Minzu University of China
Infinity publishing

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

International Conference

Beijing, China 2019

上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

International Conference
“Scientific research of the SCO countries: synergy and integration”

Part 3: Participants’ reports in English

2019年2月11-12日，中国北京
February 11-12, 2019. Beijing, PRC

ISBN 978-5-905695-93-3

Materials of the International Conference
“Scientific research of the SCO countries: synergy and integration”. Part 3 - Reports in English

(February 11-12, 2019. Beijing, PRC)

ISBN 978-5-905695-93-3

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。

作者对所引用的出版物，事实，数字，引用，统计数据，专有名称和其他信息的准确性负责

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.

ISBN 978-5-905695-93-3

CONTENT

TECHNICAL SCIENCE

CHEMICAL SCIENCES

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,
member of the Chinese Academy of Sciences

前言

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

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

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

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

预防参与者关于责任刑事案件的法院细节：刑事诉讼程序和组织方面
PREVENTION OF PARTICIPANTS OF COURT DETAILS ON CRIMINAL CASE ON RESPONSIBILITY: CRIMINAL-PROCEDURAL AND ORGANIZATIONAL ASPECTS

Sidorova Natalia Vyacheslavovna
Candidate of Juridical Sciences, Associate Professor
Tyumen State University
Khabarova Elena Anatolyevna
Candidate of Juridical Sciences, Associate Professor
Tyumen State University

注解。 本文分析了刑事诉讼法中规定的要求和程序，主审法官有责任在刑事案件中警告参与者拒绝作证并提供明知故意的证据。 提交人提出了关于将订阅存储在刑事诉讼材料中的程序的提案，以及对管辖该问题的刑事诉讼法作出适当修正的必要性。

关键词：警告，责任，诉讼参与者，法院书记员，主持人。

Annotation*. The article analyzes the requirements and the procedure provided for in the criminal procedure law on the duty of the presiding judge to warn participants in a criminal case on criminal liability for refusing to testify and giving knowingly false testimony. The authors formulated proposals on the procedure for storing the subscription in the materials of the criminal proceedings and the need to make appropriate amendments to the criminal procedure law governing this issue.*

Keywords*: warning, responsibility, participants in the proceedings, court clerk, presiding.*

The question of the order of warning participants in the trial of their rights and obligations is of practical importance. An improperly made, or not at all, made a warning about the rights of a participant in a criminal case can be interpreted as a violation of the criminal procedure law and, consequently, lead to an appeal and then cancellation of the judicial act by a higher court. Not explaining or not observing the procedure for clarifying criminal responsibility for refusing to give evidence or for knowingly false testimony and at all entails the loss of the possibility of criminal prosecution of a participant in criminal proceedings who failed

to comply with his procedural obligations to provide truthful information on the criminal case. It is necessary to agree with the researchers that the conscientious implementation of the provisions of Article 11 of the Criminal Procedure Code of the Russian Federation is an additional guarantee for ensuring the rights and obligations of the participant in the process. [4, p. 29]

It should be noted that the judge, who presides at the court hearing, must warn about the responsibility for failure to comply with the duties arising during the proceedings at the judicial stages of the Russian criminal process. In practice, however, part of the workload (mainly organizational) is transferred to the court clerk. At the same time, the law itself - the Code of Criminal Procedure of the Russian Federation calls into question the determination of the status of a court clerk as a full-fledged subject of criminal procedure relations. In particular, this follows from the interpretation of the Section 2 of the Criminal Procedure Code of the Russian Federation "Participants in Criminal Justice", in which the court clerk is not mentioned.

All this allows us to conclude that, whatever the professional functions of the court clerk, it is not he, but only the judge who is responsible for the timely, full explanation of the rights, duties and responsibilities of the participants in the proceedings. The secretary must provide organizational support for the implementation of criminal procedure.

Disclosing the connection of legal and criminal procedural guarantees of ensuring the rights and freedoms of an individual, Yu.P. Mikhalchuk and V.I. Solodkin is considered "necessary to focus on such an important element of the mechanism of ensuring rights, as the criminal procedure form, which has a serious impact on the organization of the activities of the investigator, inquiry officer, prosecutor, judge". [3; P. 89]

Of course, the procedure for clarifying the rights, duties and responsibilities of the participants in the proceedings should be carried out in a procedural manner. What questions arise with this?

The Criminal Procedure Code of the Russian Federation does not establish a place in the courtroom where the selection of a criminal responsibility subscription should be carried out in accordance with Articles 307 and 308 of the Criminal Code of the Russian Federation. According to Article 278 of the Criminal Procedure Code of the Russian Federation, an explanation of rights, obligations and a warning about responsibility must be made immediately before the main (substantive) part of the interrogation. In what specific place of the courtroom it will be done, it has no legal value. Selecting a subscription at the special tribune of the courtroom, for which the interrogated testify and answer questions, does not contradict the criminal procedure legislation. The record of the warning must be made in the minutes of the court hearing (Article 259 of the Criminal Procedure

Code of the Russian Federation). This mark must be made in any case and cannot be replaced by a simple attachment of a separate document (subscription) to the written protocol. The judge personally (or through the court clerk) must make sure that the witness actually signed the relevant document, otherwise it is impossible to say that the person has signed the corresponding subscription.

All subscriptions in accordance with Part 2 of Article 278 of the Criminal Procedure Code of the Russian Federation are attached to the trial record. It is important to remember that the final form of the protocol should be made no later than three days from the date of the end of the court hearing (part 6 of Article 259 of the Criminal Procedure Code of the Russian Federation). All documents of the court session, which are included in the materials of the criminal case, are attached to the file along with the protocol (paragraph 7.9 of the Instruction on judicial proceedings in the district court). The location of the storage of these documents until the final formation of the protocol of the court session of the Code of Criminal Procedure does not determine, but it clearly follows from the aforementioned regulations that the documents must be intact, and a note about the warning is made in the protocol.

As part of the criminal case file, as follows from Article 278 of the Criminal Procedure Code of the Russian Federation, subscriptions should be kept together with other materials of the case, and there are no rigidly fixed criminal procedure or judicial (organizational) norms. A special regime for storing materials prior to the production of the court hearing protocol in its final form does not establish the Criminal Procedure Code of the Russian Federation and the Instruction on judicial proceedings in the district court [1].

The Criminal Procedure Code of the Russian Federation does not establish the rules by which the court must make a special decision on the inclusion of a subscription on the warning of criminal liability to the materials of the criminal case. As mentioned above, in accordance with the provisions of Article 259 and 278 of the Criminal Procedure Code of the Russian Federation, the fact of clarification of rights, duties and responsibilities is confirmed by a note in the protocol and a corresponding subscription to the protocol attached (without a special procedure regulated by law). The loss of a subscription before the final formation of the court record should be regarded as the loss of the criminal case materials. However, the fact of the loss of a subscription issued as a separate document does not indicate that the subscription by the witness was not given at all and that the warning was not made properly. The Criminal Procedure Law actually establishes a double formal confirmation of the court's explanation of the rights, duties and responsibilities of witnesses at the court hearing: a) by signing a separate document by the witness (the subscription itself, which, along with other documents, is attached to the protocol); b) by marking in the text of the record of the court session. Consid-

ering that before the final production of the court record, the secretary can record the course of the trial by recording or using other technical means, as well as transcribing (part 2 of Article 259 of the Criminal Procedure Code of the Russian Federation), the fact of proper warning of liability with the loss of a subscription in the form of a paper document.

The issue of storage of the criminal case and its individual materials in court is not a matter that should be settled by the criminal procedure law, it is the subject of regulation of instructions for judicial proceedings and, possibly, job descriptions of court employees. In our opinion, at present, this regulation in the Instructions for judicial proceedings in the district court is not enough.

References

1. Instruction on judicial clerical work in the district court, approved by order of the Judicial Department at the Supreme Court of the Russian Federation No. 36 of April 29, 2003 with changes and additions as of January 9, 2018 // Consultant Legal System "Consultant Plus".

2. The Criminal Procedure Code of the Russian Federation of December 18, 2001 N 174-FZ (as amended on December 27, 2017) (as amended and added, entered into force on January 8, 2019) // Meeting of the Legislation of the Russian Federation, 24.12. 2001, No. 52 (Part I), Article 4921.

3. Mikhalchuk Yu.P., Solodkina V.I. Organizational-legal and criminal procedural guarantees of ensuring the rights and freedoms of the individual in criminal proceedings // Bulletin of Krasnodar University of the Ministry of Internal Affairs of Russia. - 2014. - № 4. P.87-91.

4.Hatuyeva V.V. Savchenko D.A. On the question of some procedural guarantees of the protection of the interests of a witness in criminal proceedings // Modern science of Eurasia. Collection of materials of the international scientific conference. - Voronezh: Publishing House Rhythm LLC. - p. 27-29

关于在优先满足个别贷方要求的情况下挑战交易的问题

ON THE ISSUES OF EXPERIENCE OF TRANSACTIONS, PERFECTED WITH THE MAJOR SATISFACTION OF THE REQUIREMENTS OF INDIVIDUAL CREDITORS

Sholokhova Elvira Aleksandrovna
4th year student of Law Institute
Irkutsk State University, Russia, Irkutsk,

注解。 近年来，破产组织的制度正以惊人的速度发展。 规范债务人交易的程序和本质的立法，特别是对债务人优先交易的挑战，正在与之一起发展。

关键词：组织破产，具有挑战性的交易，有优先权的交易，债权人的债权，优先权证明的主题。

Annotation. *In recent years, the institution of bankruptcy organizations is developing at a tremendous rate. The legislation regulating the procedure and the essence of challenging the debtor's transactions, and in particular challenging the debtor's transactions made with preference, is developing along with it.*

Keywords*: bankruptcy of organizations, challenging transactions, transactions with preference, claims of creditors, the subject of proof of preference.*

The institution of bankruptcy at the present stage is one of the most popular among organizations and citizens who are unable to pay off their creditors with their obligations.

As you know, the majority of "bankrupts" are trying to evade the full satisfaction of the requirements of all creditors and they do this in a variety of ways. However, creditors in this case are the persons least protected from major material losses in the bankruptcy procedure.

The debtor, in turn, concludes various transactions for the withdrawal of their assets before entering into bankruptcy proceedings. So that in the future it was possible to replenish the bankruptcy estate and pay the debtor’s obligations as much as possible, the persons participating in these separate disputes dispute the debtor’s transactions on two grounds: suspiciousness of transactions, execution of a transaction with preferential satisfaction of one creditor’s claims over others.

One of the most difficult issues is challenging the debtor’s transactions in bankruptcy proceedings. Challenging the debtor’s transactions in bankruptcy pro-

cedures as a way of protecting the rights and interests of creditors is important for creditors, since an unfair debtor by entering into various kinds of transactions can make it impossible to satisfy creditors' claims, which, in turn, is the main objective in a bankruptcy case.

This should be called a debtor's transactions with a negative effect on creditors, by which it is proposed to understand the debtor's transactions with any person, resulting in the impossibility or difficulty for the creditors to realize the legal possibilities in a bankruptcy case.

This should be called a debtor's transactions with a negative effect on creditors, by which it is proposed to understand the debtor's transactions with any person, resulting in the impossibility or difficulty for the creditors to realize the legal possibilities in a bankruptcy case.

Federal Law dated 10.26.2002 N 127-ФЗ "On Insolvency (Bankruptcy)" (hereinafter referred to as the Bankruptcy Law) establishes special grounds for challenging the debtor's transactions different from the Civil Code. In particular, it provides for the possibility of challenging suspicious transactions of the debtor (Article 61.2 of the Bankruptcy Law), as well as challenging the debtor's transactions that entail preference for one of the creditors over other creditors (Article 61.3 of the Bankruptcy Law).

The bankruptcy law establishes that a transaction entered into by a debtor against a particular creditor or another person may be declared invalid by the court if it entails or may entail the preference of one of the creditors over other creditors regarding the satisfaction of claims, in particular one of the following conditions:

- if such a transaction was sent to repay any obligation to the creditor that arose before the conclusion of such a transaction;
- if it can lead to a change in the priority set by the law for repaying claims to creditors on obligations that arose prior to the execution of the disputed transaction;
- if it led to the fulfillment of those obligations, the maturity of which has not yet arrived, and if at that time there were other outstanding obligations to other creditors with the commencement date;
- if it led to the fact that one creditor was given or may be given greater preference in respect of the settlement of claims that existed before the disputed transaction was completed than in the case of settlement with creditors in order of priority in accordance with the insolvency (bankruptcy) law .

The rest of the transactions specified in par. 4, 5 p. 1, Art. 61.3 Bankruptcy Law and committed with preference, can be challenged if they are committed after the court accepted the application or within one month before. It is not necessary to establish the bad faith of the counterparty of the debtor in this case (clause 11 of the Resolution of the Plenum of the Supreme Arbitration Court of the Russian Federation of December 23, 2010 N 63).

This can be done by an external or competitive manager. For example, on its own initiative or by decision of the meeting of creditors (clause 1 of Article 61.9 of the Bankruptcy Law); representative of creditors, if the manager has not filed an application pursuant to the decision of the meeting of creditors (clause 1 of Article 61.9 of the Bankruptcy Law); the bankruptcy creditor or the authorized body, if the size of the debtor's payable to it is more than 10% of its total amount. The calculation of the total amount does not include the indebtedness of the creditor, in respect of whom the transaction is disputed, and his affiliates (clause 2 of Article 61.9 of the Bankruptcy Law); the interim administration of a financial organization in cases provided for by the Bankruptcy Law (Section 3, Article. 61.9 of the Bankruptcy Law).

The controversial point is the question of the nature of preference - subjective or objective. The law says nothing about the fact that there should be a malicious act of the debtor, aimed at the withdrawal of assets. In order to recognize the deal in question invalid it is enough only to the fact of the preferential satisfaction of the claims of one creditor over other creditors. Refusing to meet the requirements, the court, as a rule, refers to the absence of other unsatisfied and overdue claims made to the debtor.

For example, in a decision of the Arbitration Court of the East-Siberian District dated September 28, 201, the court refused to satisfy the requirement to invalidate banking operations for transferring money on payment orders, applying the consequences of the invalidity of a transaction in the form of collecting money recovery of interest for the use of other people's money, as there is no evidence of any other payment documents not executed by the bank to the same order, the presumption of committing contested transactions in the ordinary course of business has not been refuted, the courts rightly pointed out the absence of grounds established by paragraph 1 of Article 61.3 of the Bankruptcy Law to invalidate contested transactions.

Thus, it seems that the court proceeds from the subjective nature of preference: it takes place when the debtor chooses who to pay in the conditions of insufficient funds. If this choice does not occur, you can not talk about preference.

