occurs against the background of damage to peripheral nerves,

blood vessels, skin, soft tissues, bones and joints and is accompanied by destructive and purulent-necrotic processes. DFS occurs in various forms in 20-80% of patients with DM and increases the risk of developing gangrene of the lower extremities by 20 times. And amputations of the lower extremities in these patients are performed 15-20 times more often than in people without DM. In most cases, amputations are performed due to ischemia and deep infection, or a combination of both. DFS occurs more often with inadequate treatment of diabetes. It occurs in two clinical forms: neuropathic and neuroishemic (Mitish, Eroshkin, Galstyan, & al., 2008).

When neuropathic affects the peripheral nervous system with impaired sensitivity. The main blood flow does not suffer.

At the neuroischemic form of neuropathy were less pronounced, but is always dominant decompensated, critical ischemia. It is caused by polylocal occlusions and stenoses, mainly of the distal arteries. With the development of irreversible ischemia, wet gangrene or uncontrolled dry necrosis is observed.

The most important link in the pathogenesis of diabetes mellitus is oxidative stress, which is induced by tissue damage and cell death, leading to increased production of free radicals and inhibition of antioxidant protection.

Objective: to evaluate the effectiveness of ozonated solutions in the complex treatment of diabetic foot syndrome.

Research problem:

1. To study the effect of ozonated solutions on the immediate postoperative period in patients with diabetic foot syndrome;

2. To determine the effect of ozonated solutions on the indicators of endotoxicosis and the level of microbial bodies in smears-prints;

3. Identify the economic effect of including ozonated solutions in the treatment of patients with DFS.

Materials and methods

We observed 71 patients with DM who developed SDS (grade 3-5 according to the F. Wagner classification). All patients are divided into 2 groups. The first control group (n=37) consisted of patients who received traditional treatment. In the second major group (n=34), traditional treatment was supplemented with local and General ozone therapy sessions.

Patients in both groups were matched by gender, age, underlying and concomitant diseases, and developed complications. The age and gender composition of patients is shown in table 1.

Table 1. Age and gender characteristics of patients

Age	Major group (n=34)		Control group (n=37)		Total
	men	women	men	women	
21-30	2	-	-	-	2
31-40	-	2	-	-	2
41-50	2	-	2	-	4
51-60	2	-	4	4	10
61-70	6	10	8	4	28
> 70	-	10	6	9	28
Total	12	22	20	17	71

80% of patients had type II diabetes, severe form, and decompensation stage.

According to the form of purulent-necrotic lesion of the limb, our patients were distributed as follows:

* phlegmon and abscess of the foot (III degree by Wagner) - 35;

* gangrene of one or more toes (IV degree) - 13;

* common gangrene of the foot, with pronounced symptoms of intoxication and requiring amputation of the lower limb in an emergency (V degree) - 13. Of these, one patient had both feet affected at the same time.

The main study group included patients admitted between January 2017 and December 2018. Clinical, hematological, bacteriological, and cytological studies were performed on admission before treatment and on the 1-3-5-7-10 postoperative day. As a control group, the objects of the study were data from medical records of patients received in the same period of 2015-2016.

Complex treatment was performed by several specialists (surgeon, endocrinologist, resuscitator) and included conservative therapy and surgical correction.

Conservative treatment began with the correction and / or compensation of diabetes mellitus with mandatory transfer to insulin therapy, antibacterial and symptomatic therapy, and ways to reduce the phenomena of critical ischemia.

Surgical treatment was based on the principle of tissue conservation and maximum preservation of the foot length. They carried out a wide opening of purulent-necrotic foci, removal of necrotic and pus-soaked tissues and adequate drainage. However, a single surgical intervention did not always allow for radical surgical treatment, and repeated surgical treatment with necrectomy was required.

The volume of surgical interventions, taking into account the severity of VTS, is shown in table 2.

Table 2. Volume of surgical treatment of DFS

The degree of DFS at F. Wagner	Volume of transactions								Total
	An autopsy phlegmon		Disarticulation of fingers		Amputation (resection) of the foot		Amputation of the lower extremity		
	Major group	Control group	Major group	Control group	Major group	Control group	Major group	Control group	
III degree	19	15							34
IV degree			4	15		2		1	22
V degree			16		5	6	2	10	39
Total	19	15	20	15	5	8	2	11	95

In the main group, the traditional treatment complex was supplemented with local and General ozone therapy sessions.

For General ozone therapy, 200 ml of Ozon-saturated 0.9% sodium chloride solution with an ozone concentration of 800-1000 mcg/l was administered intravenously daily. The duration of the course depended on the General condition of the patients, the course of the wound process, the dynamics of biochemical, clinical and immunological parameters of the body.

Local ozone therapy in the postoperative period included daily dressing of wounds and introduction of ozonated saline solution with a concentration of 3.3-4 mg/l into drains.

The main outcome of the study was the timing of regenerative processes in a purulent wound and the number of microbial bodies in smears.

As additional outcomes of the study, endotoxicosis indicators and the number of bed days in the main group were evaluated in comparison with the control group.

The degree of intoxication was judged by the average molecular weight (AMW) and the leukocyte index of intoxication (LII) by Kalf-Kalif.

Cytological examination of the material was performed by applying a non-greased sterile slide to the wound surface cleared of exudate. Wound prints were fixed with 96% ethyl alcohol and stained according to Romanovsky-Gimza. For a more accurate representation of the dynamics of the wound process, the cell composition was expressed as a percentage, and the quantitative characteristics of the main cell elements were combined into a common cytogram, taking into account the microflora, white blood cells (lymphocytes, monocytes, macrophages, neutrophils).

During hematological studies, the following indicators of peripheral blood were studied: dynamics of the total number of white blood cells, leukogram, ESR.

Statistical analysis was performed using the program StatGraphics 5.0.

Results

We have been a local visual inspection of wounds of the soft tissues of patients daily dressings. Before treatment, there was purulent discharge, pronounced fibrinous plaque at the bottom of the wounds, edema and hyperemia of the surrounding tissues. In the course of treatment with ozone in patients by the 3rd-5th day, manipulations in the area of wounds did not cause any painful sensations. When analyzing the results of treatment, it was found that under the influence of ozone therapy, there was a significant reduction in pain, a more intense reduction of edema and hyperemia of tissues, and early cleaning of wounds compared to the control group.

Analysis of hematological indicators in patients in the study groups in the first day after surgery showed that patients had high ESR, leukogram showed neutrophilism with a shift to the left, there was a decrease in the total number of lymphocytes. On the 3rd-5th day, patients in the main group showed normalization of ESR indicators, the total number of white blood cells, a decrease in the content of rod and segmentonuclear white blood cells, an increase in the number of lymphocytes and monocytes compared to the control group.

According to our data, the pathogens of the purulent process were St.aureus (55.8%), St.epidermidis (28.4%), Ps.aerugenosa (12.2%), and associations of microorganisms (St.aureus + St.epidermidis) were sown in 42.8%. In the main group, there was no growth of pathogens on the 5th day after the use of ozone from the wounds.

On cytograms before treatment, the cell elements of smears were represented mainly (90%) by neutrophilic leukocytes, mostly with degeneration phenomena and isolated cases of macrophages (1.4%), and no fibroblasts were detected. Morphologically, the presence of necrotic detritus was noted.

The dynamics of cytological and bacteriological changes is presented in table 3.

Table 3. Characteristics of cytological and bacteriological changes in the body

Cellular composition of smears-prints	Major group (n=34)				Control group		(n=37)	
	1 day.	3 day.	5 day.	7 day.	1 day.	3 day.	5 day.	7 day.
Neutrophils	90%	58%	36%	20%	91%	70%	62%	55%
Macrophages	1,4%	5%	18%	32%	1,2%	1,2%	10%	25%
Fibroblasts	-	3%	15%	30%	-	-	5%	15%
Microorganisms	10^7	10^7	-	-	10^7	10^7	10^6	10^5

As table 3 shows, in the main group there was a rapid transition from inflammatory-degenerative processes to regenerative processes, rapid, complete elimination of microbial flora, while in the control group, the dynamics of cytograms and contamination of wounds with microorganisms indicated a sluggish course of regeneration processes.

The dynamics of endotoxicosis indicators (ASW, LII) in both groups is shown in Pic.1 and 2, which show that under the influence of General and local use of ozone, faster detoxification occurred.
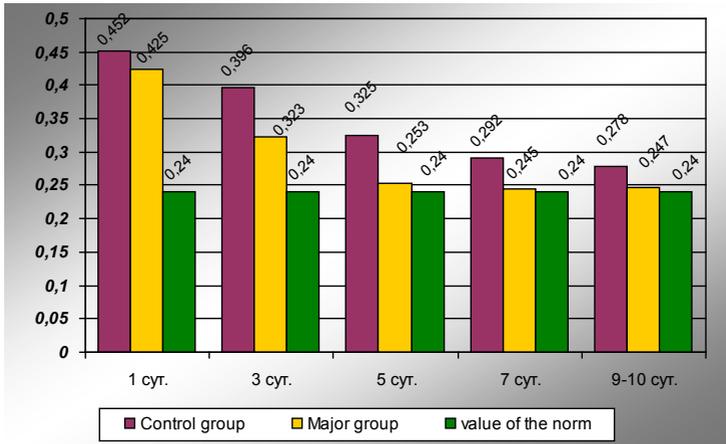
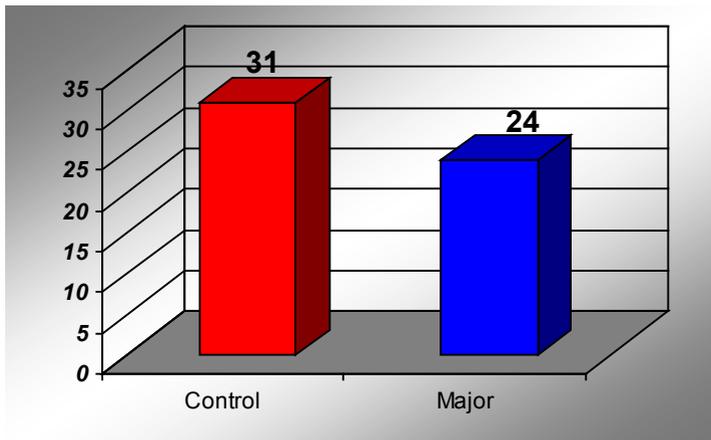**Pic. 1.** *Dynamics of the ASW level.*
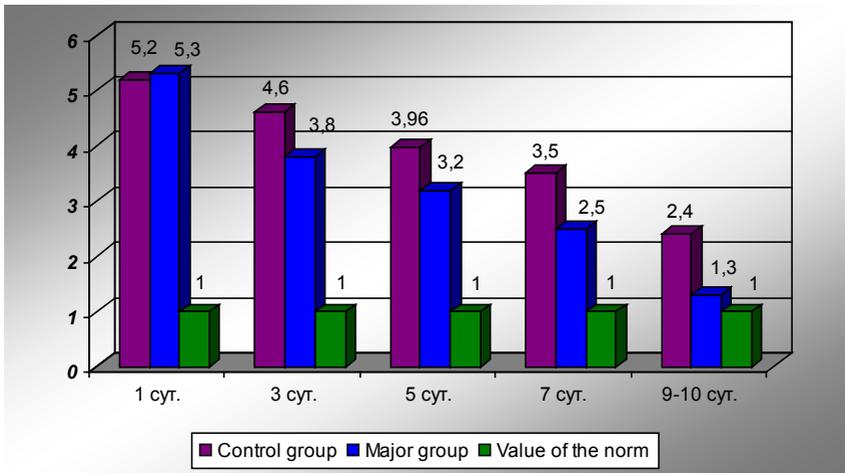
Pic.2. *Dynamics of the LII level.*

Pic.3. *The ratio of bed days in the study groups.*

The ratio of bed days in patients of both groups is shown in Pic.3, which indicates that the use of ozone therapy has reduced bed days in the main group of patients by an average of 7 days.

One patient died, whose postoperative period was complicated by the development of TEBA.

Conclusion

Thus, our research has shown:

1.   The addition of complex treatment of patients with acute purulent surgical diseases in the main group with sessions of intravenous and topical application of ozone-containing medications leads to an earlier improvement in the General condition of patients.

2.   Under the influence of ozone therapy, an earlier improvement in the clinical picture occurs in the main group of patients. The recovery of endotoxicosis results and the cessation of microflora growth from the wound occurs on the 5th day, whereas in the control group the recovery period is 10 days or more.

3.   Local and General ozone therapy leads to a reduction in bed-days.

4.   Methods of ozone therapy have a pronounced therapeutic effect in SDS, are easy to use, available to any surgical hospital and are economically justified.

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外阴鳞状癌前病变诊断和分类问题的现代观点
MODERN VIEW OF THE PROBLEMS OF DIAGNOSIS AND CLASSIFICATION OF SQUAMOUS PRECANCEROUS LESIONS OF THE VULVA

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抽象。本文反映了病毒学和分子生物学的现代数据和成就，这再次导致了外阴鳞状病变患者的分类和诊断和治疗方法的变化。对癌症前期和初始外阴癌的诊断中的客观困难进行了分析和系统化，例如：不断的分类变化及其长期协调，临床表现的长期系统化。目前可用于有条件的常规形态学实践的新的预测指标已提供了有关外生殖器官的肿瘤前发展和肿瘤过程的新数据。同样在本文中，详细分析了新的外阴疾病临床分类，比较了标准方法和新的诊断方法，这些方法在临床实践中有助于正确诊断，确定病变范围，并根据分子预后因素，选择个别的现代治疗策略。

关键词：癌前体病变，鳞状上皮内病变，外阴角化病，地衣硬化，VIN，人乳头瘤病毒（HPV），外阴鳞状细胞癌（SCC），诊断。

Abstract. *This article reflects the modern data and achievements of virology and molecular biology, which again led to a change in the classification and approaches to the diagnosis and management of patients with squamous lesions of the vulva. The analysis and systematization of objective difficulties in the diagnosis of precancer and initial vulvar cancer, such as: constant classification changes and its long-term coordination, long-term systematization of clinical manifestations, were carried out. New predictor markers, currently available for use in conditionally routine morphological practice, have provided new data on the development of the pre-tumor and tumor process of the external genital organs. Also in this article, a new clinical classification of vulvar diseases is analyzed in detail, standard and new diagnostic methods are compared, which in clinical practice helps to correctly diagnose, determine the extent of the lesion, and, depending on the molecular prognosis factors, select individual modern treatment tactics.*

Keywords: carcinoma precursor lesion, squamous intraepithelial lesion, kraurosis vulvae, lichen sclerosus, VIN, human papillomavirus (HPV), squamous cell carcinomas (SCC) of the vulva, diagnosis.

Changes on the vulva are usually divided into optional background diseases and precancerous processes. Facultative background diseases of the vulva include chronic dystrophic diseases of the vulva (CDDV). Precancerous processes – are intraepithelial squamous lesions, HSIL (High-grade intraepithelial squamous lesion). Chronic dystrophic diseases of the vulva have long been attributed to precancerous processes; at present, these lesions are considered benign, but the risk of their malignancy ranges from 10 to 35%. Previously, such changes were classified as "kraurosis" and "leukoplakia", later they were allocated to the "vulvar dystrophy" group, the nosological forms of which are lichen sclerosus and squamous cell hyperplasia.

Classification

For many years, various terms have been used to refer to vulvar diseases, which have been interpreted differently by clinicians and pathomorphologists. Due to the great variability and discrepancies between clinical and histological diagnoses in 1993, thanks to the collaboration of the International Society for the Study of Vulvovaginal Disease (ISSVD) and the International Society for Gynecological Pathology (ISGP), a new (now widely used all over the world) clinical classification of vulvar diseases was developed and adopted, which is based on pathological changes in the tissues of the external female genital organs. Clinical Classification Modification 2012:

I. Benign lesions of the vulva:

– Sclerotic lichen.

– Squamous cell hyperplasia (formerly known as hyperplastic

dystrophy).

– Other dermatoses.

II. Vulvar intraepithelial neoplasia (VIN).

1. Squamous vulvar intraepithelial neoplasia.

– VIN I – mild vulvar dysplasia.

– VIN II – mild vulvar dysplasia.

– VIN III – severe dysplasia and Ca in situ.

2. Non-squamous vulvar intraepithelial neoplasia.

– Paget's disease.

– Melanoma in situ.

III. Invasive cancer.

Despite the fact that the terms "Bowen's disease", "Keyir erythroplasia" and "carcinoma simplex" are included in the concept of VIN, it is not recommended to use them. The legitimacy of the term "bowenoid papulosis" is controversial, it

does not reflect the morphological characteristics of the disease and therefore is not recognized, although dermatologists understand that this is a VIN, accompanied by the formation of multiple papules.

The International Society for the Study of Vulvar Diseases (ISSVD) does not recommend the use of the terms "bowenoid papulosis" or "bowenoid dysplasia" either in the clinic or in morphology. The combination of VIN with genital warts is not a basis for changing the diagnosis or determining the degree of VIN. When coilocytosis or genital warts are localized where VIN is, it is recommended that these conditions be separately reflected in the diagnosis, but not as, for example, "condylomatous dysplasia".

The origin and evolution of these terms is interesting.

Bowen's disease was first described by dermatologist J.T. Bowen in 1912. He noted the extreme hyperplasia of the epidermis, the absence of a granulomatous layer and numerous mitoses, as well as the accumulation of nuclei. At that time, Bowen denied the features of a "distinct carcinomatous formation" due to the lack of dermal invasion, but reflected on the precancerous nature of the lesion.

In 1958, Woodruff and Hildebrandt EE recognized the imperfection of the terminology used to describe squamous precancerous lesions of the vulva and proposed the unifying term "carcinoma in situ" (CIS)

In 1976, the International Society for the Study of Vulvovaginal Disease (ISSVD) approved the term "squamous cell carcinoma in situ" and "hyperplastic dystrophy". The latter was additionally qualified as atypia of mild, moderate or severe degree.

The term "intraepithelial neoplasia" was first proposed by Richard (Richart, R. M.) in 1967, and then by Crum in 1982, initially for intraepithelial lesions of the cervix, and then the vulva. In 1986, ISSVD adopted the term VIN, which was divided into VIN I, II, and III.

In the following years, a great deal of data has been accumulated from studies that indicate that VIN I, II, and II do not quite correspond to the gradual development, as implied by the classification. VIN I almost always corresponded to condylomas and was associated with HPV 6 and 11 types of low oncogenic risk. In contrast, VIN II and III were associated with high-risk HPV types and carried the risk of progression to vulvar squamous cell carcinoma. Recognizing the etiological and prognostic differences, ISSVD in 2004 removed the term VIN I because of its low risk of malignancy. A two-level classification scheme was proposed:

(1) uVIN (including lesions previously classified as VIN II and III) and

(2) dVIN. uVIN was divided into verrucous, basaloid and mixed types.

In 2003, the World Health Organization (WHO) recommended the use of the designation VIN I (similar to CIN I) due to the small proportion of cases associated with high-risk HPV.

After nearly 100 years of evolution of terminology, some consensus has finally been reached among several committees. All support the introduction of just such a name for this pathology - "squamous intraepithelial lesion." The College of American Pathologists (CAP) and the American Society of Colposcopy and Cervical Pathology (ASCCP) jointly published in 2012 a guide to using the terminology Lower Anogenital Squamous Terminology (LAST), which is applicable to all HPV lesions of the cervix, vulva, vagina, anus, perineum and penis:

1. low-grade squamous intraepithelial lesion (LSIL)

2. High-grade squamous intraepithelial lesion (HSIL).

Thus, LSIL is equivalent to uVIN I, and HSIL includes uVIN II and uVIN III.

The degree of intraepithelial neoplasia can be bracketed, if necessary. It was stated that the two-tier system is more reproducible and biologically significant than previous schemes. The 2014 WHO and ISSVD 2015 classifications also adopted SIL terminology, but in addition to this, dVIN is included as a separate category.

Table 1.

The main classification of squamous precancerous lesions of the vulva

1958	1976 ISSVD	1986 ISSVD	2004 ISSVD 2003 WHO	2005 Bethesda-like	2012 LAST (Lower Anogenital Squamous Terminology) 2014 WHO 2015 ISSVD
Cancer in situ (CIS)	Unexpressed atypia of cells	VIN I		LG-VIL - condylomas - VIN I	LSIL VIN 1 - condylomas - unexpressed dysplasia - coylocytic atypia
	moderate cell atypia	VIN II	uVIN	HG-VIL	HSIL
	Severe atypia or cancer in situ (CIS)	VIN III, severe atypia or	VIN I	VIN II–III	VIN II–III
		VIN III, CIS	VIN III	dVIN	moderate / severe dysplasia bowen disease Bowenoid dysplasia Cancer in situ (CIS)
	VIN III	dVIN	dVIN		dVIN

Etiology and pathogenesis.

Despite the fact that the background and precancerous diseases of the vulva have been known to gynecologists for a long time, the etiology and pathogenesis of dystrophic diseases of the vulva has not been fully studied.

Currently, there are several theories trying to explain the causes of this pathology.

Often atrophic and dystrophic processes of the lower genital tract are considered as a homogeneous group of diseases. However, they are based on various factors and clinical manifestations, which determines the different principles of patient management.

Atrophy - is a depletion of tissue caused by a violation of cell proliferation, a decrease in their vital functions and ischemia, accompanied by a decrease in the volume of a tissue or organ, a violation or termination of their function.

Dystrophy is a pathological process caused by metabolic disorders in cells and tissues, which leads to a change in their normal function. Atrophy is a progressive process, irreversible and often associated with the termination of the functioning of the organ, while dystrophy is a process leading to a change in the normal function of the organ associated with metabolic disturbances, and in most patients it is possible to restore the function of the organ. Lichen sclerosus and squamous cell hyperplasia are classified as dystrophic diseases. However, the symptoms of dystrophic processes are very similar to those of atrophic processes, for example, sclerosing lichen is characterized by atrophy of large and small labia, inflammatory changes and vulvar fissures. Thus, these are not mutually exclusive diseases, but, apparently, links in a single pathological process.

Recently, evidence has been obtained showing the similarity of the mechanisms of development of precancerous conditions of the vulva and cervix. Therefore, the International Society for the Study of Vulvar and Vulvovaginal Disease (ISSVD) and the International Society for Gynecological Pathology (ISGP) since 1986 have been designated vulvar dysplasia as vulvar intraepithelial neoplasia (VIN) by analogy with cervical intraepithelial neoplasia (CIN). It was divided into 3 histological types, according to severity.

To understand, it must be clarified that there are two different etiopathogenetic pathways leading to the development of vulva squamous cell carcinoma (VSCC):

1. Normal type VIN (uVIN), which is caused by human papillomavirus (HPV),

2. VIN differentiated ("other") type (dVIN), which develops independently of HPV

uVIN in most cases develops against the background of HPV infection. In a large number of studies, HPV positivity was more than 80%. Human papillomavirus (HPV) type 16 is the most common in HSIL (77.2%), the second most detectable in this pathology is HPV type 33 (10.6%) and type 18 HPV (2.6%). In more than 90% of cases with LSIL, HPV of low oncogenic risk of type 6, 11 was detected. However, at present there is an assumption that the simultaneous development of LSIL and HSIL is possible. This may be due to simultaneous HPV infections of high and low oncogenic risk. (Table 2)

Although most uVINs are associated with high-risk HPV, HPV detection rates for squamous cell carcinoma of the vulva (VSCC) are significantly lower. This suggests that there are alternative ways of developing squamous cell carcinoma of the vulva not associated with HPV infection. This led to the study of the formation of dVIN as a separate pathway for the development of vulvar cancer.

The pathogenesis of HPV-induced malignancy is well described. Protein E6 HPV blocks the p53 inhibitor, which leads to disruption of the cell cycle. Protein E7 inactivates the tumor suppressor RB and releases transcription factors E2F, causing cellular hyperproliferation. The biological function of RB is to block the transcription of the kinase of the p16 and p14 inhibitor. Therefore, in the HPV-associated neoplasms, there is usually an increased expression of p16 and minimal p53 expression to the absence. While the pathogenesis of the development of HPV-independent VSCC is not well understood.

Table 2. Comparison of 2 types of VIN

	uVIN	**dVIN**
disease development age	from 30 to 50 years	from 60 to 80 years
the presence of lesions in another area	multiple (multifocal) backing. Often there is a lesion of the anal area.	monofocal backing
cervical dysplastic lesions	CIN in 18-52% of cases	none
HPV infection	in 80% of cases, HPV is positive	HPV negative

VIN usual type, uVIN)

uVIN is commonly found in young women 30 to 50 years old.

Risk factors include smoking, frequent changes in sexual partners, and immunosuppression. HPV infection is closely related to uVIN. A combination with HSV infection (herpes simplex virus) is observed in 30% of women.

Most patients complain of itching or dysuria, 20% of patients may not have any complaints. External manifestation - white or erythematous spots on the mucosa and skin of the vulva, which can form drain plaques. About 10% of lesions are pigmented.

VIN III in the form of an erythematous spot (erythroplakia)

VIN III as leukoplakia

dVIN, differentiated type VIN

dVIN is commonly found in postmenopausal women. The average age is 60-80 years, but can also occur in younger patients. Often develops against the background of sclerosing lichen and / or chronic vulvovaginitis, other inflammatory dermatoses of the vulva. Compared to uVIN, dVIN tends to a single lesion and causes less extensive lesions of the mucosa and skin of the vulva. Clinically, it can manifest itself in the form of focal gray-white discolored spots with a rough surface, indistinctly expressed by thick white plaques or raised knobby "growths", often mistaken for coarse vulvar leukoplakia.

dVIN against the background of sclerosing lichen (A, B).

Diagnostics

Diagnosis of vulvar diseases presents significant difficulties due to the absence of specific complaints and typical clinical manifestations in most patients. When performing a complex of diagnostic studies, the following is applied:

1.Visual inspection using a magnifying glass.

2. Vulvoscopy, advanced vulvoscopy using a colposcope and a Schiller test, which makes it possible to accurately determine the boundaries of white areas, since they are not stained with iodine.

3. Detection of HPV by polymerase chain reaction (PCR) with DNA typing.

4. A cytological study, which is less informative than histological, but convenient for conducting a screening test and subsequent dynamic observation.

5. Fluorescence Diagnostics (FD) *

6. Vulvar biopsy with histological examination of the tissue.

 * In the 90s of the twentieth century, tumor-specific photosensitizers appeared that were able to selectively absorb light of a certain wavelength, fluoresce in an excited state and start free radical oxidation by sequential conversion of light into chemical energy, which leads to the destruction of the tumor cell. The main advantage of this method is the accuracy of determining the boundaries of the tumor, the identification of lesions invisible to the eye for more accurate sampling of biopsy material or excision of the lesion within healthy tissues.

In histological evaluation of biopsy specimens and foci, VIN shows early stromal invasion in 3.2-18.8% of cases. Early invasion is usually represented by single cells or nests of eosinophilic keratinocytes with irregular or angular contours penetrating from the basilar epidermis or from elongated reticular ridges.

The depth of invasion is measured from the epithelial-stromal joint of the adjacent most superficial dermal papilla to the deepest point of the tumor. The International Federation of Gynecology and Obstetrics (FIGO) defines stage IA of the vulva carcinoma as measuring ≤2 cm and stromal invasion ≤ 1 mm. Accurate assessment of invasion is critical to the choice of surgical treatment volume and further prognosis of disease-free progression.

To improve the histological verification of the diagnosis, an immunohistochemical study is currently being used.

p16

Positive p16 expression correlates very well with high HPV status (> 90%) and is usually used as an additional marker for high-risk HPV infection.

With HSIL, high p16 expression can reach 100%. With LSIL, variable expression of this marker is observed. Only in 0-17% dVIN is p16 expressed.

p53

A different picture can be observed with respect to p53. In 66-100% of cases of dVIN, a positive activity of this marker is noted.

Ki-67

Another useful marker for distinguishing dVIN from background processes and normal epithelium is Ki-67. Ki-67-negative staining of the cells of the basal layer is a distinctive feature of normal epithelium; But with uVIN and dVIN there is a positive staining of Ki-67 in the basal and parabasal layers. With dVIN, Ki-67 staining occurs in the basal layer and thin parabasal layer. A distinctive feature with uVIN is also staining in the basal layer, but it will be more intense, often the entire thickness of the epithelium.