At the same time, the Supreme Court, abolishing judicial acts, proceeds from the objective nature of preference: the subjective attitude of the debtor to payment does not matter, it is important that the respective creditor receives more than he could receive when distributing the bankruptcy parity with other creditors of his turn. In this sense, the debtor may not be aware of the fact that paying the debt puts the creditor in a preferential position. That, as a rule, creates extensive grounds for abuse of the right, actively used by persons involved in a bankruptcy case and separate disputes.

No one can be sure that, receiving funds against debt, is not in a position

advantageous over other creditors. The collision of the principle of equality of creditors and interests of turnover is solved as follows: “objective imputation” of creditor preference is limited to one month before initiating a bankruptcy case) (paragraph 2 of Article 61.3 of the Bankruptcy Law), beyond which the creditor can only impute such preferential payment debt, of which he knows his preferred character. At the same time, the subject of proof in a dispute about invalidation of a transaction (actions) with a preference made no earlier than six months and no later than one month before the court accepted the application for declaring the debtor bankrupt, includes determining whether or not the counterparty is aware of the sign of insolvency or insufficiency of the property, or of the circumstances that lead to the conclusion about the presence of such signs.

To testify that the creditor had the opportunity to learn about the insolvency of the debtor or the insufficiency of his property can: repeated requests from the debtor to the creditors with requests to postpone the performance of his obligations; the long availability of the filing of the debtor’s bank account (including the hidden one); the creditor’s knowledge that the debtor has filed for bankruptcy.

Awareness of the parties to the transaction about the sign of insolvency or insufficiency of property or about circumstances that allow to make a conclusion about the sign of insolvency or insufficiency of property (hereinafter - a sign of insolvency) of the debtor, due to the subjective nature of this phenomenon and the use of this standard by the law enforcement officer is extremely difficult to install. The courts often have difficulty in assessing the circumstances that indicate that the counterparty or other person in the transaction was aware of these signs, or that refute such awareness.

The difficulty mainly lies in the fact that quite often after a judicial act is accepted in favor of the creditor and appeals to the debtor, it turns out that he is not his only creditor. This, in turn, impedes the return of funds to the lender. In this regard, there are difficulties with the execution of a judicial act. This state of affairs is caused by the multiplicity of grounds in the law and the lack of a clear separation of grounds in judicial practice.

Another problem in the field of contesting transactions with preference in the framework of the bankruptcy procedure is related to the execution of judicial acts to recover money from the debtor. According to article 855 of the Civil Code of the Russian Federation, if there are insufficient funds on the account to satisfy all the demands made on it, the funds are written off in the following order:

first of all, according to the executive documents providing for the transfer or withdrawal of funds from the account to meet the claims for compensation for harm caused to life or health, as well as claims for the recovery of alimony;

secondly, on executive documents providing for the transfer or issuance of funds for settlements on the payment of retirement benefits and remuneration with

persons working or working under an employment contract (contract), on payment of remunerations to authors of intellectual property results;

thirdly, on payment documents providing for the transfer or issue of funds for payment of wages with persons working under an employment contract (contract), instructions of tax authorities to write off and transfer arrears on taxes and fees to the budgets of the budget system of the Russian Federation, and also instructions of the bodies controlling the payment of insurance contributions to write off and transfer the amounts of insurance contributions to the budgets of state extra-budgetary funds;

in the fourth turn under the executive documents providing for the satisfaction of other monetary claims;

in the fifth turn on other payment documents in calendar order.

The funds are written off from the account according to the requirements related to one queue, in the order of the calendar order of receipt of documents.

The order of satisfaction of claims under the Bankruptcy Law is somewhat different.

Thus, from paragraph 10 of the Resolution of the Plenum of the Supreme Arbitration Court of the Russian Federation "On some issues related to the application of Chapter III.1 of the Bankruptcy Law, it follows that the list of conditions when there is a preference for one of the creditors over other creditors, is open, and secondly, that the grounds for declaring the debtor's transactions void, enshrined in this Resolution of the Plenum and provided for in paragraph 2 - 5 clause 1 of Article 61.3 of the Bankruptcy Law, are different.

It is proposed to disclose the concept of “preference” in bankruptcy legislation, as well as to increase the number of evaluation criteria that testify to the preferential satisfaction of the requirements of an individual creditor, in order to create the most uniform practice of applying the rule specified in section 61.3 of the Bankruptcy Law.

It should also be concluded that the assessment of evidence indicating that the creditor is aware of the insolvency of the debtor rests directly with the judges, and therefore it is proposed to include in the bankruptcy law a list of circumstances indicating the creditor’s knowledge, which presumably turns out to be a preference in a particular isolated dispute .

References

1. Kuzbagarov M.N., Kuzbagarova E.V., Rogova Yu.V. Recognition of the invalid transaction of the debtor-bankrupt in connection with the preference of one of the creditors // Bulletin of arbitration practice. 2018. No. 2. p.34.

2. For more information on the theories of the grounds for denial of the debtor's transactions, see: K. B. Korayev. Problems of invalidity of transactions of an insolvent debtor // Law. 2008. N 6. p. 47.

3. Recognition of an invalid transaction of a bankrupt debtor in connection with giving preference to one of the creditors (Kuzbagarov M.N., Kuzbagarova E.V., Rogova Yu.V.) (Bulletin of Arbitration Practice, 2018, N 2)

4. On insolvency (bankruptcy) / Feder. Law of 10.27.2002 N 127-FZ // SZ RF. 10.28.2002. N 43. Art. 4190

5. Civil Code of the Russian Federation // Feder. Law of January 26, 1996 N 14-FZ (as amended on 07/29/2018) / NW. N 5, Art. 410.

6. Practice of the board on economic disputes of the Armed Forces of the Russian Federation: review of definitions for December 10 - 14 // Consultant Plus. 2019.

7. Resolution of the Arbitration Court of the East-Siberian District of February 16, 2017 No. F02-8149 / 2016 on case No. A19-7040 / 2014 // ConsultantPlus. 2018.

触觉接触在交际舞中的作用，它对合作伙伴的身体和情感状态的影响

THE ROLE OF TACTILE CONTACT IN BALLROOM DANCING, ITS INFLUENCE ON THE PHYSICAL AND EMOTIONAL STATE OF PARTNERS

Muravyeva Anastasia Sergeevna
Specialist (Master degree)
in "Sport and Ballroom Dancing on the Floor"
St. Petersburg University of Physical Culture and Sports P.F. Lesgaft
International, British, USA, Asian, and World Cup
Professional Ballroom Dance Champion

抽象。 令人惊讶的是，尽管触摸在我们日常的社交互动中具有重要意义，但人们对生活和交谊舞中的人际关系这一主题进行了很少的科学研究。 人际关系是人性的一个基本但被低估的方面。 在交谊舞中需要特别注意这个主题，因为这是一项活动，允许两个人连接并体验必要的触摸，因此，建立两个人之间的触觉感受的渠道，以防止，改善和延迟 压力，以及痴呆症，老年痴呆症和抑郁症等疾病。

Abstract. *Surprisingly very little scientific research has been conducted on the topic of interpersonal touch in life and in ballroom dancing despite the significant importance of touch in our everyday social interactions. Interpersonal touch is a fundamental but undervalued aspect of human nature. Special attention needs to be given to this topic in Ballroom dancing as this is an activity that allows two people to connect and experience the necessary touch and, therefore, establish the channel of tactile sense between the two individuals to prevent, improve and delay levels of stress, as well as sicknesses such as Dementia, Alzheimer, and Depression.*

The purpose of this paper is to bring attention to and estimate the value of the psychological effects of touching in ballroom dancing and how touch can have a powerful impact on our emotional and social functioning. In this paper, by using practices with special exercises and focusing on the aspect of touch an external analysis of one's emotional state has shown that just by being aware of the touch there is a better chance of making another person feel happy and, therefore, make dancing itself more balanced. It also shows that social anxiety and stress levels were significantly reduced, which gave participating couples a boost of confidence

in their next performance. In addition, through reviewing and analyzing reports of engaged dancers it appears that the trust between the two engaged people was expanded. The result of this research and the analysis of the results of conducted experiments allowed for the creation of recommendations and the development of exercises. The awareness of the importance of this aspect should help coaches and teachers make positive effects on the emotional and social functioning of engaged social dancers as well as help professional dancers in achieving better performances.

关键词：交谊舞；触觉；触摸的重要性；减轻压力和抑郁；预防和延迟老年痴呆症和老年痴呆症。

Keywords: *Ballroom dancing; tactile sense; importance of touch; reducing stress and depression; preventing and delaying Dementia and Alzheimers.*

Touch is a critical communication channel not just in dancing but also in one's life. It is a critical communication channel across a person's lifespan. "Commonly we divide this sense of touch into two major categories: proprioceptive and interceptive or in other words - affective, activated by distinct mechanisms with cerebral correlates in somatosensory and insular cortex, respectively" (11, 6).

Touch has been always regarded as a powerful communication channel (8) playing a key role in governing our emotional well-being (5) and possibly our perception of self-interceptive reactions.

Touch, along with the sense of sight, hearing, smell, and taste, is one of the five classic senses. But unlike the other senses whose function is mediated through a localized concentration of receptors in a specific organ, the sense of touch is a distributed system, with multi-sensory receptors embedded throughout the entirety of the human body (7). In a given square inch of epidermis, on average, there are 50 heat receptors, 8 cold receptors, 100 touch receptors, and 800 pain receptors all of which contribute to the subjective bodily sensations associated with touch. Additional touch receptors in the joints and connective tissues to respond to stretching and variations in tension and allow for the perception of our body's location in space (12).

One important complexity is that touch is inherently a multi-sensory experience. During interpersonal touch, we typically experience tactile stimulation, but also changes in body temperature, along with changes in what we see, hear, and smell. At the same time inputs from other senses can have independent effects.

Taking in consideration that interpersonal touch is increasingly becoming a scarce commodity due to our modern life style and technology, it is important to know how touch influences our lives. Very often touch is being viewed as unhygienic and even invasive. One of the prime examples would be the case of sexual harassment.

People are more often sequestering themselves behind phones and laptop screens that has only exacerbated the trend. Ballroom dancing is a perfect physical activity where two people can be involved in a pleasant movement in harmony with one another and that does require a touch.

Why is touching and being touched by others so important to human beings? New research by Auvray, Myin, & Spence explains why touching and being touched is so important to us. "It suggests that even fleeting forms of touch may have a powerful impact on our emotional and social functioning. For instance, people can communicate distinct emotions such as anger or sadness through touch. Moreover, people who are touched briefly on the arm or shoulder are more likely to comply with requests such as volunteering for charity activities. These findings could have far-ranging implications for the role of touch in everyday life and point to important applications in therapy and virtual communication.

Whether we get a friendly slap on the back, a sensual caress, or a loving kiss --interpersonal touch has a powerful impact on our emotions. In fact, our skin contains receptors that directly elicit emotional responses, through stimulation of erogenous zones or nerve endings that respond to pain." (1).

Coan, Schaefer, & Davidson insist "the soothing effects of touch are very important in adulthood. There is growing evidence that touch from a romantic partner buffers us against stress. For instance, happily married women who are holding their husband's hand have smaller threat-related neural responses when they are holding the hand of a stranger or do not engage in handholding." (3) Datcher's Keltner research has shown that it takes 8 to 10 meaningful touches a day to maintain physical and emotional health. Studies show that "touch signals safety and trust and it soothes." (9)

People may also obtain the comforting effects of touch from non-romantic relationships.

Touch is the first necessary element that we need to explore in order to dance with another person. It's unavoidable and requires attention and awareness of one touching another. Depending on the style of dance, it can be anything from an open handhold to full body contact. Those contact points may also change or evolve throughout the dance and those connection points may require specific physical responses from partners. These touches are a type of "dance touch" in that they are how two people communicate with each other for the purposes of leading, following, and creating an interesting and enjoyable moment in dancing.

Essentially, dancing with someone else can be referred to as exercise and a hug rolled into one. Touch has been always regarded as a powerful communication channel playing a key role in governing our emotional wellbeing and possibly our perception of ourselves.

When people engage in dancing with each other they are experiencing touches

of hands and body contact together and share it to beautiful music. Unfortunately, very often teachers and instructors are taking it for granted and not giving enough value, attention, and awareness to the thought and practice of the touch. But, the "right touch" cannot just stimulate an emotional response but also help in achieving more satisfaction and enjoyment in dancing. And, therefore, trigger a high emotional response such as pleasure and happiness. We have conducted an experiment by engaging 4 professional and 4 social amateur couples and making them aware of their touch throughout the practice sessions. The attention was on the aspect of finding the "right touch" through different approaches and awareness. The approaches we used were "what you touch", "when you touch", "why you touch", "where you touch", and "how you touch." Through experiencing different approaches to the touch and analyzing the results and responses it showed that the approach of "how you touch" brought out the most beneficial emotional response as well as the most helpful in achieving a higher level of performance with less stress being involved.

We put a value in the awareness of how one takes his partner's hand, on how fingers are closed, how soft or strong muscles in the hands are engaged, and how aware dancers are of all those factors that have an influence on their physical and emotional condition as well as the quality of the dance. Traditionally in ballroom dancing, the male dancer is the one who invites the female dancer to take a step. Therefore, as a common practice he would decide the tone, mood, and energy that he puts into the dance and the first communication of that would be through the touch of the female dancer's hand. Female dancers would respond to the male dancer and add her own feelings and interpretation.

We have developed exercises and recommendations that would put attention and awareness on the touch and not on the steps or any other aspects of dance. We've made one of the partners close their eyes and only respond to the touch and follow the steps and movements through received lead and feel of their haptic sense. Then dance partners switched roles and proceed with the same activity.

The conducted experiment has shown that couples that have a high level of awareness have a much more charged and intimate way of how they make that first touch. The awareness of touch has helped to create a bond of two bodies having harmony between each other and, therefore, a more balanced dance movement. All couples seem to be more alert and excited on an emotional level during this exercise as well as for some time after the session has concluded.

Through the use of developed recommendations it showed that touch is a very personal aspect and every dancing couple had to experiment and discover their own comfortable range of tone, energy and intention. Different dances, different steps, and different shapes also required a change in the way engaged couples were touching each other and, therefore, a different response from partners.

All 4 social dancing couples noticed more enjoyment and a feeling of happiness as well as elevated mood during and after practice sessions with this approach. They also admit that they felt a closer bond with their partner and a better trust on a physical level. In the meantime their anticipation for coming back to practices was increased.