Conclusion

Thus, in the article we wanted to show that there are objective difficulties in the study of precancer and initial vulvar cancer, namely: a constant change in the classification and its long-term coordination, long-term systematization of clinical manifestations, which is associated with the development and achievements of virology and molecular biology, which gave an understanding of the development of the pre-tumor and tumor process, and also led to the fact that the development of diagnosis of precancer and primary vulvar cancer is directly related to the development of science. It was proved that the cytological method and vulvoscopy did not live up to the expectations of researchers and did not become screening methods for the detection of pre-tumor lesions of the vulva, showing significantly less sensitivity and accuracy than with squamous changes and precancer of the cervix. And only the latest achievements of physical chemistry gave impetus to the development of diagnostic methods at the cellular and molecular level, which help to clarify the stage of development of the tumor process and determine the prognosis of the course of the disease. Currently, scientific advances allow the use

of the latest diagnostic methods, namely, fluorescence diagnostics with one of the photosensitizers and most accurately identify additional lesions and clearly define their boundaries. A biopsy performed along with fluorescence diagnostics helps to correctly diagnose, determine the extent of the lesion and, depending on the molecular prognosis factors, choose a specific modern treatment tactic.

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生物气象学方法研究北部地区人口的适应性
BIOMETEOROLOGICAL APPROACH TO THE STUDY OF ADAPTATION OF THE POPULATION OF THE NORTHERN REGION

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抽象。这项工作的目的是结合气候因素的变化，研究汉特–曼西斯克（Khanty-Mansiysk）人口急性发作和慢性病恶化的节律结构特征。观测期为2001年1月1日至2013年12月31日。气压；相对湿度；重磅倾向最大风速；空气中氧气的重量含量。根据主要疾病类别，对汉特–曼西斯克的救护车服务进行呼叫。为了检验存在周期性的假设，使用了一个使用小波分析的程序。

在分析救护车服务的活动时，会发现一系列长期和年度内的节奏。在北部地区，对于鼻病分类人群最有力的节律是呼吸道病理学，传染病，精神障碍和循环系统疾病。

已经建立了对健康恶化的延迟响应，这主要表现为急救电话的呼叫次数增加，这主要取决于吸入空气中氧气的重量指标。

关键词：气候，适应障碍，健康，北方。

Abstract. *The aim of this work was to study the features of the rhythmic structure of the occurrence of acute and exacerbation of the chronic pathology of the population of Khanty-Mansiysk in conjunction with variations in climatic factors. The observation period is from January 1, 2001 to December 31, 2013. The ambient temperature was taken into account; barometric pressure; relative humidity; baric tendency; maximum wind speed; weight content of oxygen in the air. Calls to the ambulance service of Khanty-Mansiysk are grouped according to the main classes of diseases. To test the hypothesis of the presence of cyclicities, a program was used that uses wavelet analysis.*

When analyzing the activity of the ambulance service, a spectrum of long-term and intra-annual rhythms is revealed. The most powerful rhythms for nosological groups in the northern region are respiratory pathology, infectious diseases, mental disorders and diseases of the circulatory system.

A delayed response to health deterioration has been established, which manifests itself in an increase in the number of calls to the ambulance service, primarily, depending on the indicator of the weight content of oxygen in the inhaled air.

Keywords: *climate, impaired adaptation, health, north.*

Relevance

Biorhythmological adaptation is, first of all, temporary coordination of the state of the organism and the requirements of the environment [1,5,13,20,23]. The human body is almost always in a state of external desynchronosis, that is, some mismatch in the phase of their own daily rhythms and the rhythms of physical time sensors [2,11], which can develop in cases of overwork, shift work, stress and with the development of somatic and mental pathology. In the northern region, conditions are created for the violation of the temporary organization of the psychological and physiological functions of the body, due to the influence of climatic and geographical features and the characteristic heliophysical status of the circumpolar regions [7,12]. Huge material has been accumulated on the effects of weather and climate on human health. A rather serious contribution to the theory of meteotropic reactions of the body was made by Russian scientists [20,21]. Meteotropic reactions are observed in diseases of the cardiovascular system, bronchopulmonary pathology, diseases of the digestive system, joints, skin, nervous and mental diseases [3,4,6,8,14,15,16,17,22]. It is quite difficult to predict the reaction of the body, because, in each factor, there is not one cycle, but several interacting ones; superposition of endogenous and exogenous rhythms occurs; every process in the redistribution of a limited time interval consists of directional and cyclic components; the synchronicity and common mode of the analyzed rhythms changes [18]. How much does the length of the observation period affect the identification of the spectrum of constant and insertion rhythms; is there a sufficient relationship between the time series, given the short-term bursts of rhythmic activity of the variables? All these questions determined the relevance of this study.

Purpose of work

Study the features of the rhythmic structure of the occurrence of acute and exacerbation of chronic pathology of the population of the city of Khanty-Mansiysk in conjunction with variations in climatic factors characteristic of the northern region.

Objects and research methods

In this study, long-term meteorological data of specialized arrays for climate studies of the All-Russian Scientific Research Institute of Hydrometeorological Information - the World Data Center and archival materials of the Khanty-Man-

International Conference

siysk weather station were used. Observation period from January 01, 2001 to December 31, 2013. The length of the time series is 37982 observations. The following weather factors were taken into account: ambient temperature (T) (Co); barometric pressure (P) (kPa); relative humidity of air (φ) (%); baric tendency (BT) (hPa/3 h); maximum wind speed (MWS) (m/s); the weight content of oxygen in air (OIA) (g/m^3) is directly proportional to atmospheric pressure minus the partial pressure of water vapor and inversely proportional to air temperature. Calls to the ambulance service of Khanty-Mansiysk are grouped by class: Some infectious and parasitic diseases (AB); Neoplasms (CD); Diseases of the endocrine system (E); Mental and Behavioral Disorders (F); Diseases of the nervous system (G); Circulatory system diseases (I); Respiratory diseases (J); Digestive system diseases (K); Musculoskeletal system diseases (M); Diseases of the genitourinary system (N); Pregnancy, childbirth and the puerperium (O); Injury (ST). To test the hypothesis of the presence of multiple cyclicities, a program was used that performs wavelet analysis to determine the rhythmic structure of individual parameters and estimates the synchronization and coherence of the described parameters [17]. The following research objectives were set: to identify variations in the climatic factors of the Khanty-Mansiysk, characteristic of circumpolar latitudes; to study the structure of mega-and mesorhythms of calls to the ambulance service of Khanty-Mansiysk by main groups of nosologies for the period from 2001 to 2014; conduct a comparative analysis of circannual circulation cycles for emergency care for the study period; to determine the spectrum of intra-annual rhythms of the occurrence of acute and exacerbation of chronic human pathology.

Research results and discussion

It is established that the variations of meteorological parameters are polycyclic, with a spectrum of significant rhythms from 5 years to 1 month. When analyzing coherence by rhythms with the same period, pronounced desynchronosis is detected, which explains the majority of the negative correlation between weather parameters. Wavelet analysis allows us to identify fading insertion rhythms, which, when interfered with constant rhythms detected by the Fourier transform, can explain unsteady rhythmic changes, the individual implementation of which is the time series of weather data. When analyzing the appeal to the ambulance service, a spectrum of long-term and intra-annual rhythms is revealed, consisting of high-amplitude constant rhythms and short-term bursts of rhythmic activity. The most powerful rhythms for nosological groups in the northern region are respiratory pathology, infectious/parasitic diseases, mental disorders and circulatory system diseases. The rhythm power indicator is a more operational parameter of health monitoring than its period. The intra-annual dynamics of emergency care was studied, which is characterized by the fact that with more calls in the winter, their intra-month fluctuations are smoothed, while spring-summer variations at

lower absolute values differ in pronounced fluctuations during the 30-day cycle. The altered photoperiodic status induces rhythmic activity in the form of "quasi-seasonal" intercalated circadian receptors (14 ± 3 days), circaviginth (21 ± 3 days) and circatrigintan (30 ± 5 days) rhythms of occurrence / exacerbation of somatic and mental pathology along with constant rhythms. The presence of a circadian component in the spectrum of rhythms of all annual cycles in the form of irregular rhythmic activity with a maximum in the winter-spring period was revealed. The results of the study, at this stage, do not allow us to talk about an obligate endogenous circuscept rhythm, but they demonstrate an insertive near-weekly activity, which is most likely of a social nature. According to the coherence of the described rhythms, a delayed health deterioration reaction has been established, which manifests itself in an increase in the number of calls to the ambulance service, primarily, depending on the oxygen content in the inhaled air.

Conclusion. The results of the study complement and expand the understanding of violations of the state of the body that determine the nature of its response to the combined effect of geophysical and climatic factors in the northern region and can be used in planning and implementing regional health programs aimed at studying and correcting the functional state of the population in complex natural and social systems ; in the work of specialists in the field of health monitoring, preventive medicine and medical control. The use of wavelet analysis of extended time series makes it possible to identify long-term rhythms of health disorders, which is applicable for retrospective assessment and short-term forecasting.

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关于环境因素和生活方式对痤疮发展过程的影响问题
TO THE QUESTION OF INFLUENCE OF ENVIRONMENTAL FACTORS AND LIFESTYLE ON DEVELOPMENT AND COURSE OF ACNE

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抽象。 痤疮是年轻人中常见的皮肤疾病。 一些环境因素和生活方式会影响痤疮的发展和过程。 痤疮的皮肤护理尤为重要，它可以显着降低副作用的风险，同时增加对治疗的依从性。
关键词：痤疮，流行病学，暴露因素，皮肤护理。
Abstract. *Acne is a common skin disease in the young population. Some environmental factors and lifestyle can affect the development and course of acne. Of particular importance is skin care in the treatment of acne, which can significantly reduce the risk of side effects, while increasing adherence to therapy.*
Keywords*: acne, epidemiology, exposome factors, skin care.*

Acne is a multifactorial chronic inflammatory disease of the sebaceous hair follicles, which affects most adolescents [1]. In 2010, acne was the eighth most common pathology and was found in 9.4% of the world's population, of which people aged 20-29 years old accounted for 64% [2,3]. According to other sources, acne was observed in 85% of people aged 12-25 years [4]. Although acne is a disease prevailing at a young age, it is increasingly common in adulthood, including menopause [5]. A number of authors note that women over 25 have

higher prevalence and incidence rates than men of the same age. The frequency of exacerbations and the severity of acne in adulthood is less than in adolescents, but the negative impact on the quality of life in women older than 25 years is more pronounced [1,6].

Acne occurs as a result of a complex interaction of various external and internal pathogenetic factors. Despite its prevalence, misconceptions regarding the initiating and provoking effects that affect the development of common acne continue to exist [4,7].

Environmental factors and lifestyle (exposome) interact with the epidermal barrier and microbiota of the skin and contribute to the strengthening of inflammatory processes in the sebaceous glands. These include: unbalanced nutrition, environmental pollution, smoking, exposure to UV rays, climatic features, the use of certain medications, the use of electronic devices, psycho-emotional stress, lack of sleep, the use of poor-quality cosmetics, and mechanical effects on the skin [8, 9].

The aim of the study is to analyze the probability of the influence of environmental factors and lifestyle on the development and course of acne.

The PubMed database searched for articles published from 2015 to February 2020 using the term acne in combination with epidemiology, exposome, and skin care.

One of the important factors in the pathogenesis of acne is psychological stress. The associated synthesis of hormones, cytokines and neuropeptides can lead to a chronic course and exacerbations of the disease. Facial skin of patients with acne is characterized by richer innervation, an increased number of nerve endings and mast cells containing substance P. This neuropeptide affects the activity of sebum, stimulating the proliferation and differentiation of the sebaceous glands and lipid synthesis. In the study, the authors noted that patients with acne had a higher level of average serum concentration of substance P, however, there was no statistically significant correlation between the severity of acne and the level of substance P. Scientists came to the conclusion that the number of stressful events is not a factor determining the severity of acne, and the course of acne may depend on tolerance to stress and methods of dealing with stress [10].

A large number of publications on the provocative role of certain foods in the appearance of acne was found. So Chalyk N. et al. note that the consumption of dark chocolate, apparently, affects the skin of young men, enhancing desquamation of corneocytes and stimulating bacterial colonization of the skin of the face. These changes can potentially contribute to the development of acne, but it remains unclear whether these reasons alone are sufficient to cause the appearance of acne eruptions [11].

A European online study of 10,521 people aged 15-24 years revealed an increase in the likelihood of acne when eating chocolate, in the presence of burdened heredity (acne in the parents) and a decrease in the probability of smoking tobacco [12].

The results of published meta-analyzes of observational studies prove a positive relationship between the use of milk, especially non-fat, and the risk of acne [13,14,15] and the lack of influence of certain dairy products (yogurt, cheese) on the appearance of acne [14].

Other authors note that there is no direct connection between the characteristics of eating behavior and the development of acne rashes. Even if a series of observations made it possible to identify certain patterns due to excessive consumption of dairy products and hyperglycemic foods, information on the influence of nutrition on the occurrence of acne still remains controversial, and hypotheses and myths continue to dominate the debate. Thus, further clinical studies are needed to examine and confirm the relationship between nutrition and this skin pathology [16].

The results of a national study in 2002-2015 on more than 600 thousand 17-year-old military personnel showed an inverse correlation between body mass index and the appearance of acne [17].

According to other publications and on the basis of the report "Primary results on acne exposome: real life data" presented by Dréno B. at the meeting of the 28th Congress of the European Academy of Dermatology and Venereology (Madrid, 10/12/2019), currently causes of worsening acne may be:

1. features of food habits (frequent use of dairy products, fast food, foods with a high glycemic index, whey protein),

2. environmental pollution, climatic conditions, exposure to the sun,

3. stress factors and aggressive skin care.

However, cigarette smoking, which was considered a potential trigger for acne, did not show its effect on the development of this disease. Thus, when collecting an anamnesis in patients suffering from acne, prior to prescribing treatment, careful attention should be paid to identifying the most important exposome factors [8, 9].

In the treatment of acne, skin care is of particular importance, which should have a direct pathogenetic effect: self-regulating, keratolytic, disinfectant, anti-inflammatory [18]. Removal of sebum lipids from the skin surface leads to irritation of sensitive nerve endings and a sharp increase in the production of sebum secretion. Complete restoration of the lipid film occurs only 3-4 hours after its degreasing. With regular cleaning of the skin with this method, the qualitative composition of sebum is also violated: the supply of linoleic acid is depleted, its relative deficiency is noted, which can contribute to hyperkeratosis of the excretory duct of the sebaceous gland [7]. In this connection, for skin care prone to acne, it is necessary to use gentle cleansing, to avoid its "delipidization" and adequate hydration. The use of basic skin care products significantly reduces the risk of side effects of treatment, while increasing adherence to therapy [18].

Conclusion

There are many triggers that affect the frequency, prevalence, and persistence of acne. Timely identification and possible correction of provoking factors, training patients in competent skin care will contribute to the successful treatment of this pathology, prevent complications and reduce the tendency to spread the disease.

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UDK: 003.26.09, 004.056.53, 004.89, 004.418

创建量子密码系统的有效高维生物特征保护的前提条件
PREREQUISITES FOR CREATING AN EFFECTIVE HIGH-DIMENSIONAL BIOMETRIC PROTECTION OF QUANTUM CRYPTOGRAPHIC SYSTEMS

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抽象。 会议报告讨论了黑客可能对具有不同量子密钥分配协议的密码系统的攻击。 指出了量子密码系统稳定性的关键弱点，并提出了通过生物特征识别提高系统耐用性的智能方法。
关键词：信息论，信息完整性检查、、矩阵，量子位量子态，生物特征代码，模糊提取器，大型人工神经网络，小型学习样本，分层量化。

Abstract. The conference report discusses the possible hacker attack on cryptographic systems with different protocols of quantum key distribution. Key weaknesses in the stability of quantum cryptographic systems are noted and proposed intelligent methods for improving the durability of the system through biometric recognition.

Keywords: information theory, information integrity check, unitary, matrix, qubit quantum state, biometric-code, fuzzy extractors, large ANN, small learning samples, layered quantization.

Quantum cryptography in Brief

Quantum cryptography has been developing rapidly in recent years, in particular, in Russia and abroad, research and development is actively conducted in the field of creating intelligent systems, communication systems and information protection based on the use of quantum technologies. Initially, the idea of using quantum objects to protect information was proposed by Stefan Weisner in 1970 [1]. A few years later, Charles Bennett and Gilles Brassard proposed using quan-

tum objects to transfer secret key distribution [2], and already in 1991 the idea was continued in the works of Arthur Ekert [3,4]. The very idea of a quantum computer and quantum cryptography systems is based on the quantum theory of information [5], which takes as its basis the fundamental uncertainty of the behavior of a quantum system, expressed in Heisenberg's uncertainty principle. Uncertainty of Heisenberg allows to achieve a new cryptographic phenomenon, which turns out to be unattainable when using cryptography in the classical sense. It states that it is impossible to simultaneously obtain the coordinates and momentum of a particle with the required accuracy, it is impossible to measure one photon parameter without distorting another parameter.

Thus, the fundamental prohibitions of quantum mechanics on the measurability of quantum states make it possible to realize the secret distribution of keys between space-distant users of a quantum channel. In quantum cryptography, it is customary to single out two main directions for the development of key distribution systems.

Quantum information systems and their fundamental properties. Quantum information systems are systems for receiving, processing, storing and transmitting information using individual atoms, molecules, electrons and photons, based on the quantum principles of information processing through the latest achievements in the world. The following properties of quantum systems are distinguished:

1. Measurements of the physical characteristics of a quantum system change the state of the system itself;

2. The impossibility of the exact cloning of quantum states;

3. Non-orthogonal quantum states cannot be reliably distinguished;

4. The effects of quantum correlation allow to achieve mutual correlation of two or more quantum systems with the possibility of their influence on each other.

There are two main directions of development of systems for quantum distribution of keys: the first is based on the coding of the quantum state of a single particle, and the second is based on the effect of quantum entanglement (entanglement). The basic principles of these two areas formed the basis for the development of all protocols for quantum key distribution.

Quantum key distribution and the main types of protocols. Classical key exchange methods are incompatible with a quantum computer (simulator), but there is a solution to this problem - today, various variations of protocols for quantum key distributions have been developed, which are based on the fundamental and at the same time paradoxical characteristic of quantum mechanics - measuring small quantum particles depending on the observation. Quantum key distribution

is a method by which a secret key can be distributed between two parties (Alice and Bob, see Fig.1) if they have access to a channel for transmitting individual quantum particles, for example, photons, and an open normal channel with the possibility of authen - the sender of the message.
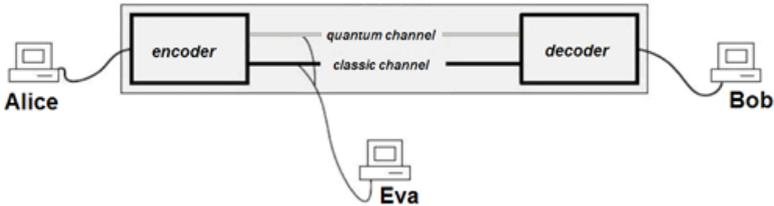

Fig.1. *The scheme of communication channel of quantum key distribution*

The bits transmitted over the quantum channel are converted into a secret key, which then encrypts the messages transmitted over any open channel, for example, using the classical cryptographic scheme of one-time blocks.

Among the main types of quantum key distribution protocols worth noting:

1. Protocols using single qubits transfer (BB84, SARG04, BB84 (4+2), six-state protocol, Goldenberg-Weidman protocol, Koashi-Imoto protocol and similar);

2. Protocols using phase coding (B92 and similar);

3. Protocols using entangled states (E91, ping-pong protocol, protocols using block transfer of entangle qubits and similar);

4. Protocols with bait states (DecoystateQKD and similar).

Possible attacks on cryptographic systems with quantum key distribution protocols. The main advantage of quantum key distribution over conventional classical schemes is that it is possible in principle to detect an eavesdropping agent, which, by virtue of the laws of quantum physics, is forced to perturb the states of transmitted quantum particles when eavesdropping. Thus, the Eavesdropper (Eve) introduces a certain percentage of errors to the transmitted bit sequence. If the level of transmission errors significantly exceeds the natural level of interference in the channel (which, of course, should be known to Alice and Bob), then this serves as a signal to interrupt the key transfer procedure.

However, the laws of quantum mechanics, due to which it is possible to detect Eve, also allow different types of attacks on the quantum communication channel. Analyzing the most well-known quantum key distribution protocols based on quantum principles, it can be noted that they are all vulnerable to one or more of the attacks presented below (see Table 1). Attack using a beam splitter presented in Fig. 2 and Fig.3 (curves 6, 7, 8), others attack – Fig.4.
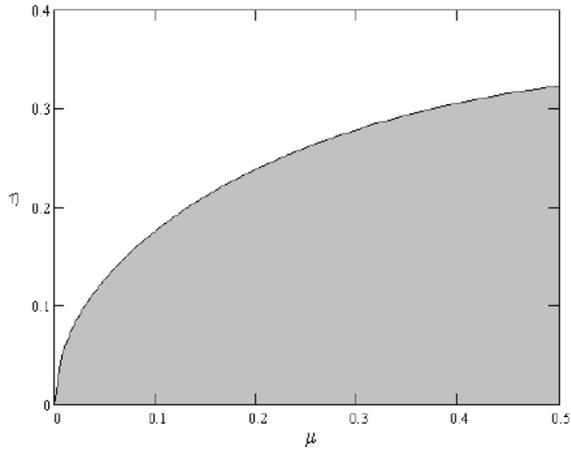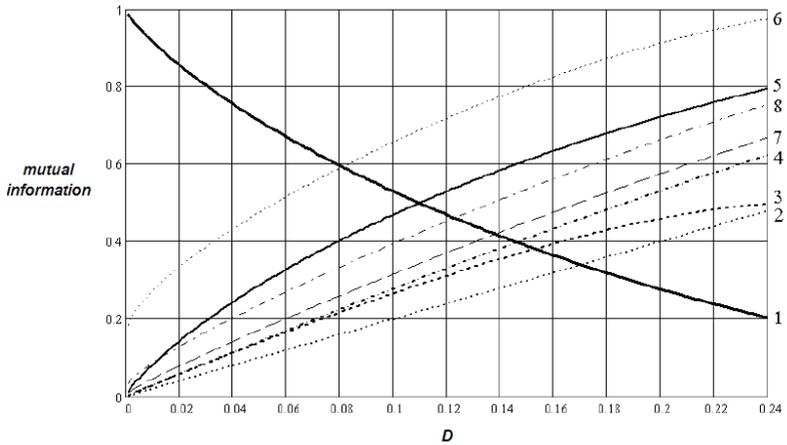
Fig.2. *The field of parameters η and μ, where the attack will be successful when replacing the original channel with losses to an ideal*

―― 1, *mutual information between Alice and Bob*
······ 2, *qubit re-interception attack*
―――― 3, *non-coherent two-dimensional probe attack without waiting for declaring bases*
―·―·― 4, *optimal incoherent attack*
―― 5, *coherent attack*
······ 6, *photon number dividing attack* , $\mu=1, \eta=0.9, k=0.105$
― · ― 7, *photon number dividing attack* , $\mu=0.1, \eta=0.9, k=0.101$
―·―·― 8, *photon number dividing attack* , $\mu=0.1, \eta=0.3, k=0.725$

Fig.3. *Mutual information I (D) AB (curve 1) and I (D) AE for different BB84 protocol attack strategies (curves 2–8)*

Table 1. Actual attacks on the quantum channel

Attack with using a beam splitter [6]	Attack "Trojan horse" [7]	Coherent and incoherent attacks for the case of single-photon signals [8]	Attack with "Blinding" of avalanche photo-detectors [9]
This attack consists of scanning and splitting pulses into two parts and analyzing each of the parts in one of two bases.	This attack is included in the pulse scanning through the optical multiplexer towards the sending side or the receiving side. The pulse is divided into two parts for the synchronization of detection and enters the decoding scheme, while the distortion of the transmitted photons does not occur.	Coherent attacks are based on the tactics of qubit retransmission and consist in intercepting photons from the sender side, measuring their states, replacing the photons sent by pseudo photons in the measured states and sending the changed data to the recipient side. Incoherent attacks involve intercepting photons from the sending side, entangling a sample with a whole group of transmitted single photons, measuring its state and sending the changed data to the receiving party.	The secret key becomes accessible to the intercepting party, while the observed statistics of photo reports remain unchanged with the recipient.

Biometric protection of cryptographic systems with quantum key distribution protocols

Among of the attacks presented in Table 1, of the greatest interest is the attack with the "blinding" of avalanche photo-detectors. Here, the interceptor (Eva) remains completely unnoticed, which is caused by the decisive disadvantage of quantum cryptography - the low accuracy of identification of the transmitting and receiving sides [11]. This problem can be solved by means of biometrics, by creating programmable automata capable of unmistakably recognizing spatially distant users of a quantum channel and automatically learning from a small number of examples of trusted images.

The United States, Canada, and the countries of the European Union propose using for this purpose "fuzzy extractors" [12], Russia, Belarus, and Kazakhstan - neural network converters "biometrics-code" based on large artificial neural networks (ANNs) [13].

"Fuzzy extractors", as it was already shown in [14, 15], are degenerate ANNs and are inferior in terms of resistance to "biometrics-code" neural network converters. So, to extract information from fuzzy converters, it's enough to support

two branches of the evolution of biometric images going in opposite directions (information is extracted completely when 3 generations of descendants are obtained through an attack based on the entropy of long biocodes with dependent discharges).
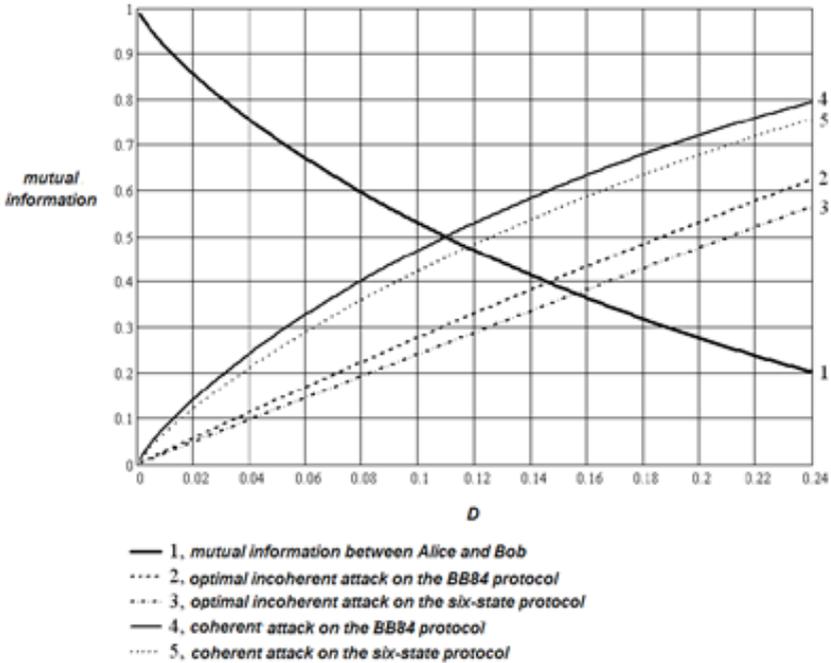

Fig.4. *Mutual information I (D) AB (curve 1) and I (D) AE for various strategies of attacks on a protocol with 6 states (curves 2–5)*

    Considering the neural network "biometrics-code" transducers, it is worth noting that even if the ANNs has a small number of inputs (24 inputs), it will be possible to extract information from it by means of an attack based on the entropy of long biocodes with dependent discharges , such a task acquires the high computational complexity of quantum cryptographic systems.

    Another advantage of using large ANNs is the fast time of their learning - up to 30 seconds. Creating an effective high-size protection is achieved by choosing authentication using a handwritten word-password and a voice image. The conducted studies are presented in Table 2.

Table 2. Studies of the durability of various biometric systems

Biometric Technology	Unsubscribe field biometric image	Time hacking protection unknown biometric image	Search field known biometric image
The structure of the blood vessels of the eye	$10^{10}…10^{12}$	2,7 hour - 12 day	$10^2…10^5$
The pattern of the iris of the eye	$10^9…10^{11}$	1,5 min – 1 day	$10^2…10^3$
Fingerprint	$10^8…10^0$	10 second - 160 min	$10^2…10^3$
2D and 3D face geometry	$10^3…10^4$	instantly	$10^0…10^1$
2D and 3D hand geometry	$10^2…10^3$	instantly	$10^0…10^1$
Voice	$10^{16}…10^{24}$	from $10^5…10^{13}$ years	$10^2…10^3$
Handwritten word-password	$10^{22}…10^{32}$	from $10^{11}…10^{21}$ years	$10^2…10^3$

So, it can be noted that the directions of biometric and quantum cryptographic information protection are very relevant today, since the quantum laws and features of biometrics allow us to bring information protection methods to a new level.