Of course, there is also a mechanical aspect to the touch in ballroom dancing. Too soft a touch creates a feeling of looseness and a negative feeling in motion. Too strong a touch locks the motion and disturbs the harmony of movement between two bodies. These feelings wouldn't bring positive emotional responses but instead seemed to increase levels of stress and dissatisfaction with their partner.

The engaged professional couples showed that this awareness of the touch brought some improvements in dancing movements. For instance, pivots in swing dances were performed with a higher speed, due to release of extra tension between dancing partners. The accents in a rhythmical Tango dance were performed much sharper, as the awareness of touch gave a sense of trust between partners and a release of personal tension in the muscles. That also gave an opportunity of having a lighter contact and, therefore, being more precise in their chosen actions. In fast and swinging dances like Quickstep and Viennese Waltz professional couples appeared to increase body flight across the floor, especially in steps like "Scatter Chasses" or "Kick and Rush."

The result of our conducted experiments showed how touch is vital in all aspects of dancing and our lives—cognitive, emotional, developmental, and behavioral. The research has shown that interpersonal tactile stimulation during the dance provides an effective means of influencing people's social behaviors to their partners and elevating overall mood and emotions. This analysis proves that a single touch can affect us in multiple and powerful ways. Dancing and experiencing the "dancing touch" helped us to develop recommendations and exercises for professional and social dancing couples to be included in their daily practice sessions.

References

1. Auvray, Myin, & Spence. «The science of interpersonal touch: An overview». Neuroscience and Biobehavioral Reviews 34 (2010) 246–259 2010 [Electronic resource] - URL: http://www.coathe.com/BOOKS/touch.pdf (date accessed 20/01/2019)

2. Cerritelli Francesco, Piero Chiacchiaretta, Francesco Gambi, Antonio Feretti "Effect of Continious Touch on Barin Functional Connectivity is Modified by the Operator's Tactile Attention [Electronic resource] - URL: http: //

semanticscholar.org/paper/Effect-of-Continuous-Touch-on-Brain-Functional-Is-Cerritelli-Chiacchiaretta/005f1f67a55217001edd7be7309eb6ad471f25a1 (date accessed 12/01/2019)

3. James A. Coan, Schaefer, & Davidson. « Lending a Hand: Social Regulation of the Neural Response to Threat». SAGE journals [Electronic resource] - URL: http: //journals.sagepub.com/doi/abs/10.1111/j.1467-9280.2006.01832.x?journalCode=pssa (date accessed 20/01/2019)

4. Federico Robert Anthony «In Touch - Creating Health and Vitality with the Tactile Sense»: Journal of Evolution and Health, 2018,Volume 2, Issue 3 Special Issue of the Ancestral Health Symposium 2017. [Electronic resource] - URL: // https:jevohealth.com/cgi/viewcontent.cgi?article=1083&context=journal (date accessed 20/01/2019)

5. Field T. (2014). Touch. Cambridge, MA: MIT Press [Electronic resource] - URL: https://mitpress.mit.edu/books/touch-second-edition (date accessed 20/01/2019)

6. Fulkerson Matthew.The First Sense: A Philosophical Study of Human Touch (The MIT Press): Matthew Fulkerson: 9780262019965: Amazon.com: Books,1977 (date accessed 20/01/2019)

7. Fulkerson, Matthew, Touch: The Stanford Encyclopedia of Philosophy (Spring 2016 Edition), Edward N. Zalta (ed.). [Electronic resource] URL: https:// plato.stanford.edu/archives/spr2016/entries/touch/ (date accessed 22/01/2019)

8. Gallace A., Spence C. «The science of interpersonal touch: an overview. Neurosci. Biobehav», 2010, Rev.34, 246–259.

9. Dacher Keltner. Hands on research: The signs on touch, [Electronic resource] - URL: https://greatergood.berkeley.edu/article/item/hands_on_reseach (date accessed 20/01/2019)

10.Konnikova Maria «The power of touch» .The NEW YORKER [Electronic resource] - URL:https;//www.newyorker.com/science/maria-konnikova/power-touch (date accessed 20/01/2019)

11. Olausson H.,Lamarre Y., Backlund H., Morin C., Wallin B. G., Starck G., et al. «Unmyelinated tactile afferents signal touch and project to insular»: Nat Neuosci ,2002 Sep;5(9):900-904 [Electronic resource] URL:https;//www.ncbi.nlm.nih.gov/pubmed/1214563 (date accessed 20/01/2019)

12.Proske U., SC. Gandevia « The proprioceptive senses: Their roles in signaling bode shape, bode position and movement, and muscle force»: Physiol Rev 92: 1651–1697, 2012 [Electronic resource] –URL: https://pdfs.semanticscholar.org/09b6/fe666d805840011069c89f230990eede5172.pdf (date accessed 20/01/2019)

13.Mandy Tjew-A-Sin & Sander L. Koole, «That Human touch that eans so much: Exploring the tactile dimension of social life» [Electronic resource] - URL: https://www.researchgate.net/publication/257037688_That_human_touch_that_means_so_much_Exploring_the_tactile_dimension_of_social_life (date accessed 20/01/2019)

论职业认同的语义障碍

ON THE SEMANTIC BARRIERS OF PROFESSIONAL IDENTITY

Aleksandrov Yevgeny Pavlovich,
Doctor of Pedagogic Sciences, Professor
Kornienko Andrey Alexandrovich,
Postgraduate
Kapitanov Roman Anatolyevich,
Postgraduate
Krasnodar State University of Culture

注解。专业身份在人格现象学空间中经历，是决定职业社会化和自我实现的载体和成功的意义。由于专业身份的形成是非线性的，并且常常因各种语义障碍而复杂化，专业教育机构的一个重要目标是认识到对专业的有目的的语义“调整”，在此期间个人获得机会在短时间内分配个人重要的专业社区价值内容以及该社区的内在价值代码和行为模式。对职业认同形成的语义障碍进行分析和分类的经验为培养和教育行动的个性化和差异化创造了先决条件，旨在促进学生的专业社会化。作者根据J. Marcia的类型学考虑了职业认同障碍的本质，并补充了现有的具有职业认同“失败”和“错误”特征的科学模型。

关键词：职业认同，职业认同障碍，职业认同失败，职业认同失误。

Annotation*. A professional identity is experienced in the phenomenological space of personality as a meaning that determines the vectors and success of professional socialization and self-realization. Since the formation of professional identity is non-linear and is often complicated by various semantic barriers, one of the important goals of the institutions of professional education is to recognize the purposeful semantic "adjustment" to the profession, during which an individual gets the opportunity to assign in a short time personally significant content of the values of the professional community and inherent value codes and behavioral patterns of this community. The experience of analysis and classification of semantic barriers to the formation of professional identity creates prerequisites for individualization and differentiation of training and pedagogical actions aimed at professional socialization of students. The authors consider the essence of the barriers of professional identity, based on the typology of J. Marcia, and complement the already existing scientific model with the characteristics of "failures" and "errors" of professional identity.*

Keywords*: professional identity, barrier of professional identity, failure of professional identity, mistake of professional identity.*

Introductory part

In psychological and pedagogical literature, professional identity is understood as a complex characteristic of a person's professional development, which testifies to one's acceptance of a particular profession as a means of personal self-realization and the presence of experiences of one's identity of a certain professional community (Klimov, 1996; Kolesnikova, 2013; Povarenkov, 2014).

Difficulties of formation of professional identity of students are mediated by a number of circumstances. In particular, the fact that modern professional practices are becoming very dynamic in both substantive and quantitative aspects. Some professions, demanded by the society at the previous stages of its development, lose their former positions at the modern labor market. The second group of professions, on the contrary, arises and gradually strengthens its position. The third group of professions is divided into a large number of branches vertically and horizontally, reflecting the characteristic trends of the information society in the division of labor. This dynamics significantly complicates the functioning of the mechanisms of professional inheritance within the family tradition that ensured professional reproduction at the previous stages of development of society and professional practices. That is why a strict targeted adjustment to a specific workplace and labor functions becomes impractical in the process of training in the institutions of vocational education. Here it is necessary to provide general professional erudition and competence in a particular professional field, which will allow a specialist to quickly adapt to specific job functions in a particular workplace. If necessary, such targeted adjustment to a workplace can occur within the framework of the system of additional (continuous) vocational education (Aleksandrov, 2018).

Professional identity is certainly one of the central, that is, the most important semantic systems of an individual. It is a value-semantic "knot" in which understanding and evaluation of external professional values and practices, on the one hand, and the results of self-knowledge and self-assessment, on the other hand, are intertwined in a stereoscopic way.

In the context of phenomenological philosophical discourse, the term "meaning" denotes the basis of human existence, reflecting the clots of life values and goals, as well as personally experienced life aspirations that a person realizes both within and outside oneself (that is, beyond one's own Self). Research by A. Adler, K. Jung, V. Frankl, E. Husserl, M. Heidegger, J. P. Sartre, K. Jaspers, M. Merleau-Ponty, etc. allows us to assert that consciousness is able not only to generate, but also to lose, to comprehend, to rethink meanings, as well as to actualize them in cognitive processes, value systems, life goals, existential elections, etc. Moreover, as V. Frankl has established, it is the aspiration to meaning that becomes the fundamental basis of one's life resistance and survival in crisis situations. The meaning cannot be invented or transferred in its original form from one person to another,

in each case it is recreated in a system of personal coordinates (Frankl, 1990). Actualization of meaning is associated with experiencing the sense of responsibility for their own destiny, decisions and existential elections.

Building complex hierarchies, the meanings form relatively stable phenomenological systems – "the image of the world and "the image of the Self in the world". A. N. Leontiev wrote: "We really build it – not the World, but the Image – and scoop it actively (...) from the objective reality. (...) The image is more adequate or less adequate, more complete or less complete... sometimes it is even false..." (Leontiev, 1983, p. 258). These images are relatively stable, but at the same time, they are not rigidly fixed and are repeatedly revised, rethought and even refuted during one's life cycle. Defective images of the world and images of "the Self in the world" are able to display themselves as psychological barriers inhibiting the processes of socialization and self-actualization.

Y. V. Krasnikova, Y. P. Povarenkov, A. A. Rean, L. B., Schneider and others indicate that the basis of the professional Self-concept of personality is presented through:

a) "image of a profession" which is understood as a "trigger" for professional affiliation, i.e. the need to merge with a particular professional community;

b) the professional self-assessment, that is, the understanding of one's personal and business potentials, allowing to claim certain status positions in the professional hierarchy (Krasnikova, 2014; Povarenkov, 2013; Schneider, 2001).

It is obvious that defects in the "image of a profession", as well as in the "image of the specialist Self", inevitably become an obstacle to successful professional development. Barriers to professional identity may arise from inconsistencies within and between these two images.

Methods

In psychological literature, the term "semantic barrier" most often refers to the experience of mental stress that blocks or disorganizes the activity (Osipova, 2017; Shakurov, 2001). At the same time, R. H. Shakurov correctly emphasizes that the semantic barrier can not only restrain activity or set it the wrong vector, but in some situations, on the contrary, become a factor that mobilizes resources and reserves of an individual to achieve the actual goal (Shakurov, 2001). In this case, the negative emotions (for example, disappointment, anxiety) accompanying the barrier, as well as the feeling of guilt (to others and to oneself) can change the polarity if an obstacle is recognized by a person as a complex problem, feasible to solve. On that background, positive expressions – passion, self-confidence, emotional lift – are revealed, encouraging an individual to actively choose behavioral strategies that ensure successful overcoming of difficulties.

Let us consider the main reasons of that kind of mismatch.

Results

It should be emphasized that young people at the threshold of choosing the path of professional development are most often guided not by objective professional functions and values, but by a diffuse, vague image of a profession, that is, a virtual mental system that has little in common with the professional reality. The focus of their attention is the group of professional affiliation, the social status of which is determined by the standard set of criteria, that is, educational level, income, authority and prestige.

In the minds of young people seeking professionalization the image of the profession is formed under the influence of a number of factors:

a) images transmitted by the content of mass communication media (including media texts of information networks), which, on one hand, do not reflect the full range of modern professions, and on the other hand, form a cliched, illusory "picture" of professional practices and labor functions. Mass media not only set guidelines for human cognitive activity directed to the outside world, but also supervise self-knowledge, that is, affect the design of the personal future, the choice of vectors and mechanisms of socialization, including professional self-development. Emotionally and rationally responding to that impact, and in fact – to its attempts to manipulate one's consciousness, young people are guided by idyllic images of famous and, as it seems, happy people, without asking questions about what a particular professional practice actually is, and what personal costs it actually demands. It is obvious that when the mental "fog" clears, the romantic elation will inevitably be replaced with disappointment;

b) stereotypes of the mass public consciousness that have in their structure the fixed ideas of successful (most often – by the criterion of profitability) and respectable (by the criteria of prestige and authority) specialist as an image of the desired future. Taking those stereotypes as a value basis and building a program of actions aimed at achieving them, an individual is often full of feelings of pride and envy. Those experiences related to external (and often illusory) attributes of a profession, but are not reflecting its inner essence, and even more so, its social mission;

c) ideas and examples drawn from the near social environment. It should be noted that one can only partially expect teaching staff of vocational education institutions be that close environment since teachers, being authoritative personalities for students, at the same time, can not act as reference representatives of professional communities, since their ways of professional self-realization, first of all, are associated with pedagogical interactions in the educational environment, and not with professional practices students prepare themselves to. In this regard, they can not be understood as full-fledged figures for professional imitation, as the vast majority of students prepare themselves for a completely different field.

The second element of professional identity is the image of "the specialist

Self", which, correlating with an image of a profession, at the same time, does not coincide with it completely and reflects specific features of professional socialization of a particular person. In the works of E. F. Zeer, T. N. Korneenko, L. B., Schneiderand others it is noted that professional identity is connected with the process of purposeful and/or intuitive interiorization, that is, with external transferring of the set of professionally significant information, attitudes, valuable orientations, behavioral patterns and roles, etc. to the inner part of the consciousness. This is a long, uneven, non-linear and not always successful professional tuning, it is a fitting of a "professional suit" according to cognitive, motivational, semantic and behavioral criteria (Zeer, 1990; Schneider, 2001; Korneenko, 2014).

Note that the process of formation of the image of "the specialist Self" is deployed in time and it can be scheduled for at least three "horizons". The basis is presented by fixating the images that fix the previous stages of personal and professional development, in which the current professional choice and achievements get some rational and logical justification. That "horizon" can be conventionally designated as a "professional personal archive" that allows you to make an informed choice of directions (vectors) and strategies of professional self-construction. The second "horizon" is the understanding of the existing potentials and reserves that can bring success in the essional development ("professional Self of the current time"). Finally, the upper "horizon" is associated with the mechanisms of professional generation of meaning, through which the student profession sets and solves specific personal and professional goals at certain stages of professional socialization. In this regard, the process of vocational training is perceived as an important stage of life, when one's professional future and other manifestations are developed.