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火灾条件下储罐保护壁表面传热参数的计算
CALCULATION OF HEAT TRANSFER PARAMETERS ON THE PROTECTIVE WALL SURFACE OF TANK IN CONDITIONS OF FIRE

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抽象。 该文章提供了一种方法，用于确定用于存储石油产品的圆柱形罐的保护壁表面上的传热边界条件。 已经开发出了热模型和数学模型来确定包围罐的圆柱形壁上部的部分与火焰表面之间的相互辐射系数。
通过将计算结果与使用当前用于计算烃类火灾条件的公式进行的计算结果进行比较，评估了所提出方法的有效性。
关键词：辐射传热； 相互接触系数 带有保护壁的水箱； 击剑；热模式。

Abstract. *The article provides a methodology for determining the boundary conditions of heat transfer on the surface of the protective wall of a cylindrical tank for storing petroleum products. Thermal and mathematical models have been developed to determine the mutual irradiation coefficient between the sections of the upper part of the cylindrical wall enclosing the tank and the flame surface.*

The effectiveness of the proposed methodology was evaluated by comparing the calculation results with the calculations using the formulas currently used to calculate the conditions of a hydrocarbon fire.

Keywords: *heat transfer by radiation; mutual exposure coefficient; tank with a protective wall; fencing; thermal mode.*

Introduction

The oil and gas complex of the Russian Federation is one of the important elements of the country's economy. Oil production enterprises include oil refineries and enterprises for the transportation and sale of oil and oil products. A thorough approach is required to ensure the fire safety of such a complex formation.

One of the modern solutions to increase the stability of reservoirs with oil products to external influences, fire and environmental safety is to install a closed

fence along the perimeter of the oil storage tanks, which eliminates the spill of oil and oil products in the event of an accident. In this case, enclosing walls (made of building materials) for several tanks or a tank with a cylindrical vertical protective wall can be used [1-5]. To increase the fire resistance of building structures, temperature fields are calculated by their thickness under real fires, taking into account the various physical and geometric properties of these structures, as well as the specifics of their field of application. The practice of using modern computational multiphysics software systems based on numerical methods for solving such problems shows that the reliability of the calculations performed with them largely depends on the accuracy of setting the initial and boundary conditions of the physical process considered on a numerical model.

Goals and objectives

The aim of this work is to develop a methodology for calculating the conditions of heat transfer and thermal regime during a fire in tanks with a protective fence.

To achieve this goal, it is necessary to develop a structure and carry out software implementation of the calculation of the temperature regime of the fire on the tank, which would take into account the conditions of the oil product combustion process and the heat transfer characteristics between the combustion products and the tank enclosure; to provide the ability to transfer the results of the calculation of the flame temperature and heat transfer coefficients due to radiation and convection as the initial parameters of the program complex for calculating thermal fields during heating of the enclosure.

Materials and methods

To calculate the temperature fields of reservoirs in a fire, depending on their geometric dimensions, used structural materials and protective layers, exposure temperatures, it is necessary to develop a calculation method, based on which it is possible to determine the parameters of structural elements that will ensure the required thermal characteristics.

As a result of a fire, a heat flow is released in the oil product tank, which is spent on heating the combustion products, dissipated into the environment and partially transferred to the heated surfaces of the enclosure. In this case, heat transfer to the heated surface of the fence due to thermal radiation is of decisive importance, as a result of which it is heated. Further, the heat flux passes through the fence due to thermal conductivity and is scattered from the unheated surface into the environment due to convection and radiation.

Thus, the calculation is reduced to solving two joint thermophysical problems:

– calculation of the temperature of the flame during a fire in the tank and the formation of boundary conditions on the surfaces of the fence;

– calculation of the temperature distribution over the thickness of the fence depending on the time of fire exposure.

The calculation of the heat flux transmitted from the flame to the surface of the fence can be performed based on the ratio:

$$Q_{\text{л}} = C_0 \varepsilon_{np} \varphi \left[\left(\frac{T_f(\tau)}{100} \right)^4 - \left(\frac{T_W}{100} \right)^4 \right] F, \qquad (1)$$

where $T_f(\tau)$ – medium surface flame temperature, K; τ – time, c; T_w – fencing surface temperature, K; $\varepsilon_{np} = 1 / \left[1 + 0{,}0022(T_f(\tau) - 273) \right]$ – reduced blackness between the radiating surface of the torch and the heat-absorbing surface; $C_o = 5{,}67$ W/(m²·K⁴) – blackbody emissivity; φ – irradiance coefficient, taking into account the fraction of thermal radiation incident from the surface of the flame plume on the surface of the fence; F – flame surface area, m².

The temperature regime of a fire during the combustion of petroleum products has a number of features characterized by a high combustion temperature (above 1000 °C), a rapid increase in temperature to a maximum value (1200 °C-1300 C), combustion with constant unlimited access of oxygen. In [1], a review of the hydrocarbon fire regimes used in domestic and world practice for assessing the fire resistance of oil tank enclosures is given, and the possibility of using the average surface torch temperature of 1200 °C throughout the fire is substantiated.

When calculating the coefficient φ, we consider the case when the height of the flame is higher than the boundaries of the tank and is sufficient for thermal radiation to reach the upper part of the fence, as shown in Fig. 1.
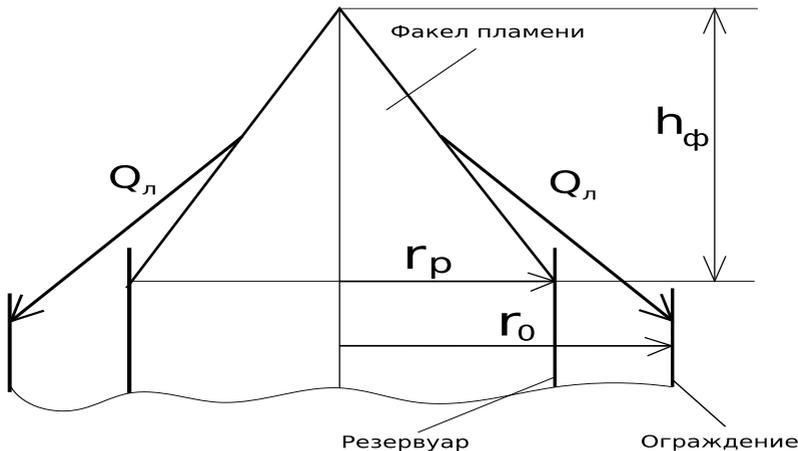

Fig. 1. *Fire model in a tank with a protective wall: r_0 – radius of the heated surface of the cylindrical wall of the fence, m; r_p – the radius of the cylindrical tank, m; $Q_{\text{л}}$ – heat flux transmitted by radiation from the flame to the surface of the upper part of the fence, W; h_{ϕ} – flame height, m.*

To simulate a fire, the shape of the torch is taken in the form of a cone, (cylinder) with a base equal to the area of the burning liquid, and the radiating surface in the form of a triangle (rectangle) [6], [7]. In this case, the coefficient φ is calculated for a site oriented normal to the surface of the burning liquid. In this paper, it is proposed to calculate the coefficient φ taking into account the slope of the radiating surface and its conical shape.
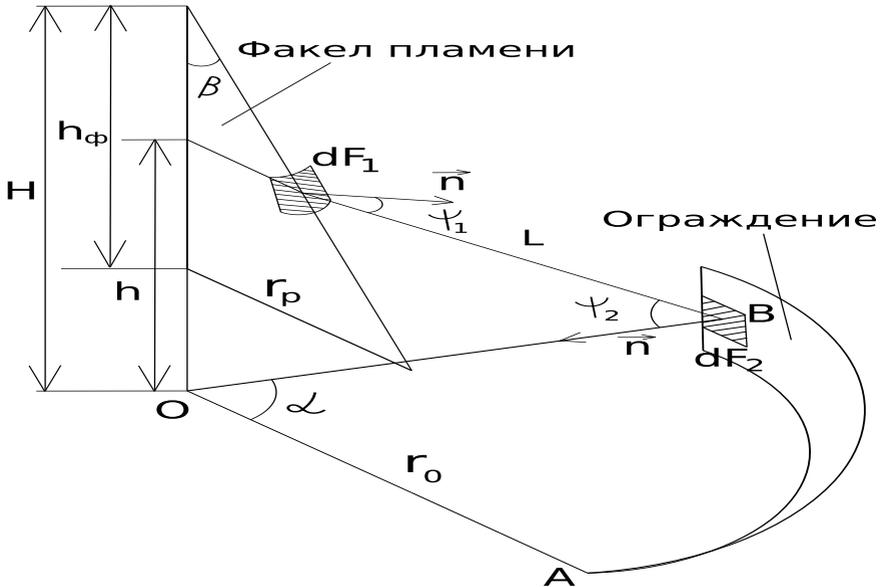

Fig. 2 *Mutual arrangement of elementary areas of the conical*
surface of the flame and the cylindrical surface of the tank fence: dF_1, dF_2 – elementary areas of the flame surface and fencing, m^2; h – height measured from the elementary fence site dF_2 to the elementary platform dF_1; H – height measured from platform dF_2 to the top of the flame; L – distance between elementary areas dF_1 and dF_2, m; ψ_1 and ψ_2 – the angles between the normals to dF_1, dF_2 and the segment L connecting these areas; α – the angle in the horizontal plane of the AOW between the projections of the normals to the sites dF_1 and dF_2; β – angle of flame cone.

Figure 2 shows the elementary areas dF_1 and dF_2 of the surface of the flame cone and the surface element of the upper part of the tank enclosure, respectively. The surfaces under consideration have diffuse reflection. The relative position of dF_1 and dF_2 is determined by the height h measured from the plane AOB, the angle α taking into account the visibility factor, the radius of the tank r_p and the radius of the heated surface of the fence r_0.

It is possible to calculate the irradiation coefficient $d\varphi_{12}$ between the elementary sites dF_1 and dF_2 from the expression 8]:

$$d\varphi_{12} = \frac{\cos\psi_1 \cos\psi_2}{\pi r^2} dF_1 \ , \tag{2}$$

where ψ_1 and ψ_2 – angles between the normals to the surfaces dF_1 and dF_2, respectively, and the straight line connecting the site; L – distance between sites, m.

To find the quantities included in expression (2), the following relations are obtained:

$$L^2 = h^2 + \left((H-h)tg\beta - r_0\cos\alpha\right)^2 + \left(r_0\sin\alpha\right)^2, \tag{3}$$

$$\cos\psi_1 = \sqrt{1 - \left(\frac{L^2 + \left(\dfrac{H-h}{\cos\beta}tg\beta\right)^2 - \left(\dfrac{H-h}{\cos^2\beta} - H\right)^2 - r_0^2}{2L\dfrac{H-h}{\cos\beta}tg\beta}\right)^2} \tag{4}$$

where β – angle between the axis of the cone of the torch and its generatrix;

$$\cos\psi_2 = \frac{L^2 + r_0^2 - (H-h)^2 tg^2\beta - h^2}{2Lr_0} \ ; \tag{5}$$

$$dF_1 = (H-h)dh\cos^2\beta d\alpha \ . \tag{6}$$

To calculate the irradiation coefficient between the radiating surface of the flame plume and the elementary area of the surface of the fence, it is necessary to integrate $d\varphi_{12}$ over the area F_1, facing the elementary area dF_2, taking into account the visibility factor:

$$\varphi_{12} = \frac{1}{\pi}\int\limits_{h_0}^{H}\int\limits_{-\frac{\gamma}{2}}^{\frac{\gamma}{2}} \frac{\cos\psi_1 \cos\psi_2}{h^2 + \left((H-h)tg\beta - r_0\cos\alpha\right)^2 + \left(r_0\sin\alpha\right)^2}(H-h)\cos^2\beta \ dhd\alpha \ , \tag{7}$$

where h_0 – the height of the beginning of the integration section, which is found from the condition of the visibility factor of the upper part of the flame torch and the fence wall; the angle α can vary from $(-\gamma\backslash 2)$ to $(\gamma/2)$, as shown in Fig. 3. The angle γ is found from the ratio:

$$\gamma = \arcsin\frac{4r_p\sqrt{r_0^2 - r_p^2}}{2r_p(2r_p + 2(r_0 - r_p))} \ ; \tag{8}$$

Integration in expression (7) is carried out numerically and implemented as a macro Visual Basic for Applications of Microsoft Office Excel, which allows you

to build an interface that is friendly to a wide range of users from among practical workers of the fire service. To find the irradiation coefficient φ between the complete surfaces F_1 and F_2 it is necessary to integrate expression (7) over the area F_2.
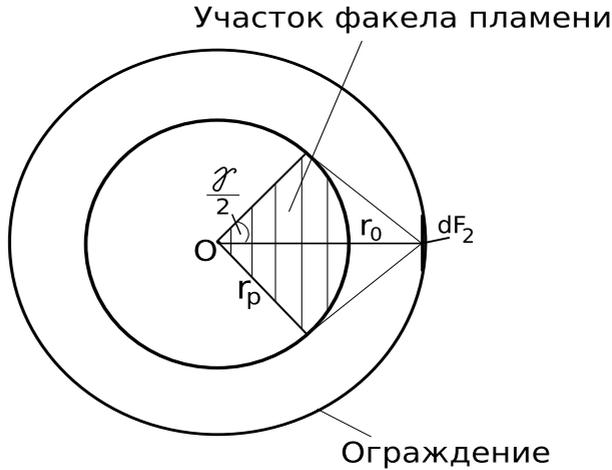
Участок факела пламени

Fig. 3 *The surface of the flame plume participating in heat exchange with the elementary site dF_2 (top view)*

The obtained results can be used as initial data for solving the second problem related to the calculation of the temperature field over the thickness of the fence. In this case, the heat transfer coefficient on the heated side is found from the ratio:

$$\alpha_f(\tau) = \varepsilon_{np} \varphi \, 5.67 \cdot 10^{-8} \frac{T_f(\tau)^4 - T(r_0,\tau)^4}{T_f(\tau) - T(r_0,\tau)} \, . \tag{9}$$

To compare the results of calculating the irradiation coefficient according to the proposed method with the currently used [7], an example is given in [2]. The calculations performed according to the expressions [2] and the proposed methodology give the values φ = 0.45 and φ = 0.28, respectively. An analysis of the results shows that one should expect overestimated values of the irradiation coefficient φ when calculated according to the expression [2]. In the method proposed in this work, taking into account the geometric features of the model of fire on the tank can improve the accuracy of the description of heat transfer conditions. Nevertheless, to verify the reliability of the presented results, experimental studies on a light model of the object or conducting fire tests are required.

Conclusion

In the course of the work, a structure was developed and a software implementation of an algorithm for calculating heat transfer conditions during a fire in an oil and gas complex based on the use of Microsoft Office Excel was carried out. The implemented methodology for calculating heat transfer conditions makes it possible to determine the mutual irradiation coefficient taking into account the visibility factor of the flame and the fencing area, which limits the width and height of the radiating surface of the flame, participating in heat exchange with the surface of the fence, its angle of inclination, and conical shape. The advantages also include the possibility of finding average and local values of the intensity of radiant heat transfer, varying along the height of the fence, calculating the heat transfer coefficient from the unheated surface of the fence into the environment and transferring the results of the calculation of boundary conditions as initial parameters for finding thermal fields during heating of the fence.

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计算传热条件并选择用于流体和气体的壳管式加热器的参数
CALCULATION OF HEAT TRANSFER CONDITIONS AND SELECTION OF SHELL AND TUBE HEATER PARAMETERS FOR FLUIDS AND GASES

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抽象。 本文介绍了一种用于液体和气体的防爆电加热器的设计。 针对加热器周围流动的两种选择，提出了燃料元件和液体之间热交换的热模型和数学模型。已经开发出用于计算对流传热的强度和用于具有针对各种液体而设计的不同尺寸，功率和数量的加热器的加热器的电加热元件的最大表面温度的方法和程序。

关键词：对流换热 温度条件 传热强化 壳管式加热器； 传热系数。

Abstract. *The article describes the design of an explosion-proof electric heater for liquids and gases. The thermal and mathematical models of heat exchange between a fuel element and a liquid are presented for two options for flow around heaters. A methodology and program for calculating the intensity of convective heat transfer and the maximum surface temperature of an electric heating element for heaters having different sizes, power and number of heaters designed for various liquids has been developed.*

Keywords: *convective heat transfer; temperature condition; heat transfer intensification; shell and tube heater; heat transfer coefficient.*

Introduction

Liquid and gaseous hydrocarbon raw materials and products of its processing are important components of the economy of our country. Today, almost all industries are somehow related to the supply of oil, gas and their derivatives. Hydrocarbon raw materials are the main type of energy carrier, and also serves as the basis for the development of modern technologies, the development of new materials and products. Oil and gas are often produced in the northern regions, so it is necessary to ensure a cost-effective and efficient supply of raw materials to the consumer. In addition, at the fields it is necessary to prepare hydrocarbons for transportation, which includes solving many problems [1].

To ensure various technological processes, including transportation, the supply of various gases and liquids to power plants with a certain temperature is required. They are heated using shell-and-tube electric heaters, consisting of cylindrical bodies, inside of which there are electric tubular heaters [2], [3].

The service life and reliability of an electric heater depend significantly on the temperature of its surface. Its value depends on many factors, the most significant of which are the flow rate and temperature of the heated coolant, its thermophysical properties, surface area, dimensions and electrical power of the heaters, the nature of the flow of gas or liquid around them.

This paper presents a methodology and program for calculating the required electric power, convective heat transfer intensity and maximum surface temperature values of an electric heating element for heaters having different sizes, power and number of heaters designed for various gases and liquids.

Basic assumptions of the thermal and mathematical models

The heat transfer processes in the device in question are complex, therefore, it is necessary to make a number of assumptions that simplify the solution of the problem and increase the reliability of the calculation results.

The proposed thermal model is based on the following assumptions:

1. The surface temperature of the electric heater has a maximum value in the area of the outlet pipe of the heater;

2. On the surface of the heater with a maximum temperature, radiation heat exchange can be neglected;

3. Heat from the surface of the heater does not spread along the partitions;

4. The coolant has thermophysical properties at a temperature at the outlet of the heater;

5. Neglecting heat flow along the heater.

6. Thermal processes are stationary.

Liquid and Gas Heater Design

Flow heaters are a horizontal or vertical cylindrical vessel with an inlet and outlet pipe with a bunch of heating elements placed in it from the end. In addition to the inlet and outlet pipes, the design of the heater, as a rule, provides for a drainage and ventilation pipe.

The heater is made in the form of a cylindrical casing with a diameter D and a length L, as shown in Fig. 1. Inside the casing parallel to its longitudinal axis are tubular electric heaters (TEHs) of diameter d and total power P. The heaters are U-shaped and made of stainless steel.

The heated medium, entering the inlet pipe of the heater, passes through it, and heated to a predetermined temperature due to direct contact with the heating elements, leaves the heater.

To intensify heat transfer on the surface of the heaters, transverse partitions

can be used in the design, providing a transverse flow of heaters around the fluid flow. Each partition has openings for installing heaters and a cutout in the form of a segment for the flow of coolant. Thus, gas or liquid moves between the partitions, transversely flowing around the heaters. The flow rate is determined by the diameter of the casing D, the number of heaters n and the distance between adjacent partitions h.

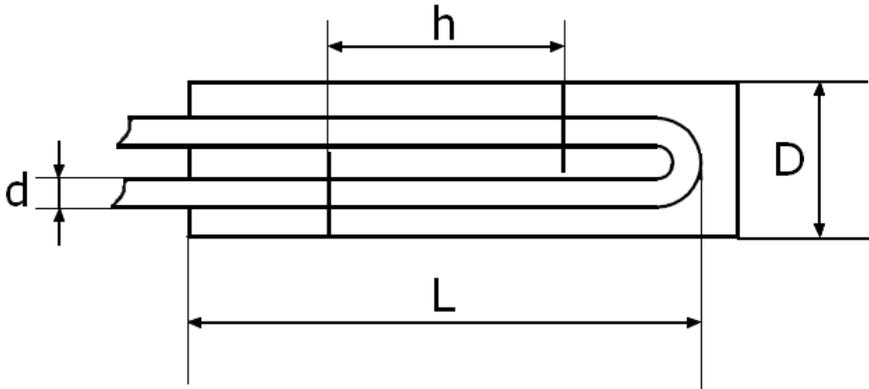In the absence of partitions, the coolant moves along the surface of the heaters parallel to the longitudinal axis.

Fig. 1 *Preheater scheme*

To heat the coolant, voltage is applied to the heaters, and the heat released in them due to forced convection is transferred to a gas or liquid. The surface temperature of the heater depends on the intensity of convective heat transfer.

The outer surface of the casing is covered with a layer of heat-insulating heat-resistant material with low thermal conductivity to minimize heat loss to the environment.

Calculation of power of heaters and maximum temperature

The electric energy supplied to the heater is released in the form of heat and almost all of it is spent on heating a liquid or gas, provided that the casing has good external thermal insulation. Based on the law of energy conservation, it is possible to compose an equation for stationary heat transfer conditions, which allows you to get the value of the total power of the heaters, substituting the limit values of the parameters [4]:

$$P = cG(t_{в\text{ы}х} - t_{в\text{х}}),\qquad(1)$$

where P – total heat output, W;

c – specific heat of the coolant at constant pressure, J/kgK; G – mass flow rate of the coolant, kg / s; $t_{в\text{ы}х}$, $t_{в\text{х}}$ – coolant temperature at the inlet and outlet of the heater, °C.

The heat release power on one heater P_i and its specific value q, W/m², can be found from expressions (2) and (3), knowing the number of heaters n and the heat transfer surface area A, m²:

$$P = nP_i \tag{2}$$

$$q = \frac{P}{A} \tag{3}$$

Based on the assumptions made at the beginning of the work, it is assumed that the maximum surface temperature of the heating element t_{max} will be at the outlet of the heater. This temperature is related to the coolant temperature by the ratio

$$t_{max} = t_{вых} + \frac{P}{\alpha A}, \tag{4}$$

where α – convective heat transfer coefficient, W / (m² · K).

The convective heat transfer coefficient depends on a large number of factors, primarily on the flow rate of the coolant, the direction of flow around the heat-transfer surface and the thermophysical properties of the liquid or gas.

1) Longitudinal flow around the heater

The value of the fluid velocity v in the longitudinal flow around the heaters is determined by the formula [4]:

$$v = \frac{G}{\rho \dfrac{\pi}{2}\left(D^2 - nd^2\right)} \tag{5}$$

where G – mass flow rate, kg/s; ρ – its density, kg/m³; D and d – diameters of the casing and heaters, m; n – number of heaters, pcs. It is assumed that the heaters are U-shaped and pass twice in the casing cavity.

The hydraulic diameter of the channel $d_г$ formed by the casing and heaters is determined by the formula:

$$d_Г = \frac{D^2 - nd^2}{D + nd}, \tag{6}$$

The Reynolds number Re, which determines the nature of the flow around surfaces, is calculated according to the dependence [5]:

$$\text{Re} = \frac{v d_Г}{v}, \tag{7}$$

where v – kinematic viscosity of the heat carrier, m²/s.

The convective heat transfer intensity can be found from the criterion relation for the Nusselt number Nu depending on the flow regime determined by the Reynolds number [5]:

$$\text{Re} < 2300 ; Nu = 1{,}4 \left(\text{Re} \frac{d_\Gamma}{L} \right)^{0.4} \text{Pr}^{0.33} ;$$

$$\text{Re} \geq 2300 ; Nu = 0{,}021 \text{Re}^{0.8} \left(1 - \frac{6 \cdot 10^5}{\text{Re}^{1.8}} \right) \text{Pr}^{0.43}, \tag{8}$$

where Pr – Prandtl number for coolant.

Convective heat transfer coefficient α, W/(m²·K), is calculated according to:

$$\alpha = \frac{Nu\lambda}{d_\Gamma} \tag{9}$$

where λ – thermal conductivity of the coolant, W/(m·K).

The obtained value of the convective heat transfer coefficient is substituted into formula (4) and the value of the maximum temperature of the heating element is obtained.

2) Transverse flow around the heater

In the transverse flow around the heating elements, the flow rate of the coolant in the diametrical plane is determined by the ratio:

$$\upsilon = \frac{G}{\rho h (D - md)} , \tag{10}$$

where m – the number of tubes of the heating elements in the diametrical plane, h – distance between adjacent partitions.

The Reynolds number in this case is determined by the formula:

$$\text{Re} = \frac{\upsilon d}{\nu} \tag{11}$$

In the transverse flow around the cylinder, the convective heat transfer coefficient is determined by the method [5]:

$$\text{Re} < 1000 , Nu = 0{,}52 \, \text{Re}^{0.5} \, \text{Pr}^{0.37},$$

$$\text{Re} \geq 1000 , Nu = 0{,}25 \, \text{Re}^{0.6} \, \text{Pr}^{0.38},$$

$$\alpha = \frac{Nu\lambda}{d_\Gamma} \tag{12}$$

The obtained value of α is substituted in the formula (4).

The calculated value of the maximum temperature of the heater t_{max} allows us to judge the thermal regime of the heating element.

To automate the calculation process according to the presented method, in the Pascal programming language a program "Calculation of the heater" was developed. The working window of the program is shown in Fig. 2.

The working window of the program is a set of fields for inputting initial data and displaying calculation results, elements for choosing the type of heat exchanger (with partitions and without partitions), and the "Calculation" button. Fields for input/output of data are collected by groups: "Environment parameters", "Operating conditions", "Heater design", "Calculation results".
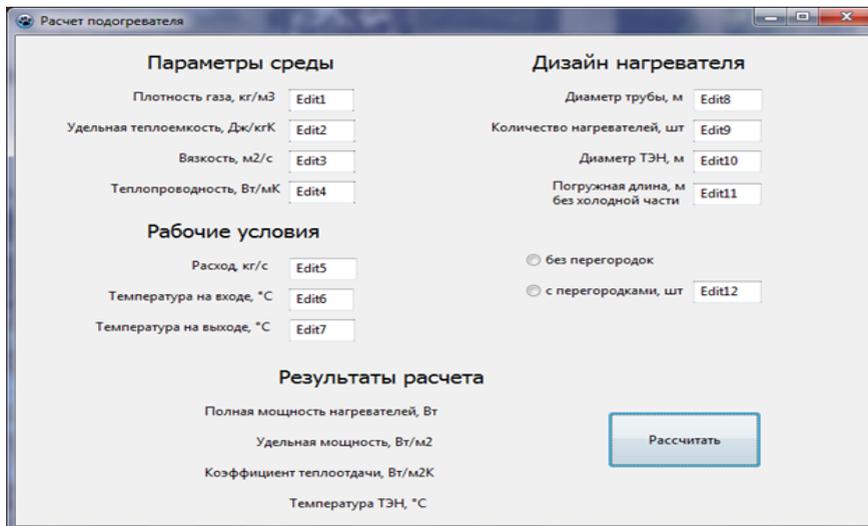

Fig. 2. *The working window of the program.*

To test the program, ten different designs of the heater were calculated. The tasks simulate real conditions for heating natural gas and certain liquids for their subsequent use in the oil and gas sector. Table 1 presents the results of calculating the electric power of the heater and the maximum temperature of its surface, depending on the flow rate of the liquid, its initial and final temperature, pressure, and thermophysical properties corresponding to these conditions [6]. The right column shows the temperature $t_{контр}$, which a heating element of a real shell-and-tube heater has under the indicated conditions.

Table 1. The results of the calculation of power and temperature of the heater

№	medium	P, kw	p, bar	G, N.m³/h	$t_{вх}$, °C	$t_{вых}$, °C	t_{max}, °C	$t_{контр}$, °C
Longitudinal flow around heaters (without partitions)								
1	natural gas	397	60	26000	0	27	161	190
2	natural gas	75	3	5902	-17	12	120	160
3	water	152	20	2,5	10	62	266	248

Longitudinal flow around heaters (without partitions)							
№	medium	P, kw	p, bar	$G,$ N.m³/h	$t_{вх}$, °C	$t_{вых}$, °C	$t_{max},$ °C	$t_{контр}$, °C
4	argon	0,9	10	49	-40	28	222	194
Cross flow (with partitions)							
5	natural gas	230	6	1300	10	390	450	411
6	oil	80	40	2,5	10	74	108	97
7	natural gas	10	150	280	5	52	242	237
8	natural gas	170	56	6500	32	80	181	135
9	transformer oil	135	2	7,64	190	220	348	282
10	natural gas	61	45	2950	-20	18	158	185

Analyzing the presented values, it can be noted that the calculation results show satisfactory convergence with the experimental data.

Conclusion

In the course of the work, a methodology was developed for calculating heat transfer conditions and the main parameters of an electric heater of natural gas and other media, and the calculation process was automated. To assess the reliability of the results obtained, a comparison is made between the results of calculating the power and maximum temperature of the electric heater with the readings of actual equipment. Using the presented program, the user can select a heater with parameters that are suitable for a particular object. As recommendations, it should be noted that an electric heater with baffles for directing the flow allows one to obtain higher heat transfer coefficients than a heater without baffles.