The third element of professional identity is the professional self-assessment, that is, a person's "professional diagnostics", the acknowledgement of his strengths and weaknesses, potentials and resources in connection with the results achieved at a certain stage of professional development and prospects of professional development. Self-assessment can be adequate, overestimated or underestimated if the person correctly defines, unreasonably exaggerates, or, on the contrary, understates his achievements, potentials and resources.

Actualization of "I-specialist" image should be divided into stages that allow students to acknowledge the growth of their professionally significant qualities, consistent development of professional competence. In the educational process, the student perceives and evaluates himself as a beginner, but still a specialist of a certain professional sphere and, in this view, evaluates the current social reality. For example, a person may try to achieve the position of the head of a large construction holding in his career development, but at a particular stage of professional socialization he realizes the need to master the functions of a foreman.

Analysis

It should be noted that the problem of psychological barriers that accompany the process of forming professional identity is still an innovative field of scientific reflection and is insufficiently considered in the modern psychological and pedagogical literature. Among the available approaches to its understanding, what stands out is the concept of J. Marcia, who proposed a four-position typology of professional identity status based on two criteria. The first criterion reveals the presence or absence of person's crisis psychological experiences about professional identity. The second criterion is the attitude to significant professional goals, values, attitudes, norms of behavior, etc. (Marcia, 1980).

The representatives of *Identity Diffusion* status are characterized by blurring, uncertainty, or almost complete lack of consciousness in the image of the profession. The identity crisis does not arise, but the psychological background of the status is the experience of indecision, uncertainty in themselves and their potentials, doubts about the correct behavior, and sometimes a pejorative assessment of their own professional prospects.

The representatives of *Foreclosure Identity* status create the professional image from the outside, and in the "ready" form, without being subjected to personal rethinking: for example, under the psychological pressure of parents, social environment, reference groups and individuals. It is dominated by a focus on external factors – the prestige of the profession in society, its social and economic benefits, traditions (often very illusory, detached from the "live" professional practice).

Representatives of *Moratorium* status are experiencing a crisis of identity that provokes an active search for their professional Me. Personality is "open" for professionally significant information and "trying on "various vectors of development, perceiving, choosing and rethinking professional values and behavioral patterns. Moreover, the psychological background for this kind of search activity is positive emotional experiences (interest, curiosity, sincere interest).

Individuals with *Identity Achievement* status have successfully overcome the identity crisis and decided on the choice of profession based on the adoption of professionally significant values and goals, awareness of the difficulties awaiting them at various stages of professional development. Since a high level of professionalism requires considerable time and efforts, the representatives of this status have a specific program of professional self-building, and, therefore, an optimistic strategy for the future. John Marcia pointed out that the status of *Identity Achievement*, as a rule, is not a rigid structure, and is characterized by a certain flexibility of professional self-adjustment, that can be adjusted and revised in the case of changes in the conditions and requirements of professional reality.

Recognizing the scientific usefulness of the typology of J. Marcia, at the same time, we believe that it does not take into account some defects of professional

identity, concerning, first of all, semantic barriers, mediating orientation, mechanisms and process of professional development. We propose to use the terminological phrases "failure of professional identity" and "error of professional identity" to differentiate these barriers.

Thus, under the term "failure of professional identity" we understand the defective images of the profession in the mind of the individual. For example, a child announces its plans to become a pastry chef, a tramway conductor, a fireman, a teenager, a banker, a Minister, a pop singer, a pilot, but it is guided by quite illusory occupation ideas cut off from the realities. That is, the image of the profession is based on secondary, non-essential values, goals and features and distorted semantic hierarchies are built. Often this image is formed from contradictory and even incongruous elements in reality. Most of the first-year students of higher education institutions are focused on the abstract image of the profession, which has little to do with the professional reality. When illusions gradually develop in the process of vocational training and students reveal the true features of the profession, the cognitive dissonance and psychological discomfort may arise on the basis of this discovery (Rean, 2006).

Under the "error of professional identity" we understand the psychological barriers associated with the inadequacy of self-esteem in the forecasts of professional development, in other words, the defects of "I-specialist" image that arise from its discrepancy with the real psycho-physiological, psychological, intellectual and creative abilities of the individual. For example, a young man dreams of a pilot's career, anticipating the positive emotional feelings of a free flight without taking into account the fact that the performance of the professional functions of the pilot is associated with a large number of dynamically emerging stressors, among which, as V. A. Ponomarenko rightly believes, the duality of consciousness rather than physical factors dominates between the apparent and real gravitational space, information, perceived by the senses and readings, contradictions between somatic sensations and mental images (Ponomarenko, 2004). Hence, not everyone who dreams of flying will be able to fully realize himself in the profession of a pilot, which explains the complex professional selection on the threshold of training, including special physical, physiological and psychological tests, on the basis of which the forecast of "coincidence" of man and profession is built.

On the other hand, it is possible to make a reversible error of professional identity associated with low self-esteem. In this case, the person voluntarily refuses this profession, as well as the status and role within it, despite the fact that its potential and resources are sufficient to achieve professional success.

Result

The opinion that students enter a professional educational institution when they have already decided on their professional choice is wrong. At first glance, the arguments about the nature and structure of professional identity are mainly theoretical and are poorly linked to the practice of professional education. But this is only at first glance. In fact, "there is nothing more practical than a good theory". This wise phrase is attributed to the German physicist Gustav Robert Kirchhoff. The analysis of professional identity is necessary not only to understand its content and structure, but also to develop tools for its diagnosis, and the results of diagnosis, in turn, create prerequisites for the organization of individual and differentiated approaches in professional educational systems. Care of professional socialization, especially at the initial stages of training, should take a central place in the overall structure of the objectives of the professional and educational systems. The effectiveness of training is directly related to the extent to which the educational technologies used in it take into account the peculiarities of the professional identity of students, offering individualized educational trajectories.

References

1. Aleksandrov E. P. Additional professional education in the context of humanistic pedagogical paradigm. Krasnodar, Krasnodar state Institute of culture, 2018, 240 p.

2. Gander, D. V., Shevchenko, S. I., etc. Introduction to the military aviation profession. Textbook. Moscow, 2008. URL: https://cyberpedia.su/11xf716.html

3. Zeer E. F. Psychology of professions: a study guide for students, 2nd ed., revised and expended. Moscow, Academic project Publ., 2005, 336 p.

4. Klimov, E. A. Professional psychology: selected psychological works. Moscow, Institute of practical psychology, Voronezh, NPO "MODEK", 1996, 530 p.

5. Korneenko T. N. Sources and prospects of phenomenological approach in education // Bulletin of St. Petersburg University . Ser. 12, Issue 3, 2014, pp. 105 - 112.

6. Krasnikov Y. V. Professional identity as a core element of professional education // Actual problems of modern pedagogy: materials of the IV International scientific conference. (Ufa, November 2013). Ufa, Leto, 2013, pp. 167-169.

7. Leont'ev A. N. The image of the world. Selected psychological works: vols.1-4; Vol. 1. Moscow: Pedagogika Publ, 1983. 392 p.

8. Malyutina T. V. Professional identity, its structure and components // Omsk scientific Bulletin, 2014, no 5 (132), pp. 149-152. Marcia J. E. Identity in adolescence // Adelson J. (ed.) Handbook of adolescent psychology. N.Y.: John Wiley, 1980.

9. Osipova, A. A. The concept and technologies of overcoming the barriers in the educational process. Extended abstract of Doctor's thesis. Rostov-na-Donu, 2017, 40 p.

10. Povarenkov Y. P. Psychological characteristics of professional identity of the subject of work // Vestnik of Kostroma State University named after N.A. Nekrasov. Series: Pedagogy. Psychology. Social work. Juvenile. Sotsiogenetika. 2014, no. 3b, vol. 20, pp. 9-16.

11. Ponomarenko V. A. psychology of professional spirituality, 2004. Avalable at: http://www.e-reading.club/bookreader.php/1042470/Ponomarenko_-_Psihologiya_duhovnosti_professionala.html.

12. Rean A. A., Kudashev A. R., Baranov A. A. Psychology of personality adaptation. Analysis. Theories. Practice. St. Petersburg, PRAYM – EUROZNAK, 2006, 479 p.

13. Tatarko S. A. Measurement of identity within the framework of the status model of J. Marcia // Psychological diagnosis. 2009, no 1, pp. 130-138.

14. Frankl V. Man in search of meaning: Collection: trans. with English and German / L. Ya. Gozman and D. A. Leontiev (Ed.); article by D. A. Leontiev. Moscow: Progress, 1990, 368 p. http://www.rulit.mes/bookschelovek-v-poiskah-read-6849-1.html.

15. Shakurov, P. H. The barrier as a category and its role in activity. 2001, no 1, pp. 3-18.

16. Schneider L. B. Professional identity and memory: the experience of genetic reconstruction // the World of psychology. 2001, no 1, pp. 64-70.

创新教育活动，作为教师专业活动的一个方面
INNOVATIVE EDUCATIONAL ACTIVITIES AS AN ASPECT OF TEACHER'S PROFESSIONAL ACTIVITIES

Mamedova Irana Oqtay kızı
Azerbaijan State Pedagogical University

In developing the problem of the professionally personal formation of a modern teacher, one should take into account the fact that the peculiarity of modern Azerbaijani society is the increasingly pronounced role of the human factor, and therefore education is beginning to be regarded as a national task, as one of the essential moments of effective social development. At the same time, the experience of the leading countries of the world community convincingly proves that education should be understood as the basis for the development of other spheres of public life, since a regularity is noted: a society that always learns has a greater potential for development.

Education, as a social function, reflects changes in society, therefore it can be said that the level of development of the education system is a consequence or result of a certain level of development of society. There is also a feedback: the education system itself has an impact on society and its development, accelerating or slowing them down. In this sense, changes in education are not only a consequence, but also a necessary condition for further social development.

On this basis, in a number of studies concerning the methodological problems of modern education, it is noted:

1) the system of "supporting education" that has developed in the past does not meet the requirements of the emerging post-industrial civilization;

2) in order to become a creator and organizer of social life, a person must, in the process of education, develop the ability to have a projective view of the future, and this can be achieved only with the help of innovative education;

3) fundamental changes in the education system cannot be achieved within the framework of the traditional pedagogical paradigm.

Modern Azerbaijani society has come close to a global, multidimensional problem: to create conditions for the development and self-development of the individual, to educate her ability to make independent decisions. The center of the new state educational policy is the personality of a person - in full accordance

with the “Universal Declaration of Human Rights”. The realization of this right requires the reform of education, i.e. making fundamental changes in the education system based on the traditional educational paradigm, which is characterized by:

1) formative education, according to which the student is purposefully inculcated with ideologically oriented qualities (discipline, diligence, public orientation, collectivism, etc.), which was the main content of the social order;

2) standardization of the educational process, in which learning is oriented towards the capabilities of the average student;

3) a dogmatic approach to the selection of the content of education, technocracy in the construction of methods of training and education;

4) the imperative style of student management, which is characterized by authoritarian influence, suppression of the initiative and creativity of the students;

5) the student’s representation by the object of pedagogical influences, and the teacher as the executor of the directives of management bodies;

6) monologized impact, in which the content of education is transmitted only in one direction: from teacher to student;

7) role-playing interaction in the pedagogical process, when each of its participants is assigned certain functional duties, a departure from which is considered as a violation of the regulatory framework of behavior and activities;

8) ignoring the inner world of the individual, arbitrariness, imposing their laws in the exercise of pedagogical influence.

Thus, the process of reforming education is an objective, socially, culturally and economically determined need that arises permanently in a society that is experiencing turning points in its development. At the same time, under reform they understand the aspect of state activity, which is expressed in the implementation of "some social processes, reforms or changes in the political orientation of society, that is, the result of political reforms." Reforming includes changing the social status of education, raising its status, increasing state funding, etc. The result of the reform is the implementation of reforms, which are called innovations organized and conducted by the state power.

Changes in the education system can be carried out not only at the level of state policy, but also as a result of the "bottom" initiative coming from the workers and organizers of the education and science system, i.e. through innovative educational activities.

The concept of innovative pedagogical activity has relatively recently entered our consciousness and still does not have an unambiguous scientific interpretation, which requires consideration of this phenomenon from the standpoint of interdisciplinary research, in a number of correlating concepts: "new", "innovation", "innovative activity", " pedagogical innovation. "

The term "new", understood as "first created or made, appeared or appeared

recently, instead of the former, re-opened", "any purposeful change that introduces new stable elements (innovations) into the implementation environment". In various scientific and theoretical sources there are several levels of novelty:

1) absolute novelty, based on the creation of something that has never before existed anywhere;

2) local novelty, when a new one is created for a given area, but having a counterpart in other areas;

3) conditional novelty, based on the actualization of the previously known, but forgotten today object;

4) regulatory novelty, when the object is considered new compared to another, considered to be the norm;

5) subjective novelty, when object is new for a given subject, but is widely known to other subjects.

The process of creating a new is called "innovation" and in a number of studies it is interpreted as:

• building known in another form;
• repetition of the existing with minor changes;
• clarification, specification of the known;
• addition of the known essential elements;
• creation of a qualitatively new (28,39).

The term "innovation" (from Latin innovatio), widespread in various fields of human knowledge and perceived as a synonym for the concept of "innovation", first appeared more than 100 years ago in culturology and linguistics to denote the process of transfer, i.e. the penetration of a cultural phenomenon from one context to another and the acquisition of new, not previously characteristic qualities. Such penetration was considered as a decisive factor in the development of cultures.

At the beginning of the 20th century, the philosopher-economist J. Schumpeter extended the concept of "innovation" to the sphere of economic development, introducing a number of terms:

• "innovative combinations" the emergence of new ways of producing material goods, developing new markets, developing new sources of raw materials, updating the sectoral structure;

• “innovation” is the main economic function of people implementing innovative combinations.

The concept of “innovation activity” has entered into scientific use since the 70s of our century, first in relation to the economy, and then to other spheres of human activity. Its interpretation is not limited to the narrow semantic meaning associated with the concept of

“creating, introducing or distributing a new one”, but has several additional shades of meaning:

1) innovation is inherent in the property of integrity, i.e. scale, inclusiveness, global innovation;

2) innovation activity should have a permanent, continuous updates and transformations;

3) innovation is not a revolution in any field, since the creation of a new is always based on some foundation that has already taken place in practice.

The mass character of the movement for the development and creation of a new one brought to life a whole direction in pedagogy - a new branch of scientific knowledge "Pedagogical Innovation", which includes:

• pedagogical neology, which studies the peculiarities of creating innovations, their sources, classifications, criteria of novelty;

• pedagogical axiology, exploring the problems of perception, evaluation and development of the new pedagogical community;

• pedagogical praxeology, which compiles data on the application of the new in the field of education.

Pedagogical innovation, as a branch of pedagogy in our country, is a young science; in foreign pedagogy, research on innovation has been conducted since the 60s, has undoubted success and is characterized by a pronounced applied character. There they are trying to theoretically substantiate innovative processes in various fields of education, to give practical recommendations on the development of emerging innovations, they analyze the issues of innovative process management. Among the most famous teachers dealing with the problems of innovation are A. Mekhrabov, A. Pashayev, F. Rustamov, H. Barnet, D. Hamilton, N. Gross, N. Linikson, M. Miles, A. Habermon, R. Heyvlok and other

Socio-philosophical aspects of the study of pedagogical innovations are given in the works of A. Aliyev, I. Isaev, A. Abbasov, N. I. Lapin, A. I. Prigozhin, N. R. Yusufbekova. Theoretical and methodological aspects of identifying the essence, composition and criteria for evaluating pedagogical innovations are considered in the works of M.S.Burgin, V.S.Lorensov, M.M.Potashnik, O.G. Khomeriki. An analysis of the activities of innovative educational institutions is given in the works of A. Alizade, R. Aliyev, V.I. Andreev, M.V. Levit, A.G. Kasprzhak, E.M.Nikitin.

The process of mastering and creating new in pedagogy takes a long time and includes several interrelated steps:

1) the development of innovations - the creation of a new or search and adaptation of the previously created;

2) the study created - the assessment by experts, experimental verification, scientific and pedagogical expertise;

3) completion of the innovation - adaptation, adjustment in relation to new working conditions;

4) introduction into practice - a theoretical study of the new and its practical

implementation by school employees;

5) further development of the subject of innovation.

The complex activity of creating, mastering, using and distributing the new in teaching practice is called the innovation process. As I.R. Yusufbekov notes, “innovative processes should be considered as the creation of innovations, their understanding by the pedagogical society and the use in the practice of training and education”. In the domestic philosophical, sociological and pedagogical literature, the structure and essence of innovation processes are disclosed, definitions are given to its initial concepts: “innovation life cycle”, “dynamics and efficiency of the new”.

The concepts of "innovations" and "innovations" in pedagogy are considered as synonyms and interpreted as a new means, that is, a method of teaching or education, work methods, pedagogical technology, a curriculum, etc.

The interpretation of the concept of "pedagogical innovation" is not sufficiently clear. A number of researchers F. Rustamov, A. Pashayev, M. Ilyasov, K. Angelovski, V. S Lazarev, M. M. Potahshshk, O. Khomeriki define it as the process of mastering new means, i.e. innovations. At the same time, the concept of “innovation process” is used in parallel to define actions related to innovation activity, which, in our opinion, violates the logic of perception of this category. In a number of studies, S. Huseynov, M. S. Burgin, L. D. Gireva, A. I. Ovsyannikova, F. Yanushkevich and others. The concepts "pedagogical innovations" and "pedagogical innovations" are used as synonyms, which makes them difficult to distinguish .

So, A. Mehrabov, A. Pashayev, F. Rustamov emphasizes that “not always the word“ innovation ”can be replaced by foreign“ innovation ”and gives several meanings of the term“ pedagogical innovations ”:

• development of new content and new methods;

• introduction and distribution of already existing advanced systems and technologies;

• development of new technology for school management and development;

• school status as an experimental site;

• a situation where the school has a fundamentally new educational orientation.

In the psychological and pedagogical sources, the main pedagogical innovations include changes in the following areas:

• the structure of the system of training, development and education of students, or in its individual components;

• the content of training, i.e. in curricula and programs in all or individual subjects;

• technology and teaching aids, in educational equipment, visual aids;

• organization of training with the help of microcomputers and multimedia technologies of the educational process;

• training in specialized classes and schools;
• comprehensive training;
• educational standard and standardization of program requirements for the educational process;
• the organization of secondary special schools of new type and new learning technologies;
• assessing the effectiveness of training using tests and other tools; indirect results are measured;
• relations in the system "teacher-students".

The process of creating and mastering pedagogical innovations is called innovative pedagogical activity, which in the context of our research is viewed as the practice of training and education created by individual teachers and entire creative teams to search for effective ways to solve actual problems posed by modern school demands of the time. Analysis of psychological and pedagogical literature shows that the diversity of types of innovative educational activities is not amenable to a clear distinction. As K.Angelovski notes, "pedagogical innovations cannot be strictly classified, since any classification suffers from schematism.

The current stage of innovation pedagogical activity is determined by the most complex social task of reforming the education system in accordance with the requirements of the new educational paradigm and the conditions of the modern socio-cultural situation. This led to an unprecedented growth of pedagogical innovations: new concepts, author's schools, experimental techniques, and innovative technologies have appeared; ideas of the humanization of education and training were actualized; The concept of a personality-oriented educational process has been developed. The strengthening of innovative pedagogical activity at the present stage, the deep character of most of the ideas put forward and the strength of their influence on mass practice are due, in our opinion, to the following reasons:
• the scale of social tasks addressed to the school;
• solving issues of education at the state level;
• the desire to integrate the efforts of theorists and practitioners;
increased initiative of teachers who are aware of the requirements of the time;
• flexibility of the management structure, giving individual teachers and whole teams the right to search and experiment;
• a broad propaganda of pedagogical innovations in the various channels of communication;
• a high level of mass pedagogical practice, due to theoretical, methodological, organizational and methodological readiness of modern teaching.

A characteristic feature of the current stage of innovation is the interest in the pedagogical heritage, the actualization of innovative searches of the past, the reinterpretation of old ideas in accordance with the requirements of today. Many pro-

ductive pedagogical ideas of modernity rely on innovative searches and findings of the 20s, 30s, 50s. So, in the methodology of large-block study of the material developed by V. F. Shatalov, one sees the influence of the complex target programs of the GUSA. In the creation of leveling classes lies the principle of research teaching methods (Dalton Plan) and the author's school of S. T. Shatsky. The advanced training system of S. N. Lysenkova is correlated with the method of commented letter of Lipetsk teachers. The elements of the brigade-laboratory method are successfully used at practical classes in physics, chemistry, and biology.

Thus, innovative pedagogical activity acts as a leading trend in pedagogical and, more broadly, social development, outlining the ways in which modern schools should go. From this it follows that the readiness to carry out innovative activity should act as the main integral characteristic of the professionally directed personality of a modern teacher.

References

1. Pashayev A., Rustamov F. Pedagogy. - Baku: 2010. - 462 p.

2. Halperin P.Ya., Talyzina N.F. The current state of the theory of phased formation of mental actions // Moscow University Bulletin, ser. 14. Psychology - Moscow: 1979, No. 4, p.3-9.

3. Drucker P.F. Management practice. - Moscow: ID Williams, 2009. - 400 p.

4. Zagvyazinsky V.I., Atakhanov R. Methodology and methods of pedagogical research. - Moscow: 2001. - 203 p.

5. Development concept "Azerbaijan 2020: future prospects". https://president.az/files/future_ru.pdf

6. Rogers E. Diffusion of Innovations. Simon and Schuster, 2010. — 518 p.

7. Рустамов Ф. Педагогика. Баку, 2010. – 748 p.

8. Robert A., Anna G. Edmonds. Redhouse Yayınları. 1999. – 1152 p.

9. Twiss B. Managing Scientific and Technical Innovations. Economics, 1989. - 272 p.

10. Schumpeter J.A. Theory of economic development. - Moscow: Eksmo 2007. - 864 p.

11. Innovation // https://en.wikipedia.org/wiki/Innovation

12. Innovation // https://dic.academic.ru/dic.nsf/enc1p/19758

13. Slastetin V.A. Innovation is one of the principles of pedagogy // Pedagogical education and science. - Moscow: 2000. № 1. p. 38-44.

外国留学生适应俄罗斯大学条件的特点：心理学和教育学方面
FEATURES OF THE ADAPTATION PROCESS OF THE FOREIGN STUDENTS TO THE CONDITIONS OF THE RUSSIAN UNIVERSITY: PSYCHOLOGICAL AND PEDAGOGICAL ASPECTS

Klyushina Alena Mikhailovna
Candidate of Philological Sciences, Associate Professor,
Department of English Philology and Intercultural Communication,
Samara State University of Social Sciences and Education
Torgasheva Marina Alexandrovna
Candidate of Philological Sciences, Associate Professor,
Chair of Foreign Languages,
Samara State University of Social Sciences and Education

注解。 本文考察了外国学生适应过程的心理和教学特点，揭示了问题的意义，提出了可能的解决方案。 解决外国学生适应俄罗斯大学学习条件的问题，对心理学和教育学具有理论和实践意义。

关键词：外国留学生；高等教育机构；适应期；心理和教学特征。

Annotation. *The article examines the psychological and pedagogical features of the adaptation process of foreign students, reveals the significance of the problem, suggests possible solutions. The solution of the problem of foreign students' adaptation to the conditions of study at the Russian university is of theoretical and practical interest for psychology and pedagogy.*

Keywords*: foreign students; higher education institution; adaptation period; psychological and pedagogical features.*

Education in the university is considered the most important period of life, as it is a period of personal growth and the formation of the modern young man as a specialist with higher education. For all first-year students, the problem of finding ways to successfully adapt to changing social conditions and new activities is relevant; its solution requires a high voltage functional systems of the body [1; 2; 3].

A foreign student arriving in Russia for higher education, like no one else, faces many difficulties, finds himself in a new linguistic, sociocultural and academic environment. Experience at the faculty of foreign languages and at the department of Russian as a foreign language shows that without special work on adaptation it is impossible to make the training of foreign students as effective as possible.

The purpose of this study is to identify the psychological and pedagogical features of the adaptation of foreign students to study at the Samara State Social and

Pedagogical University (SSUSSE). The sample is represented by students studying at the faculties and the department of the Russian language as a foreign at SSUSSE.

Optimization of the adaptation process in the first year of foreign students at the university is of theoretical and practical interest for psychology and pedagogy. Working on this problem, Russian higher educational institutions are striving to ensure the fastest and most successful adaptation of foreign first-year students to the new system of education and to the new system of social relations.

It should be noted that the first year of study of a foreign student in a Russian educational institution is considered one of the most problematic. This is confirmed by a number of reasons. To begin with, we emphasize that the student finds himself in an unfamiliar micro-and macroenvironment; he knows little about the political, economic and social systems of Russia, about cultural traditions, about the norms and customs of this country. In addition, a foreign student has to communicate with other people in a foreign language for him, which causes additional difficulties in adapting. It is also known that when adapting to a new environment, a stage of socialization and adaptation of the student's personality occurs. Foreign students are already mature individuals, they have gone through a period of socialization in a different cultural environment. In addition, each of them already has its own life position, its own individual characteristics, as well as features of national psychological, personal, ethnic, psychophysiological, etc. [4]. Thus, as we can see, the difficulties of the adaptation period are different in their origin: some are objective, some are subjective.

A review of psychological and pedagogical work leads us to the conclusion that the need for adaptation arises when a person interacts with a system in the context of a certain discrepancy with it, which leads to a certain need for change. It is revealed that these changes are associated both with the person himself and with the system with which he interacts. The need for change becomes apparent when behavior that is familiar to a person is ineffective, and sometimes even ineffective when difficulties arise due to the novelty of conditions. We believe that the adaptation of foreign students is a complex and multifaceted process that requires the joint efforts of students, heads of groups, teachers, curators of academic groups, the dean's office, the trade union committee of students and, of course, the family.

Analysis of recent research shows that the problem of adaptation of foreign students is currently being studied at the socio-psychological, psychological, educational and psycho-physiological levels. However, only certain aspects of the adaptation process have been studied. To date, there is still no clear definition of the essence of adaptation as an objective and natural process with a certain structure.

To identify the features of the period of adaptation of foreign students, we consider it necessary to give the definitions of psychologists and teachers of different

years. So, A.V. Siomichev (1985) believes that “adaptation is the process of overcoming difficulties in entering a new social environment, establishing intragroup relations, and also adapting to new forms of learning” [5].

In turn, T.I. Ronginskaya (1987) writes that “the adaptation of students is a complex process of restructuring mental activity, and it must necessarily manifest itself in changes in the level values of individual personality characteristics, in changing relationships between them, as well as in different ratios of changes in different periods of the adaptation process "[6].

In the works of A.K.Grishanov (1990) we find the following definitions: “students' adaptation is the process of bringing the main parameters of their social and personal characteristics into a state of dynamic equilibrium with the new conditions of the university environment as an external factor in relation to students” [7].

According to V.Ya. Yakunin (1994), “adaptation is a process of interaction between man and the environment, as a result of which man develops models and behavioral strategies corresponding to the changing conditions in this environment” [8].

We consider it important to note that in the modern meaning adaptation is often viewed not as a process of adaptation, but as a process of harmonization in the interaction of the subject and the environment [9; 10; 11].

In our opinion, the last two definitions are most successful in studying the interaction of the student and the educational environment, for the reason that they emphasize the activity (and not passivity) of the subject in the adaptation process.

Since the opening of the department of Russian as a foreign language at SSUSSE, more than 300 foreign citizens from European countries (Great Britain, France, Germany, Spain, Italy, Hungary, Norway), Asia (Turkey, China, Vietnam), Africa (Egypt, Morocco, Algeria, Tunisia, Nigeria), Latin America (Ecuador, Peru, Colombia) and the near abroad (Turkmenistan) have been trained according to the additional educational program "Russian as a foreign language". Speaking about the faculties of the SSUSSE, we note that to a large extent foreign students are citizens of neighboring countries (Kazakhstan, Turkmenistan).

At the core of our research, we applied the following techniques: identifying the characteristic difficulties of foreign first-year students (B.G. Meshcheryakov), determining the level of students' adaptation and studying the motivation of learning in high school (A.A. Rean, V.A. Yakunin) [12; 13; 14]

During the work on this study, we found a connection between the features of the adaptation process among foreign students with certain characteristics. To begin with, we identified motivational characteristics (motivation for choosing a profession and an educational institution) from foreign students in their first year of study. It was found that the following factors influenced the choice of the uni-

versity and the areas of training: interest in the chosen profession - 59%; the desire to get a Russian higher education diploma - 28%; example of acquaintances, friends, relatives - 9%; parental influence - 4%.

From the obtained results it is clear that the majority of foreign students consciously and purposefully linked their future education with the SSUSSE, giving preference to the university with a high-quality basis, traditions and personnel. Thus, in our opinion, at the time of admission, these students had a positive motivation to study.