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激光粉末堆焊的计算机分析
COMPUTER ANALYSIS OF LASER POWDER SURFACING

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注解。 在本文中，我们研究了计算机分析激光粉末堆焊的应用示例。 分析了以下过程和参数。 它们是通过气体–粉末混合物对激光辐射的屏蔽，粉末流动对表面上激光辐射强度分布的影响，熔体表面对辐射的吸收，粉末在玻璃中的熔化熔池以及粉末混合系数的确定。 结果表明，计算机分析使您可以在技术设计阶段评估激光粉末堆焊过程中最重要的技术指标。 这使您可以大大减少技术开发阶段的实验工作量。
关键词: 粉末堆焊，计算机分析，光束屏蔽，粉末熔化，熔池，混合系数

Annotation. *In this paper, we examined an example of the application of computer analysis of laser powder surfacing. The following processes and parameters were analyzed. They are the screening of laser radiation by a gas-powder mixture, the effect of the powder flow on the distribution of the intensity of laser radiation over the surface, the absorption of radiation by the surface of the melt, the melting of the powder in the melt pool, and the determination of the mixing coefficient of the powder. It is shown, that computer analysis allows you to evaluate the most important technological indicators of the process of laser powder surfacing at the design stage of the technology. This allows you to significantly reduce the amount of experimental work at the stage of technology development.*

Keywords: *powder surfacing, computer analysis, beam shielding, powder melting, molten pool, mixing coefficient*

Laser-powder surfacing is used for applying a layer of 5-50 mm^2 with a thickness of 0.1-1.0 mm. At the same time, the consumption of powders is small, the depth of the thermal effect usually does not exceed 0.5-0.6 mm, and there are practically no deformations of the parts. This method is successfully used in mechanical engineering since the energy input process is highly efficient and scarce filler material is used sparingly.

The method of computer engineering analysis reduces the amount of experimental research. We used a physical and mathematical model of the process [1], which reproduces adequately both the basic physical phenomena and how technological factors impact on the dimensions of weld bead.

We solved in conjunction the differential equations of heat and mass transfer and pressure equilibrium over the melt surface [1]. The initial data for modeling was the following. They are the properties of the material of the part and powder, the flow rate of the powder, the flow rate of the conveying gas, the power of the laser beam, the deposition rate, positioning and the diameter of the powder feed nozzle. The surfacing model takes into account beam shielding with a gas-powder mixture.
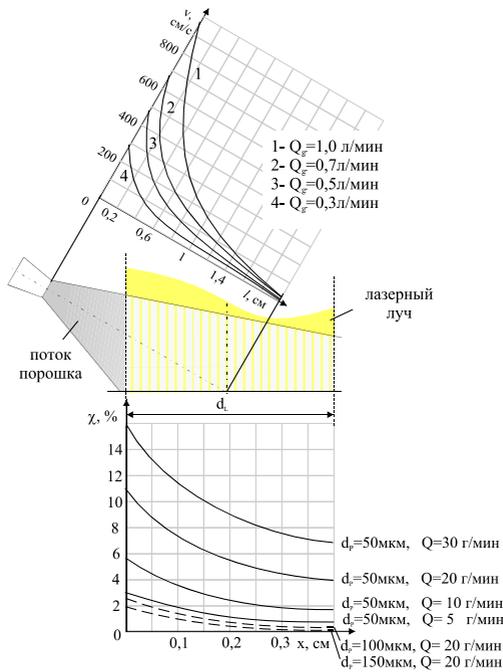
Fig 1. *The fraction χ of the radiation power that is absorbed by the powder stream and the velocity distribution v of the powder along the x axis of the stream for different particle diameters d_r at various transport gas consumptions Q_g and powder Q.*

Laser shielding with a gas-powder mixture. The gas-powder mixture shields laser radiation, which is partially absorbed in it and partially reflected from it. In order for the radiation intensity on the surface of the part to be evaluated, we must determine the degree of radiation shielding by the gas-powder mixture. To this end, we performed a calculation of the absorption of radiation from an ND: YAG laser with a power of 4 kW and a beam diameter of 4 mm (the overlaying rate was 4 mm / s, the diameter of the nozzle for feeding the powder was 1.5 mm and was located at an angle of 30 °). The 20KhN4FA steel substrate and VK3 hard alloy powder (powder particle sizes were d_p = 50, 100, and 150 μm) were used. The mass flow rate of the powder we varied within Q = 5 - 30 g / min.

Figure 1 shows a graph of the distribution of the absorption coefficient of the gas-powder mixture χ which we obtained as a result of this calculation.

The effect of powder flow on the distribution of the intensity of laser radiation over the surface. Laser radiation is partially reflected and partially absorbed by the surface. In Fig.2 a diagram of the distribution of the intensity of laser radiation and heat is shown, where I_0 is the intensity of the laser radiation; I is the radiation intensity, taking into account screening in a gas-powder mixture; I_{ogpl} is the intensity of the radiation absorbed by the surface of the part; I_{por} is the heat introduced by the powder.

Figure 2 shows that the intensity of the laser radiation acting on the surface decreases when it is shielded from I_0 = 318 W / cm² to I = 300 ... 314 W / cm².

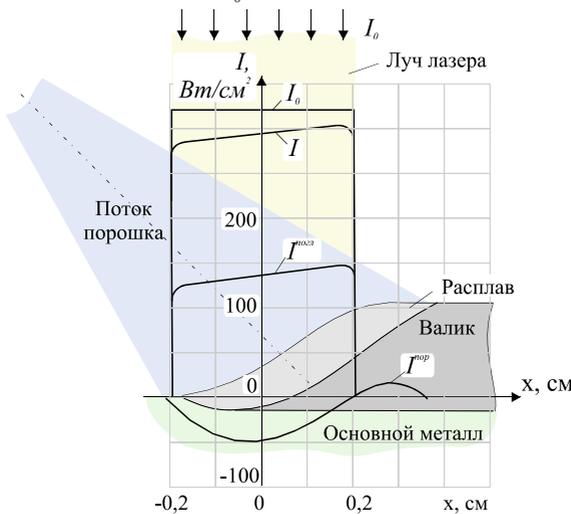**Fig. 2.** *Distribution pattern of laser radiation intensity and heat (P = 4kW, dL = 4mm, Q = 10 g / min, Qg = 1 l / min, dP = 50 mkm, Zc = 1.5 cm, dc = 15 mm and α = 45⁰).*

The absorption of radiation by the surface of the melt. When a powder falls on a molten surface, its roughness increases. This causes an increase in the absorption coefficient of laser radiation [4]. If the absorption coefficient $\varepsilon = 0.5$, then I_{ogl} = 150 - 175 W / cm^2 and I_{por} = 10 - 50 W / cm^2.

Powder melting in a molten bath. The melting time of powder particles (t_{sp}) depends on the diameter of the particles and their temperature, as well as the temperature of the melt [2].

Figure 3 shows the time of melting of VK3 powder particles depending on their diameter at different temperatures of the melt pool.
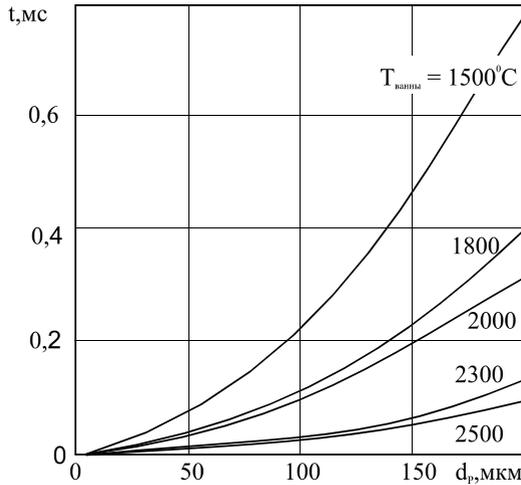

Fig. 3. *The melting time of VK3 powder particles depending on their diameter at different temperatures of the melt bath.*

The particle melting time in the melt is not more than 0.8 ms (see Fig. 3). This time is small, therefore, a particle of powder falling into the melt is immersed in it at a small distance. For example, at a surfacing speed of 1 cm / s, this distance is not more than 0.03 mm, i.e. it is less than the diameter of the particle. It follows from the foregoing that only those particles do not melt that enter the melt immediately before the crystallization front, where the melt layer on the surface of the bath is very thin [3].

Determination of the mixing coefficient of the powder. The mixing coefficient ζ_L is the ratio of the area of the molten metal of the substrate to the area of the entire molten metal in the cross section of the weld (see Fig. 4).

As in Fig. 4 shows, that minimal mixing is observed when the displacement of the center of incidence of the powder is Δx = 0.5 mm. This condition determines the minimum powder consumption.

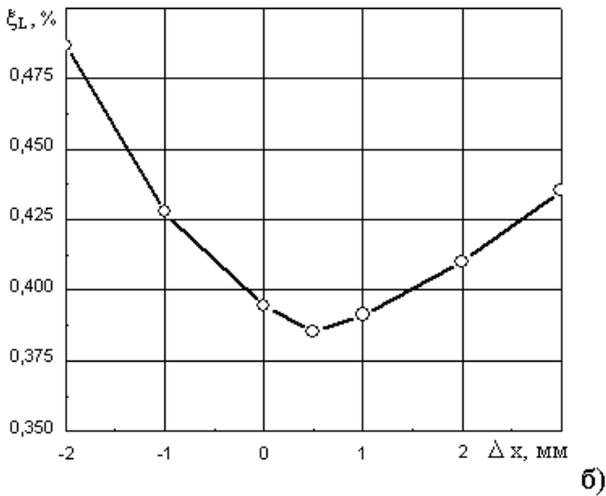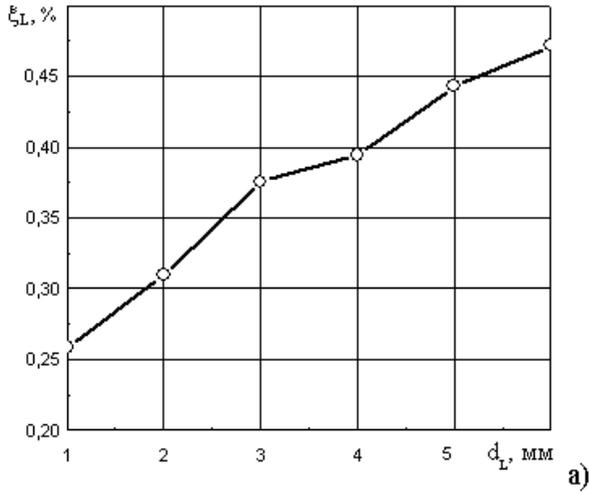*Fig. 4. The dependence of the mixing coefficient* ξ_L *on the beam diameter (a), the displacement of the laser beam relative to the center of powder supply (b) at* $P_L = 3\ kW,\ v = 1\ cm\ /\ s,\ Q = 20\ g\ /\ min$

Thus, we have illustrated that computer analysis allows you to evaluate the most important technological parameters of the laser powder deposition process at the design stage of the technology. This allows you to significantly reduce the amount of experimental work at the stage of technology development.

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在砂模和粘土模中浇铸时选择浇口系统的工程分析
ENGINEERING ANALYSIS OF THE CHOICE OF GATING SYSTEMS WHEN CASTING IN SAND AND CLAY MOLDS

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抽象。 给出了对金属填充模具的过程，冷却动力学，结晶动力学以及在金属中形成收缩缺陷进行建模的结果。 作为一个例子，考虑了由铝镁合金以砂土形式进行铸件的凝固过程。

关键词: 数学模型; 砂土形式的铸造过程; 结晶; 收缩壳的形成; 液相; 冷却动力学

Abstract. *The results of modeling the processes of filling the mold with metal, the cooling kinetics, the crystallization kinetics, and the formation of shrinkage defects in metals are presented. As an example, the process of solidification of a casting from an Al-Mg alloy in a sand-clay form is considered.*

Keywords: *mathematical model, casting process in sand-clay forms, crystallization, formation of shrinkage shell, liquid phase, cooling kinetics.*

Introduction

Currently, engineering analysis systems (CAE) are widely used. Engineering analysis involves the use of basic physical principles to solve problems in order to obtain acceptable solutions in an acceptable time.

Research objective

In each case, the task of determining the exact size of the gating system is difficult due to the complexity of the phenomena that occur when filling the mold with liquid metal. Therefore, in practice, simplified methods are used based on the following assumptions. Liquid metal is considered an ideal fluid with constant viscosity; the thermal effect of the metal and the mold (metal cooling and mold heating) is not taken into account when filling it; the movement of a liquid metal is considered as the movement of a heavy liquid through closed and open channels of the form. Typically, the following methods for calculating the gating system are used: method of Ozann-Ditter's, calculation by nomogram of Sobolev's, calculation by the method of Rabinovich's [1].

Research methods and results

To solve the problem in the developed system, an approximate mathematical model of the process of casting in sand and clay molds was built for a number of modeling areas (see Figure 1).
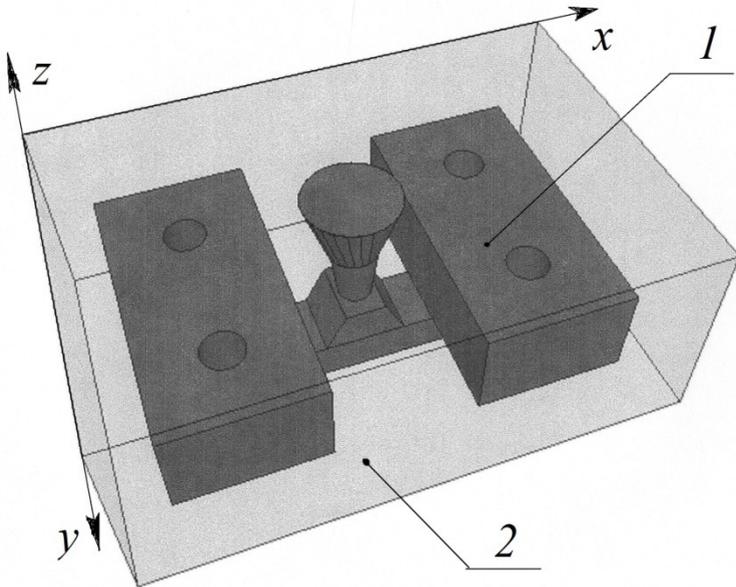

Figure 1. *The structure of the modeling area:*
1 is mold cavity filled with metal (region M); 2 is casting shape (region F).

The mathematical model describes the process of filling a mold with metal, the kinetics of cooling (temperature), the kinetics of crystallization (liquid phase), the formation of shrinkage defects in metals.