Next, we made an attempt to determine the degree of satisfaction of foreign students of the first year of study with the choice of an educational institution two months later. Systematization and generalization of the data obtained allow us to state complete satisfaction with the learning process in 77% of foreign first-year students. 23% of students are only partially satisfied with the learning process.

It is known that working with foreign citizens has its own distinctive features, which can be explained by psycho-physiological features; social factors; cultural, religious, educational priorities; features of mentality; national character and stereotype behavior.

According to G.P.Sholokhova and I.V. Chikova, there are three types of factors that have a direct impact on the adaptation of foreign first-year students to study at a Russian university: sociological, psychological, and pedagogical [15]. Sociological factors include the age of the student, his social background and the type of educational institution he graduated from. Individual psychological and socio-psychological characteristics (intellect, personal potential, orientation, position in the group) are psychological factors. Pedagogical factors include the level of pedagogical skills of teachers, the material and technical base of the university, the organization of the educational process, and so on.

When interviewing foreign students of the SSUSSE, we attempted to identify the main difficulties that such students face. The most significant were named the following:

- insufficient level of proficiency in Russian;
- increase of academic load;
- the complexity of disciplines;
- difficulties in relations with groupmates;
- difficulties in relations with teachers;
- inability to organize their time for independent study of educational material;
- factor of remoteness from relatives and friends.

The data we obtained can be used in determining the main activities of elders, professors of groups, teachers, curators of educational groups in developing a system of organizational, scientific and methodological support of educational and extracurricular work with foreign students of the first year of study.

Recognizing that adaptation is a multifactorial process, we consider it important to note the role of the pedagogical management of this process. One of the most effective forms of work on the adaptation process, in our opinion, is the activity of curators of academic groups and teachers working in such groups. Thus, we will list the forms of extracurricular work of curators and teachers of educational groups in which there are foreign students.

Extracurricular work with foreigners includes several areas. One of them is participation in cultural events, which contributes to the cultivation of a tolerant attitude towards representatives of other cultures and religions, the knowledge of original Russian culture, the identification and development of creative abilities. Students traditionally participate in creative events, in particular, "Russian Song", "Russian Fairy Tale", in international cuisine evenings, in sports events, in celebrations of Russian and international holidays (Maslenitsa, New Year, Christmas). In addition, enough time is spent getting these students to meet Samara. The curators of academic groups and the staff of the international department of the SSUSSE conduct sightseeing tours of the historic part of the city, along the Volga embankment, often attend various exhibitions, art galleries and theaters.

Various forms of extracurricular activities allow the group curators and teachers (working in these groups) to more fully realize their potential, since they help them to work with more motivated students and use various methods and techniques that may not always be applicable in the classroom. Foreign students, in turn, being included in new forms of work, receive an additional opportunity to develop and improve their intellectual and creative potential.

Participation in educational programs expands the range of communication of foreign students, prevents intercultural interference, contributes to the formation of ethnic tolerance. A particularly important role is played by events in which not only foreign, but also Russian students participate. Such events help young people to get to know, see the similarities and differences of cultures of different nations, to trace human values.

Thus, diverse and interesting extracurricular work helps foreign students to quickly adapt to new conditions and achieve certain success. All participants in the educational process - students themselves, teachers (working with them), and university management are interested in an effective process of adapting foreign first-year students to the conditions of study at a Russian university. A successful start of training will help such a student in his further studies, will positively affect the process of building relationships with teachers, classmates. The further professional career and personal development of the future specialist depend on the success of the adaptation of a first-year foreign student to educational activities in a Russian university. Systematic work in this direction allows us to increase not only the efficiency of the educational process, but also the image of our university.

References

1. Yakunin V.A. Pedagogical psychology: a textbook. 2nd ed. - SPb.: Publ. V.A. Mikhailova, 2000. 349 p.

2. Izvolskaya A.A. Age features of the development of the personality of the student as a factor of adaptation to the learning process in high school 2010. No. 6. pp. 327–329.

3. Kolmogorov L.A. Features of learning motivation and adaptation of first-year students with different types of professional self-determination // World of Science, Culture, Education. - 2008. - No. 4. p. 100–103.

4. Sviridov N.A. Adaptation processes among young people // Socis. - 2002. - №1.

5. Siomichev A.V. Psychological features of adaptation of students in the field of knowledge and communication in high school: dissertation's abstract. - L.: Leningrad State University, 1985. 17 p.

6. Ronginskaya T.A. Changes in the system of personal characteristics in the process of adaptation of students: dissertation's abstract. L.: Leningrad State University, 1987. 16 p.

7. Grishanov L.K. Sociological problems of adaptation of undergraduate students // Psychological and pedagogical aspects of the adaptation of students to the educational process in high school. - Chisinau: Shtiintsa, 1990. pp. 29–41.

8. Yakunin V.A. Psychology of educational activity of students. - Moscow: Logos, 1994. 140 p.

9. Kusakina S.N. Psychological readiness to study at the university // Management of pre-school educational institution. - 2011. - No. 8. p. 24–37.

10. Nikolaev E.I. Comparative psychophysiological analysis of the functional state of students of different forms of training in a pedagogical university // Questions of psychology. - 2011. - No. 4. p. 24–32.

11. Smirnov S.D. Study - joy: psychological factors of successful study of students // Students: Dialogues about education. - 2011. - № 4 (58). p. 9–11.

12. New attempt to open the latent identification of persons / B.G. Meshcheryakov [et al.] // Experimental Psychology. - 2015. - Vol. 8, No. 4. p. 45–60.

13. Rean A.A. Psychology of Personality. - SPb.: Peter, 2013. 288 p.

14. N. Badmaeva. Methods for the diagnosis of educational motivation of students (A. A. Rean and V. A. Yakunin, modification N. Ts. Badmaeva) // Badmaeva N.Ts. Influence of the motivational factor on the development of mental abilities: monograph. Ulan-Ude: VSSTU, 2004. p. 151–154.

15. Sholokhov G.P., Chikova I.V. Adaptation of first-year students to the conditions of education in the university and its psychological and pedagogical features // Bulletin of the Orenburg State University. - 2014. - № 3 (164). p. 103–107.

在短期课程条件下对外国学员进行俄语密集交际教学的方法
METHODS OF INTENSIVELY-COMMUNICATIVE TEACHING RUSSIAN LANGUAGE TO FOREIGN TRAINEES IN THE CONDITIONS OF SHORT-TERM COURSES

Samosenkova Tatiana Vladimirovna
Doctor of Pedagogic Sciences, Professor,
Belgorod State National Research University
Nazarenko Elena Borisovna
Candidate of Pedagogic Sciences, Associate Professor,
Belgorod State National Research University

摘要。目前，当外语技能作为书面和口头交流的手段变得特别相关时，方法学家，心理学家和语言学家的注意力集中在语言学习的交际方面。在课程框架内培训外国学员的主要特点之一是培训时间短，这意味着需要确保在最短的时间内同化最多的培训材料。有必要寻找新的教学方法来培养具有提供跨文化交流的沟通技巧的专家。教学方法是学习系统中最重要的组成部分，它是学习过程中技术的发展，其中许多方面和组成部分，所有的法律和原则，所有的学习环境和条件都是必不可少的。

关键词：外国学员，短期课程，专业交际能力，强化方法，交际方法

Summary. *At present, when foreign language skills as a means of written and oral communication become particularly relevant, the attention of methodologists, psychologists and linguists focuses on the communicative aspect of language learning. One of the main features of the training of foreign trainees in the framework of courses is the short duration of training, which implies the need to ensure the assimilation of the maximum amount of training material for a minimum period of time. It is necessary to search for new teaching methods to train specialists with communication skills that provide intercultural communication. Teaching methods are the most important component of the learning system, it is the development of technology of the learning process, in which many parties and components, all the laws and principles, all the circumstances and conditions of learning are essential.*

Key words: *foreign trainee, short-term courses, professionally-communicative competence, intensive methods, communicative methods*

The teaching of foreign trainees in terms of short courses has a number of features: the age of the students, their individual characteristics, previous professional experience, language level, specific goals, objectives, principles and methods of teaching, the achievement of a certain result of the possession of professional communicative competence in a specific professional field. One of the main features of training of foreign trainees in the framework of the courses is the compactness of the training period, which implies the need to ensure the absorption of maximum amount of educational material for a minimum period of time.

Currently, when foreign language proficiency becomes particularly relevant as a means of written and oral communication, the attention of the methodists (psychologists and linguists) focuses on the communicative aspect of language teaching. For training specialists with communication skills that ensure intercultural communication, the search for new teaching methods is required. Traditionally, the process of teaching Russian language the foreign students includes three levels: - teaching language as a linguistic system; - teaching verbal aptitude (speech abilities); - communication training. However, taking into consideration the short duration and intensiveness of training, we have focused on teaching speech and communicative abilities. From our point of view, to ensure the most efficient mastering a foreign language interns in the process of formation and development of professional communicative competence in the context of short-term courses it is necessary to combine the basic principles of intensive and communicative teaching methods.

Intensification of the learning process in the methodological literature is defined as "increase of the rapidity and quality of teaching as well as a greater volume of work performed in a given period of time" [1, 37]. From the standpoint of psychology intensification of the process of learning is a "the combination of four parameters: the increase in the volume and speed of absorption of the material, the number and variety of teaching techniques, the density of communication and the full activation of the mental reserves of the individual student" [12, 127]. Scholars such as I.A. Zimnyaya V.E. Musnitskaya, N.I. Berishvily, S.K. Folomkina considered the problem of accelerated foreign language teaching, its place and role in specialists' professional communication. They came to the conclusion that teaching a foreign language should be intensified and contain general typical for professional communication elements, as well as specific tasks, conditions, and problems of communication the specific areas of activity professionals.

Analysis of historically developed methodological approaches to foreign language teaching in the higher education system shows the change of methods of language teaching as a tool of written and oral communication in every historical moment (grammatical-translation method, direct method, audiolingual method, audiovisual method, conscious-comparative method, conscious-practical meth-

od, oral method without translation, training in collaboration method, method of reflection, suggestopedic method, communicative method) due not only to their classification characteristics, but also to the social situation, the social order at the relevant educational product and currently it is focused on the formation of a multicultural worldview and understanding between people [3, 172]. The problem of teaching methods has been studied by many scientists (R.I. Lerner, A.V. Tekuchev, A.N. Shukin) but until now there's no specific solution.

The teaching method is an organized way of interrelated activity of teachers and students aimed at achieving the goal. Teaching methods are an essential component of the educational system. This is the development the process of teaching technology in which many, if not all, parties and the components, laws and principles, circumstances and conditions of teaching are substantial. Teaching methods are defined as "pattern of activity" as "a method of interrelated activities of teachers and students aimed at solving problems of education", as "a generalized view of the interactions of teacher and student"[10, 17-18].

E.I. Passov tells about the system of "functionally stipulated principles, aimed at achieving strictly defined purposes and in accordance with objective psychophysiological data assimilation of a certain kind of speech activity and the conditions in which the learning process occurs"[12, 17], and not about the method of language teaching. For I.L. Bim method is "the main structural-functional component of the activities of teachers and students, ... the way and means to achieve a certain goal in teaching and learning " [2, 19].

Definition of the method given by A.N. Shukin and T.I. Kapitonova most fully, from our point of view, meets the objectives of intensive training, as realized in the form of training activity which provides the students' interaction with the linguistic environment: "the teaching method is regarded as two subsystems: the method as a training method and as a combination of teaching and learning" [5, 4]. In this study, the term "teaching method" is understood in the second meaning.

We define a method as a theoretically generalized idea of set and combination of methodological and pedagogical actions that lead to the achievement of the educational goal. "Didactic (methodological) systems differ not by the nomenclature and description of these operations but by their orientation, rule of enterprising and system formation" [4, 194].

In the dynamics of development and the predominance of a certain method of teaching foreign language the orientation to specific learning goal can be traced and its displacement with learning receptive learning-language activity (reading, writing and translation) on training to productive kinds of speech activity (speaking and practical communication and thinking in a foreign language), as well as the productive types of written communication. According to the definition proposed by A.N. Shukin "intensive teaching methods are the methods based on not used in

conventional training psychological reserves of the individual student, provide for the management of social psychological processes in the group and contribute to the mastery of spoken language in a short time with a significant concentration of daily training hours" [11, 85]. The basis of intensive teaching foreign languages is based on the ideas of suggestology and the pedagogy suggestive of the famous Bulgarian psychotherapist, doctor of medical sciences G. Lozanov. The essence of these ideas is the use of suggestio, as an effective means of introducing educational material at the levels of reception and production with the expansion of the creative reserves of the students' personalities. According to G.K. Borozenets, "suggestion provides the most complete effective perception, learning and reproduction of educational material in the shortest possible time and stimulating the formation of a complex of attitudes, motives and perceptions, with a maximum of efficiency, the sense of lightness and decrease fatigue, when you commit a psychohygienic and psycho revitalizing state and the process of creative self-expression, as well as activation of hidden mental reserves of the individual in the process of teaching communicative activities" [3, 80]. G. Lozanov has many followers who developed his ideas. Such formed and successfully applied methods of intensive training, as a method of teaching adults foreign speech (systematic approach) of L.S. Gegechkori; the method of enhancing capabilities of the individual and the collective, or the method of G. A. Kitay-Gorodskaya; emotional-semantic method I. J. Schechter; suggestibility integral method of V. V. Petrovskiy; relaxometry method I. E. Schwartz; suggestive-programmed method A. Vostrikova, etc. is the result. These methods of intensive teaching are characterized by full removal of mental barriers to learning, the creation of a special theatrical situation at the lesson (dim lights, relaxed atmosphere, the sound of classical music); by assigning each student a specific role, character of the role-play, laid to the basis of an intensive teaching course. As the purpose of intense teaching is considered: "increasing the speed and intensity of learning a foreign language, including the language of specialty as a means of professional communication when using the internal reserves of the psyche of students and overcoming mental barriers through the application of the phenomenon of pedagogical suggestion" [3, 189].

The basis of teaching communication in the course of intensive training is not the language code but the activity of their speech behavior. As B.D. Parygin noted, "intensification of human mental activity is quite versatile in nature and involves the activation, growth, production, consumer, communicative, reflexive, cognitive, creative and reproductive activity..." [9, 67]. The intensification is "a process aimed at the achievement of student's personality activity and the preservation of this state" [3, 82]. Particularly the state of activity of the teacher and the students allows to achieve a high level of intensity of the educational process. Activity of participants of educational process is determined by their constant involvement in

the process of group interaction and educational communication. Communication in the target language permeates the learning process, acting both as objective of learning and the means and conditions of its achievement.