The heat equation (1) expresses the heat balance for a small element of the volume of the medium, taking into account the heat input from sources and heat loss through the surface of the elementary volume due to heat conduction.

$$\frac{\partial H}{\partial t} = \frac{\partial}{\partial x}\left(\lambda \frac{\partial T}{\partial x}\right) + \frac{\partial}{\partial y}\left(\lambda \frac{\partial T}{\partial y}\right) + \frac{\partial}{\partial z}\left(\lambda \frac{\partial T}{\partial z}\right) + I \ , \qquad (1)$$

where λ is coefficient of thermal conductivity (W/(cm×K)); I is volume density of the heat flow of internal sources (W/cm^3):

$$I = \partial W / \partial t \tag{2}$$

where W is specific heat released or absorbed by internal sources [2].

This equation is solved in a nonlinear medium, since the properties of the metal (region M in the Fig.1) and the material of the form (region F in the Fig.1) are very different.

$$\lambda = \begin{cases} \lambda_M & x,y,z \in M \\ \lambda_F & x,y,z \in F, \end{cases} \tag{3}$$

where λ_M, λ_F are thermal conductivity of metal (region M in the Fig.1) and mold material (region F in the Fig.1).

$$H = \begin{cases} \begin{cases} c\rho T & if \ T < T_s \\ c\rho T + H_L \dfrac{T - T_s}{T_L - T_s} & if \ T_s < T < T_L \quad x,y,z \in F \\ c\rho T + H_L & if \ T > T_L \end{cases} \\ c_F \rho_F T \quad x,y,z \in F \end{cases} \tag{4}$$

where c, ρ are heat capacity (J/(gr×K)) and density (gr/cm³) of metal; c_F, ρ_F are heat capacity and density of mold material; T_L, T_S are metal liquidus and solidus temperatures; H_L is enthalpy of melting (J/cm³).

The initial conditions are the initial distribution of the enthalpy temperature in space.

$$t = 0; \ T = T_0 \ for \ x,y,z \in F; \ T = T_{cst} \ for \ x,y,z \in M, \tag{5}$$

where T_{cast} is metal temperature after casting.

Boundary conditions describe the location of the surface (casting) in space (mold) and the condition of heat exchange of the body with the external environment.

$$x = 0 \cup x = x_{max} \ | \ \frac{\partial T}{\partial x} = -b(T - T_0)$$

$$y = 0 \cup y = y_{max} \ | \ \frac{\partial T}{\partial y} = -b(T - T_0) \tag{6}$$

$$z = 0 \cup z = z_{max} \ | \ \frac{\partial T}{\partial z} = -b(T - T_0)$$

where b is heat transfer coefficient (W/(cm²×K)).

The numerical solution of the model is implemented on a regular rectangular difference grid, nodes i, j, k which are the enthalpy and temperature $T_{i,j,k}$ $H_{i,j,k}$ respectively.

The structure of the discrete space is described by a three-dimensional array U, indicating that the assembly belongs to a metal or shape material.

The solution of equation (1) was performed by the finite difference method [2].

The program that implements the solution of the task, is written in the programming environment Borland Delphi 7.

The result is presented in Fig. 2 as an image of the temperature distribution in the plane of symmetry of "casting - casting mold" system.
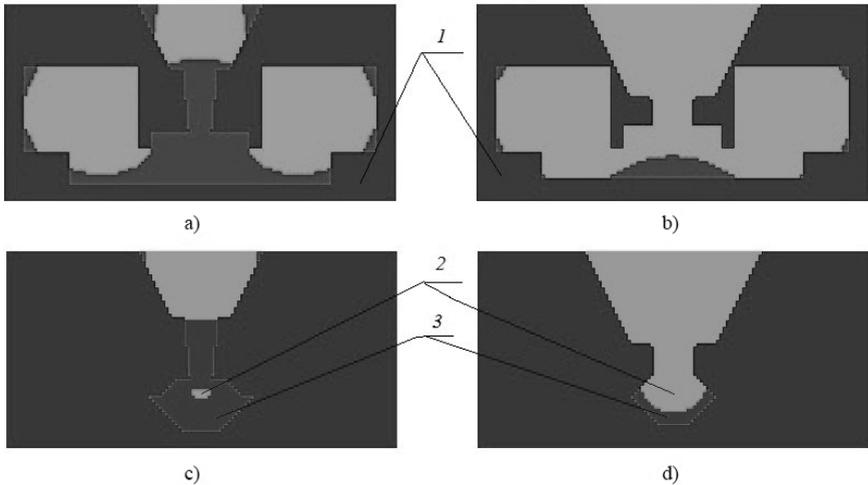

Figure 2. *A screen shot when solving the problem of choosing the gate system elements:*

Fn = 2.7 cm² (a and c); Fn = 3.0 cm² (b and d); 1 is casting shape, region F; 2 is mold cavity filled with metal, region M; 3 is crystallization process.

The program allows you to solve the problem of determining the dimensions of the elements of the gating system. The criterion for the quality formation of castings is the absence of closed cavities with liquid metal at the end of solidification.

As an example, the solidification process of casting from an alloy of an Al-Mg system in a sandy-clay form is considered. Overall dimensions of the casting are 600×450×450 mm.

When modeling, the following values were used: T_L = 650°C, T_S = 500°C, H_L = 600 J/cm³, λ_M = 2 W/(cm K), λ_F = 0,1 W/(cm K), b = 0,1 W /(cm² K).

With a cross-sectional area of the feed system of the feeder equal to F_f = 2,7 cm², during the solidification process, a closed area has formed inside the casting (Fig. 2, a), which is unacceptable, since defects arise in the form of shrinkage shells.

Then, the gating system sizes were increased with the cross-sectional area of the gating system feeder $F_f > 3,0$ cm^2 the solidification process is completed in the gating system. The value of $F_f = 3,0$ cm^2 is optimal, a further increase is impractical, since it leads to an increase in metal consumption.

Summary

The developed model allows us to solve the problem of optimizing the design of the gate system elements. For practical use of the program, it is necessary to create an interface that allows you to describe the design of castings of complex shape.

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带区域相电压调节器的电力机车晶闸管最小开度减小的电磁过程研究
THE RESEARCH OF ELECTROMAGNETIC PROCESSES WITH A DECREASE IN THE MINIMUM OPENING ANGLE OF THYRISTORS ON AN ELECTRIC LOCOMOTIVE WITH A ZONE-PHASE VOLTAGE REGULATOR

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抽象。　该工作提出了一种通过改变依赖于调节区域的整流器–逆变器转换器（RIC）的晶闸管的最小开度角来增加电力机车的功率因数的方法。　已经开发出一种用于产生角度为α0的脉冲的装置，该装置排除了开关前和开关后电压波动对其操作的影响。　分析了减小角度α0对切换前和切换后电压波动的影响。

关键词：电力机车；　功率因数。

Abstract. *The work proposes a method of increasing the power factor of an electric locomotive by changing the minimum opening angle of the thyristors of a rectifier-inverter converter (RIC) depending on the regulation zone. A device for generating pulses of angle α_0 has been developed, which excludes the influence on its operation of pre- and post-switching voltage fluctuations. The effect of decreasing the angle α_0 on the pre- and post-switching voltage fluctuations is analyzed.*

Keywords: *electric locomotive; power factor.*

Introduction

On the railway network of alternating current of the Russian Federation, electric locomotives with zone-phase regulation of voltage on traction motors received the greatest distribution. At the same time, modern electric locomotives (3ES5K, EP1, etc.) are not without the drawbacks of the locomotives of the previous series associated with the relatively low value of the power factor K_m, which reaches at best 0.84 in the traction mode. In regenerative braking mode, the value of this indicator is even lower.

The power factor of the consumer of electric energy in the general case is determined by the expression:

$$K_M = cos\,\varphi \cdot \nu \qquad (1)$$

where φ – shear angle between supply voltage and first harmonic of current consumption;

ν – current shape distortion factor.

The angle φ for a multi-zone rectifier-inverter converter of an electric locomotive in traction mode is calculated by the approximate formula:

$$\varphi \approx \alpha_0 + \frac{\gamma}{2}, \qquad (2)$$

where α_0 – minimum unregulated angle required to open the thyristors;

γ – angle characterizing the duration of the current switching process in RIC thyristors.

The analysis of expressions (1) and (2) shows that an increase in the power factor K_m is achievable by reducing the minimum opening angle of thyristors α_0 and shortening the switching time γ, as well as by improving the shape of the current consumed by an electric locomotive. Consider the possibility of increasing K_m by reducing the opening angle of the thyristors α_0.

Change in angle α_0 depending on the regulation zone. Currently, a fixed value of the minimum thyristor opening angle $\alpha_0 = 9 \pm 2$ el.grades in all four regulation zones, i.e. control pulses arrive at the RIC thyristors with a delay of an angle α0 relative to the beginning of the half-cycle of the mains voltage. This is necessary so that by the time the thyristors are opened, the direct voltage between their anodes and cathodes has reached the required level, ensuring their reliable engagement.

Reducing the minimum opening angle of thyristors α_0 can be carried out in the second, third and fourth control zones while providing potential conditions for reliable opening of thyristors. The voltage level at which reliable opening of the thyristors will be ensured is determined by the first regulation zone, where the anode voltage on the shoulders of the thyristors $V3$, $V5$ at the moment of their inclusion is:

$$U_{om\kappa p} = \sqrt{2}U_1 \sin 9^\circ = \sqrt{2} \cdot 315 \cdot 0.156 \approx 70\ B. \qquad (3)$$

This means that such a voltage across two thyristors of the same branch of the RIC arm provides their guaranteed opening at the beginning of the half-period with all possible distortions in the shape of the mains voltage.

Let us determine the values of the angles α_0 from expression (3), at which a voltage level equal to U_{open} will be provided in the second and subsequent control zones. So for the second regulation zone at $U_2 = 630$ V, the angle $\alpha_0 = 4.5$ electric degrees. For the third and fourth control zones at $U_2 = 945$ V and $U_2 = 1260$ V, the minimum opening angle of thyristors is 3.0 electric degrees and 2.25 electric degrees, respectively.

As a result of simulation, the power factor was calculated for a standard electric locomotive circuit and for a modernized circuit with $\alpha_0 = 4.5$ electric degrees and $\alpha_0 = 2.25$ electric degrees. The simulation was carried out while ensuring a constant load current $I_n = const$ and angle regulation $\alpha_{reg} = 90$ electric degrees. As a result of the calculations, the values of the power factor Km in the standard circuit were 0.701, in the circuit with $\alpha_0 = 4.5$ electric degrees - 0.713, in the circuit with $\alpha_0 = 2.25$ electric degrees. - 0.718. Thus, a decrease in the angle α_0 contributes to an increase in the power factor K_m.

Pulse Shaper. FESTU has developed and patented a device for generating pulses of the minimum opening angle of thyristors α_0 and phase-delayed pulse α_0 back with a distorted shape of the supply voltage [1]. Since distortions in the shape of the supply voltage are characteristic only for the beginning of a half-period, it was decided in the device to measure the value of the minimum control angle α_0 not at the beginning but at the end of the half-period, where distortions of the voltage form are absent or minimal. In accordance with the values of the control angle measured at the end of the half-period, the formation of control pulses α_0 for the thyristors of the converter occurs at the beginning of the next half-period. In this case, the measurement and formation of control pulses is carried out according to the actual value of the anode voltage (tracking voltage) on the thyristors of the converter.

The effect of decreasing angle α_0 on post-switching oscillations. It is known that the beginning and end of network and phase switching is accompanied by the appearance of free high-frequency oscillations in the form of a network voltage U_l. The analysis of electromagnetic processes occurring in a contact network with distributed parameters and with a minimum opening angle of thyristors $\alpha_0 = 9$ electric degrees is a subject of works [2] and [3].

We model electromagnetic processes at the current collector of an electric locomotive located in the middle of the inter-substation zone with a minimum opening angle of thyristors $\alpha_0 = 9$ electric degrees and $\alpha_0 = 4,5$ electric degrees. Transient calculations in the contact network model (Figure 1) were performed in the MATLAB/Simulink simulation environment [4].
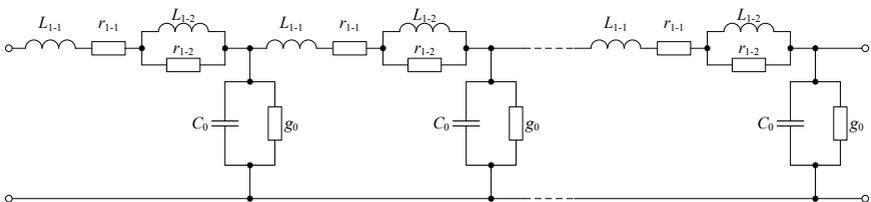

***Figure 1** - Contact network model that takes into account the nonlinearity of the longitudinal parameters*

From an analysis of the results of modeling electromagnetic processes for voltage drop, it was found that the beginning of switching at an angle $\alpha_0 = 9$ electric degrees causes voltage fluctuations with an initial frequency of 2770 Hz and a maximum amplitude of $U_{m9down} = 6968$ V. The end of switching is accompanied by an initial frequency of 2760 Hz and a maximum amplitude of with a plateau $U_{m9up} = 49963$ V. The duration of the transient in both cases is 0.008 s.

From an analysis of the simulation results of electromagnetic processes on the voltage jump it follows that the beginning of switching at an angle $\alpha_0 = 4.5$ electric degrees causes voltage fluctuations with an initial frequency of 2770 Hz and a maximum amplitude of $U_{m4.5down} = 3495$ V. The end of the switching is accompanied by an initial frequency of 2760 Hz and the maximum amplitude $U_{m4.5up} = 48755$ V. The duration of the transient in both cases is 0.008 s.

Thus, a decrease in the angle α_0 from 9 electric degrees to 4.5 electric degrees leads to a decrease in the initial amplitude of high-frequency voltage fluctuations from 6968 V to 3495 V at the same oscillation frequency.

Conclusion

As a result of the study, it was found that increasing the power factor of an electric locomotive is possible by reducing the minimum opening angle of thyristors α_0 depending on the control zone. It was found that, compared with the standard scheme of an electric locomotive, a decrease in the angle α_0 to 4.5 electric degrees leads to an almost twofold decrease in the amplitude of pre-switching voltage fluctuations and a decrease in the amplitude of post-switching voltage fluctuations.

To increase the stability of the control system of an electric locomotive with a distorted shape of the supply voltage, a device is proposed for forming minimal control angles α_0 at the end of a half-period. This will ensure the operation of the electric locomotive in case of distortion of the form of mains voltage.

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