Intensive methods of learning has the following characteristics: mastery of oral communication; language environment; mastering the complex skills required to implement activities in specific areas of communication that finds expression in the selection of lexical and grammatical material, situations, and topics of communication for sessions; intensive training (duration of training up to 10 hours a day: six hours of lectures and four hours of independent work, the saturation of a variety of types and forms of work that require great activity of students); the focus of learning is not on the acquisition of knowledge about language, but on the formation of speech skills; the widespread use of collective forms of work and management of the communication process in the group by the teacher; the widespread use of all possible means and channels of impact on students, support as a consciously arbitrary and subconscious, involuntary mastery of the material, which in particular is achieved through inclusion in the educational process special methods of teaching (e.g., providing students different roles, musical accompaniment, the use of physical exercises, etc.).

Communicative teaching methods require the formation of speech and communicative skills in close to natural communication conditions, i.e. it is assumed the organization of teaching as a model of communication [6, 51]. The most important common characteristics of the learning process and the real process of communication are: the objectivity of the process of communication, a careful selection of speech intentions, themes and situations that reflect the professional needs and interests of the students; communicative-motivated behavior of a teacher and students during learning; the use of special teaching techniques that promote maximum realization of communicative exercises; use of funds clarity and extracurricular forms of work.

It is obvious that the goals and objectives of the intensive and communicative teaching foreign trainees not only do not contradict each other, but, on the contrary, are complementary and mutually enriching. The intensively communicative teaching is characterized by principle of interaction of conscious and unconscious processes of mental activity of students in the course of mastering professional communication, use of audio, visual, subject and visual tools, pragmatism and the narrative structure, effective educational interaction between the students and the teachers. Thus, we define the intensively-communicative teaching as a specially organized training communication, in the process of which the accelerated assimilation of the material is carried out and also there is an active development of professional communicative competence of foreign students. "The invasion of communicative beginnings in the intensive educational process is an indispensable condition of efficiency of their use" [7, 13].

References

1. Berdichevsky A.L., Optimization of the system of teaching foreign languages at the pedagogical university. - Moscow: High school, 1989. - 101 p. 1989: 37

2. Bim I.L. Methods of teaching foreign languages as a science and problems of a school textbook: experience of system-structural description. – M.: Rus. language, 1977. - 288 p.

3. Borozenets G.K. Integrative approach to the formation of communicative competence of students of non-linguistic universities by means of a foreign language: dis. ... PhD in Pedagogy: 13.00.08. - Togliatti, 2005. - 434 p.

4. Dzutsev E.S. Social-communicative approach to the formation of the content and methods of teaching coherent speech in the national school. - M., 1991. - 389 p.

5. Kapitonova T.I., Schukin A.N. Modern methods of teaching Russian to foreigners. 2nd edition. - Moscow: Russian language, 1979. - 159 p. 1.

6. Kolshansky G.V. Communicative function and structure of language. - Moscow: Science, 1984. - 175 p.

7. Kolshansky G.V. Linguistic and methodological aspects of intensification of foreign language teaching / Methods of intensive foreign language teaching. – M.: Torez's MSPIFL, 1979. – Vol. 5. - P. 5-15.

8. Lerner I.Ya. Didactic bases of teaching methods. - Moscow: Pedagogy, 1980. - 186 p.

9. Parygin B.D. Anatomy of communication. – Training manual. – SPb: Publishing House of V.A. Mikhailov, 1999. - 301 p.

10. Passov E.I Basics of methodology. - M., 1977. - 216 p.

11. Schukin A.N. Methodology of the short training of Russian as a foreign language. – M.: Rus. language, 1984. - 126 p.

12. Zimnyaya I.A. Psychological aspects of teaching foreign language speech skills - Moscow: Education, 1985. - 267 p.

加强俄中学术流动的基础设施，工具和机制（萨马拉州立社会科学和教育大学的案例）

INFRASTRUCTURE, INSTRUMENTS AND MECHANISMS OF ENHANCING RUSSIAN-CHINESE ACADEMIC MOBILITY (THE CASE OF SAMARA STATE UNIVERSITY OF SOCIAL SCIENCES AND EDUCATION)

Bondareva Valeria Vitalevna
Candidate of Pedagogical Sciences, Associate Professor
Samara State University of Social Sciences and Education
Samara, Russia
李旭 Li Xu
PhD, Associate Director, Global Engagement Office
South China University of Science and Technology
Shenzhen, China

注解。 本文定义了学术流动的“基础设施”，“工具”和“机制”的概念，并描述了萨马拉州社会教育大学与中国合作大学之间互动的经验和前景。

关键词：学术流动，国际合作，上海合作组织国家，俄中双边关系，俄中教育协会，俄语作为外语，教育合作，合作大学

Annotation*. The article defines the concepts of "infrastructure", "tools" and "mechanisms" of academic mobility and describes the experience and prospects of interaction between the Samara State University of Social Sciences and Education and Chinese partner universities.*

Keywords: *academic mobility, international cooperation, SCO countries, Russian-Chinese bilateral relations, Russian-Chinese educational associations, Russian as a foreign language, cooperation in education, partner universities*

According to the draft "Concept of development of academic mobility in the Russian Federation", developed in 2013 within the framework of the project of the National Training Foundation "Development of proposals for the organization of Russian academic exchange programs for Russian and foreign scientific and pedagogical workers", the infrastructure of academic mobility is understood as "its conditions implementations, including organizational ones - operators implementing academic mobility programs; legal - normative legal acts and interna-

tional agreements defining the procedure and process for the implementation of mobility; informational - ensuring transparency and availability of data on mobility opportunities and results" [Project "Concepts of the development of academic mobility in the Russian Federation", 2013: 3].

Tools of academic mobility The concept is interpreted as "programs provided with financial, informational, organizational and other resources and aimed at achieving a specific result. Mechanisms of academic mobility are organizational procedures, systems for allocating funding, systems for monitoring and evaluating the implementation of academic mobility" [Project "Concepts of the development of academic mobility in the Russian Federation", 2013: 3].

The main mechanisms and tools for the provision and development of academic mobility in Russia currently include a number of government documents and resolutions, in particular, the Federal Law "On Education" of December 29, 2012 No. 273-FZ; Federal Law "On Higher and Postgraduate Professional Education" of August 22, 1996; The state program of the Russian Federation "Development of Education" for 2013-2020, approved on May 15, 2013; The concept of the state policy of the Russian Federation in the field of training national personnel for foreign countries in Russian educational institutions of October 18, 2012; The concept of the foreign policy of the Russian Federation, approved by the President of the Russian Federation on February 12, 2013; Decree of the Government of the Russian Federation No. 638 "On Cooperation with Foreign Countries in the Field of Education" dated August 25, 2008; Regulations on scholarships of the President of the Russian Federation, approved by the decree of the President of the Russian Federation No. 613-rp dated September 6, 1993; Resolution of the Government of the Russian Federation No. 220 of 2010 "On measures to attract leading scientists to Russian educational institutions of higher professional education".

One of the priority areas for Russia for the development of international cooperation identified in the Project "Concepts of the development of academic mobility in the Russian Federation" is interaction with the SCO and ATEC countries. The document states that the strengthening of the Shanghai Cooperation Organization and the promotion of its initiative to create a network of partnerships between all integration associations in the Asia-Pacific region determine the priorities for cooperation in education in this area. The development of bilateral relations with China provides additional opportunities to strengthen the potential of the Russian education system in the global space [Project "Concepts of the development of academic mobility in the Russian Federation", 2013].

Mechanisms for the development of academic mobility in this direction include the bilateral Russian-Chinese intergovernmental agreements on cooperation in education signed in different years:

- Treaty on Good Neighborhood, Friendship and Cooperation between the Russian Federation and the People's Republic of China (July 16, 2001);

- The Treaty on Mutual Recognition and Equivalence of Education Certificates and Academic Degrees (June 26, 1995);

- Agreement on the Study of the Russian Language in the People's Republic of China and the Chinese Language in the Russian Federation (November 3, 2005);

- Agreement between the Ministry of Education and Science of the Russian Federation and the Ministry of Education of the People's Republic of China on cooperation in the field of education (November 9, 2006);

- Annual minutes of meetings of the Russian-Chinese subcommittee on cooperation in the field of education.

The infrastructure of the Russian-Chinese academic mobility can be attributed to the Russian part of the Russian-Chinese commission on cooperation in education, culture, health and sports, the main tasks of which are established by Government Resolution No. 919 of December 2, 2000

- development and implementation of measures contributing to the further development of Russian-Chinese cooperation in the social and humanitarian sphere;

- implementation of the Russian-Chinese intergovernmental and interdepartmental agreements on cooperation in the social and humanitarian sphere;

- improving the regulatory framework of Russian-Chinese cooperation in the social and humanitarian sphere;

- coordination of the activities of federal executive bodies, executive bodies of the constituent entities of the Russian Federation, educational, cultural, sports organizations and health organizations on the development of cooperation with the People's Republic of China in the social and humanitarian sphere;

- promotion of the establishment and development of direct links between Russian and Chinese educational, cultural, sports organizations and health organizations [On the Russian part of the Russian-Chinese Commission on Cooperation in the Field of Education, Culture, Health and Sports, 2000].

The actions of both sides aimed at solving the set tasks yielded positive results. With the support of the Ministries of Education of the Russian Federation and the People's Republic of China, centers for the study of the Chinese language have been established in Russia, which function successfully in a number of Russian universities. Russia has also opened 10 Russian language centers in Chinese universities. In Russia, in more than 130 universities, about 10,000 students study Chinese as a foreign language. In Moscow, more than 2,000 students study Chinese. In the Far East, the teaching of Chinese is practiced in many secondary and primary schools.

More than 70,000 Chinese schoolchildren in 100 secondary schools in China are studying Russian. Only in Beijing more than 700 students are trained in the specialty "Russian language". As a foreign language, he is taught at leading universities in the capital - Peking University, Metropolitan Pedagogical, Peking

Pedagogical and People's Universities, Institute of Language and Culture, Institute of Economics and Business, Beijing University of Foreign Languages and several other universities. The largest educational institutions in which the Russian language is studied are Beijing, Heilongjiang and Dalian universities, Beijing and Shanghai universities of foreign languages [Song Xiaomen, http://mgs.org.ru/2014/03/sun/].

As of August 2018, there are eight Russian centers and five offices of the Russian world in China, on the basis of which information and consulting and training activities are conducted. The ministries of education of both countries reached an agreement on the development of an interdepartmental memorandum on supporting the activities of the Russian Language Centers in China and the Institutes and Confucius Classes in Russia. The issues of increasing the exchange of students and graduate students to 100 thousand by 2020 were considered and a plan for implementing this initiative was developed [Cooperation between Russia and China in the field of education http://минобрнауки.рф/новости/5691/].

In order to maintain a high level of interaction and wider involvement of young people in the study of Russian and Chinese, the Years of National Languages (2009-2010) were held. The results of the Years are of particular importance for improving the quality of training Orientalists with knowledge of Chinese in the interests of staffing Russian departments and organizations, as well as strengthening the base of practical and scientific Sinology. To date, more than 900 partnerships have been established between Russian and Chinese universities and organizations in which 120 universities participate from the Russian side, about 600 from Chinese. In the Years of youth exchanges between Russia and China, in July-August 2014, summer schools were organized Russian language and culture for Chinese students on the basis of the Ryazan State University named after S.A. Yesenin, Udmurt State University, Ulyanovsk State Pedagogical University. I.N. Ulyanova, summer camp for the study of the Russian language and acquaintance with the Komi culture on the basis of Ukhta State Technical University.

At present, Russian-Chinese educational associations, in particular, the Association of Classical Universities of Russia and China, the Association of Universities of the Far East, Siberia and Northeastern Provinces of China, as well as the Association of Universities of the Volga Federal District of Russia and the provinces of the upper and middle reaches of the Yangtze River of the PRC, are successfully functioning.

Issues of development of bilateral academic mobility are considered at the annual meetings of the Russian-Chinese Commission on Humanitarian Cooperation. In particular, the Protocol of the XVIII meeting of the Russian-Chinese subcommission on cooperation in the field of education, held in China in October 2018, secured the parties' agreement to increase student exchanges to 100 thousand by

2020, expand inter-university cooperation, continue the development of Russian-Chinese associations universities and the expansion of activities to spread the Russian language in China and the Chinese language in Russia, strengthening cooperation in the field of education.

In order to implement the provisions of intergovernmental agreements on the need to develop international cooperation in July 2014, a decision was taken to create the International League of Universities of the twin cities of Shenzhen (China), initiated by the South China University of Science and Technology, and 9 other universities became founders located in Shenzhen and Hong Kong. The League includes 17 universities in Europe, Asia, America, Australia and Russia. Samara State University of Social Sciences and Education joined the League as a member of the Executive Committee, becoming the only representative from the Russian Federation.

Founded in 2012, the South China University of Science and Technology is an experimental platform for reforming China's higher education system. Much attention is paid to the university teaching social, economic and humanities disciplines. All educational programs offered by the university are taught in English, which contributes to the implementation of academic mobility programs and conducting research together with foreign colleagues. Leading professors of universities in the USA, Great Britain, Canada, Japan and Israel are involved in the educational process. Thus, the university has created all the conditions for the provision and development of academic mobility, which was announced at the ceremonial meeting dedicated to the creation of the International League of Universities, which was held in the framework of the International Forum "Innovation and Transformation: The Future of Higher Education in a Network Society" in Shenzhen on November 16, 2014.

The work program of the Forum included negotiations with representatives of Chinese universities, which resulted in the signing of a number of bilateral cooperation agreements. In particular, an agreement was signed between the South China University of Science and Technology and the Samara State University of Social Sciences and Education(SSUSSE), involving joint research, the organization of conferences, seminars and master classes, as well as the exchange of students and the teaching staff between partner universities.

It is gratifying to note that the agreements reached in China did not remain on paper, but resulted in fruitful bilateral cooperation. For example, in January 2015, together with colleagues from the South China University of Science and Technology, a report was prepared on the policy of internationalization of higher education of the People's Republic of China: problems and prospects presented at the section "Educational reforms in the SCO countries" of the International Scientific and Practical Conference "For the SCO summit. Problems and Prospects of

Interstate Cooperation in the Educational Space", which was held with the support of the "Russian World" Foundation at the Ufa State University of Economics and Service.

In April 2015, within the framework of the signed agreement, the International Student Online Conference "Samara - Shenzhen: at the crossroads of friendship" was held, in which students of the SSUSSE and a Chinese partner university took part. The conference discussed a wide range of issues from national stereotypes and their impact on intercultural communication to the characteristics of higher education systems in both countries and possible prospects for cooperation. The conference resulted in the creation of a group for learning Chinese in the SSUSSE, which included Russian and Chinese students enrolled in the SSUSSE.

In August 2015, a group of SSUSSE students took part in the Summer School organized by the University of Shenzhen. Students from Japan, USA, Namibia, Azerbaijan, Ireland, Great Britain, Taiwan, Austria and Poland took part in the school. The Summer School program included visits to universities and enterprises of Shenzhen, acquaintance with the culture, economics and history of China, with the latest Internet technologies, learning the basics of the Chinese language, project activities, presentations, contests and quests. An extensive cultural and excursion program was organized for the participants of the school, which included a visit to the Museum of Modern Chinese Sculpture, a museum of history with exhibits showing the development of the territory of modern Shenzhen from the prehistoric era to the present day. The students visited the stadium of the World Summer Universiade 2011, visited the corporation "Tencent", famous for its social network QQ, and the corporation "DJI" producing quadcopters for various purposes, from amateur models to professional devices used to shoot sports matches. In addition to acquired knowledge and unforgettable impressions, students gained a unique experience of intercultural communication, which will make a significant contribution to their professional development, which is, in our opinion, the main goal of this kind of events. In 2017, representatives of the SSUSSE took part in the 8th International Student Festival of Short Films held at the South China University of Science and Technology, which was accompanied by numerous meetings and master classes.

Without dwelling on the results achieved, SSUSSE continues to develop relationships with Chinese partner universities. Negotiations were held and a cooperation agreement was signed with Siyan International University, located in northwestern China in the Huang he River Basin. Founded in 1992, Xian International University is one of the largest private universities in China, accredited by the Ministry of Education of the People's Republic of China, with 36,000 students and about 2,500 faculty and staff. The university offers training in 96 specialties and areas of training, including economics, management, marketing, journalism,

literature, foreign languages and Sinology. The University has established the Chi-Fang Private Educational Research Institute and the Institute of Traditional Chinese Culture. The university management pays special attention to the internationalization of education through the development of academic mobility.

Cooperation in the framework of the signed agreement involves student and academic academic exchanges, joint conferences, seminars, round tables, implementation of research projects in areas of mutual interest for both parties, publication of research results, preparation and holding of mass cultural and sports events. The priority areas in which it is planned to develop cooperation are foreign languages and economics. Of particular interest is the program of training specialists in the field of Sinology, being implemented at Sian International University. It is no secret that the Chinese language, history and culture are of increasing interest among Russian applicants. In connection with this, the leadership of the SSUSSE made a decision to develop an additional education program "Translator of Chinese Language", the implementation of which is planned by the teachers of the SSUSSE with the involvement of native speakers from among representatives of Chinese partner universities. The signed agreement will allow students to undertake internships or internships at Xian International University. Currently, negotiations are underway with the leadership of a foreign partner university on the implementation of the provisions of the signed agreement.

Thus, bilateral cooperation agreements with Chinese partner universities cover practically all areas and profiles of training in the basic professional educational programs implemented in the SSUSSE, from the exact and natural sciences (physics, mathematics, information technologies) to humanitarian and socio-economic (foreign languages, literature, journalism, economics, management and Sinology). It is also important that these agreements were signed on the initiative of the Chinese side, which indicates the steadily increasing interest of Chinese universities to interact with Russian partners.

It should be noted that in order to increase the level of international academic mobility in the SSUSSE, mechanisms have been developed for information and financial support for students participating in exchange programs, as well as organizational procedures and systems for monitoring and evaluating the implementation of academic mobility programs, enshrined in the "Regulations on Academic Mobility of Students and Employees of the SSUSSE", approved in 2013.

In conclusion, it is worth mentioning the fact that the SSUSSE has a long-term experience of interaction with Chinese students and Chinese culture. Since the establishment of the department of Russian as a foreign language in 2006, more than 100 Chinese students attended the Russian language as a foreign language program, the most successful of whom were enrolled in the SSUSSE basic professional educational programs for various areas and training profiles. In the sum-

mer of 2016 and 2018, within the framework of the International Russian-Chinese Youth Forum Volga-Yangtze visited the SSUSSE twice the delegation of the Anhui Province of the People's Republic of China. In total, over 50 undergraduates and undergraduates from Anhui University and Anhui Pedagogical University, studying Russian, journalism, information technology, economics, law, as well as teachers and representatives of the administration of both universities visited the SSUSSE delegation. Foreign guests met with the leadership and student activists of the SSUSSE, expressing their interest in establishing partnership relations with a Russian university.

Hopefully, the signed agreements and bilateral visits will give new impetus to the development of cooperation between the SSUSSE and Chinese partner universities, and the efforts of both parties in this direction will help increase the volume of educational cooperation and will build long-term partnerships that bring our nations closer.

References

1. The project "Concepts of the development of academic mobility in the Russian Federation", 2013. [Electronic resource]. URL: // https://docplayer.ru/32483042-Proekt-koncepcii-razvitiya-akademicheskoy-mobilnosti-v-rossiyskoy-federacii.html (Appeal date: 01/15/2019).

2. Government Decree of 02.12.2000 N 919 "On the Russian part of the Russian-Chinese Commission on cooperation in the field of education, culture, health and sports". [Electronic resource]. URL: // http://base.consultant.ru/cons/cgi/online.cgi?req=doc;base=EXP;n=534814 (Appeal date: 01.01.2019).

2. Analytical report "SCO University as a tool for the integration of educational systems of the SCO member states." [Electronic resource]. URL: // http://www.asu.ru/files/documents/00009828.pdf (Appeal date: 11/01/2019).

3. Song Xiaomen. Legal support of Russian-Chinese cultural relations as the basis of modern Russian-Chinese cooperation. [Electronic resource]. URL: // http://mgs.org.ru/2014/03/sun/ (Released: (11.01.2019).

4. Cooperation of Russia and China in the field of education [Electronic resource]. URL: // http: //minobrnauki.rf/news/5691/ (Appeal date: 03.06.2017).

5. Minutes of the fifteenth meeting of the Russian-Chinese Commission for Humanitarian Cooperation, 2014. [Electronic resource]. URL: // http: //minobrnauki.rf/documents/5336/file/4227/Protokol%202014.pdf (Access date: (07.06.2017).1

教师和家长对有特殊教育需要的儿童的包容性教育的态度
THE ATTITUDE OF TEACHERS AND PARENTS TO INCLUSIVE EDUCATION OF CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

Golovchits Lyudmila Adamovna
Doctor of Pedagogical Sciences, Professor
Soloveva Zoia Andreevna
master student
Moscow State Pedagogical University

注解。 本文讨论了残疾儿童全纳教育的组织问题。 揭示了教师和家长对残疾儿童和正常发展同龄人的包容性教育的态度。

关键词：全纳教育，残疾儿童，特殊教育需求，教师准备。

Annotation. *The article discusses the organizational problems of inclusive education of children with disabilities. The attitude of teachers and parents to the inclusive education of children with disabilities and normally developing peers is revealed.*

Keywords: *inclusive education, children with disabilities, special educational needs, teacher readiness.*

At present, a single educational space has taken shape, and inclusion has become the leading direction in the education and upbringing of children with disabilities, which is reflected in the convergence of general and special educational systems.

Inclusive education as one of the forms of education, the basic principles of which are: early correction, psycho-correctional help to each child, the presence of a positive attitude on the part of society to the joint training of children. The integration of children with disabilities into general education institutions takes into account the level of development of each child and the provision of a real choice of integration model (N.N.Malofeev, N.D.Shmatko). Today we are talking about giving a new, social and pedagogical meaning to the process of inclusion of children with disabilities in educational practice.

The willingness of participants in the process of inclusive education - teachers, parents of students, affects in general the effective organization of education for children with disabilities.

The purpose of this study is to identify and analyze the factors that determine the nature of the attitude of teachers and parents to the inclusive education of children with disabilities. The main research methods were: questioning the participants in the educational process; statistical analysis of survey data; qualitative analysis of the results, oral conversation. Teachers of school and preschool general education organizations, parents of students with disabilities and parents of students with normative development were involved in the study. Only 78 people.

The study showed that the attitude to joint training, first of all, depends on the involvement of teachers and parents in this process. A generally positive attitude to co-education of students with disabilities and their normally developing peers of teachers of pre-school general education and general educational organizations has been revealed. Thus, 38% of teachers in general education schools, 67% of speech therapists, special teachers, psychologists, and 72% of educators expressed a positive attitude towards inclusive education. Teachers of pre-school general education organizations are most positive about inclusive education. They consider this form of education for children to be effective or possible in 72% of cases versus 38% noted among school teachers. Most likely, this is due, on the one hand, to the uncensored nature of the education of preschoolers, and, on the other hand, to the higher demands placed on children with disabilities in the school education system. In the context of inclusive education, teachers faced certain difficulties and, in some cases, lack of readiness to co-train students with normal development and students with disabilities. The problem of not understanding the developmental characteristics of children with disabilities was revealed. Some teachers of educational institutions in the process of questioning orally expressed their concerns: “What will I do with such a child if he gets to my class?”. Those respondents who have experience in joint education of children with disabilities and children with no developmental disabilities noted that “everything depends on the individual characteristics of the child”. Considering the question of the readiness of teachers to teach children with disabilities, depending on the category, we can conclude that the most “preferred” categories of children: visually impaired, hearing, speech disorders, cerebral palsy, to a lesser extent, teachers are ready to work with children with mental backwardness. Regarding this category there were categorical statements: “these children are untrained,” “they have no place in a general education organization.” Significant difficulties arise when teaching children with mental retardation. If we talk about children with multiple disabilities, then teachers of general educational organizations demonstrate impotence and lack of readiness to work with them.

70% of teachers expressed their opinion about the greater effectiveness of teaching children with disabilities in terms of educational organizations, in which there is the possibility of creating combined classes / groups, which, from their point of view, most closely matches the idea of inclusion. It is in these organi-

zations that one can organize regular, special and "flexible" classes, as well as pre-school groups with a combined focus. This allows for various forms of inclusive education, individually developing an adapted educational program for each child; provide qualified professional assistance; to establish a genuine interaction of teachers of special and secondary schools.

Having no experience in working with children with disabilities, teachers in general education schools need to receive special training and acquire information about the developmental characteristics of children with disabilities. 85% of teachers of preschool and school general education negatively answered the question "Do you have enough knowledge about the peculiarities of the development of children with disabilities?"

Parents generally have a positive attitude towards the possibility of joint education of children with disabilities and normally developing children: 50% of parents support inclusion, only 12% oppose such type of education. However, 38% of parents, among which parents of children with no developmental disabilities, found it difficult to express their attitude to the problem of joint education, emphasizing the option "neutral" in the questionnaire. Parents of students with disabilities, among whom there were children with an autistic spectrum disorder, or with multiple severe disorders, expressed their negative attitudes towards inclusive education. A more positive attitude among parents of hearing impaired, visually impaired, children with speech disorders. The attitude to co-education of parents of children with disabilities is determined primarily by the capabilities of their child and depends on how well work with the child was started in advance, whether the joint work of the correctional teacher and parents is fully ensured.

Speaking about the most effective educational institution for teaching children with disabilities, 75% of parents reacted positively to general education organizations where it is possible to create combined compensating groups / classes. 12% of parents expressed a desire to return special (correctional) institutions for training children with disabilities.

Thus, at the stage of development of inclusive education, there is an acute problem of the motivational, psychological and methodological unpreparedness of teachers of general educational organizations to work with children with special educational needs. Unformed professional competences of teachers to work in the inclusive sphere, the presence of psychological barriers and professional stereotypes of teachers are found. This sets serious tasks for the psychological community in the field of education, methodological services, and the administration of educational organizations that implement inclusive education.

The future of inclusive education depends on the close interaction of society and the state to ensure full education for all children, including those with disabilities.

References

1. Alekhina S.V. Inclusive education: history and modernity - Moscow: Pedagogical University "First of September", 2013.

2. Malofeev N.N. Basic models of integrated education / N.N. Malofeev, N.D. Shmatko // Defectology. - 2008. - № 1. - p. 71-78.

3. Malofeev N.N. Formation and development of special education in Russia./ Fundamentals of special education management / Ed. D.Shilov - Moscow: Academy, 2001.

全球化时代全球语言教学的几个方面
SOME ASPECTS OF TEACHING THE GLOBAL LANGUAGE IN THE GLOBAL AGE

Lushnikova Irina Ivanovna
Senior Lecturer, department of "Linguistics"
Drozdova Ekaterina Aleksandrovna
Senior Lecturer, Head of intramural and extramural department of "Linguistics"
Arustamyan Diana Vladimirovna
Senior lecturer, department of "Linguistics"
Peoples' Friendship University of Russia (RUDN University)
Moscow, Russia

注解。 成为全球沟通的主要语言英语影响了全球的许多社会方面。 在教育中观察到了巨大的变化。 随着人们越来越关注学习英语作为全球语言，教学和学习英语也会发生迅速的变化。 传统的教育问题"谁，什么以及如何教"在不断变化的语境中提出了"谁将教授全球语言"的问题。 仍然由于动态加速和情况研究的复杂性，没有给出"现成的答案"，主要概述了这一领域的主要教育倾向和实践。

关键词：全球语言，教育问题，全球时代，三个圆圈模型，母语人士，非母语人士，跨文化交际。

Annotation. *Becoming a leading language of global communication English influenced a number of social aspects worldwide. Vast changes are observed in Education. Alongside with growing interest to learning English as the global language, teaching and learning English undergo rapid changes. Traditional pedagogic questions "who, what, and how to teach" bring up the question "who will teach the global language" in changing contexts. Still due to the accelerating dynamics and the complexity of situation researches don't give "readymaid answers" mostly outlining the main educational tendencies and practices in this sphere.*

Key words: *global language, educational questions, global age, three circle model, native speaker, non-native speaker, intercultural communication.*

The expansion of global communication transformed the status of English from an international language to the global language. English appears in the cen-

ter of "explosion of international activity" [1, p. 10] with its high-demand in a number of spheres of modern life.

Evaluation of the situation split up the researchers into two main views based on the perspectives of other languages development. Some authors consider the situation mostly as a positive one - the global language breaks cultural and communicational barriers allowing people to efficiently communicate across national borders. The other point of view characterizes situation through the prism of changes in local languages, warning that the global language threatens remarkable linguistic diversity and leads to disappearance of local language varieties. Despite ambiguous assessment of the situation English is still recognized by the majority of researchers as an "exceptional" language. In the global age the expansion of English is clearly seen in business, education, science. As a language of "global economic village" [1, p. 126], the English language becomes a result of globalization and its instrument contributing to the further development of the both [3, p. 4].

Dynamic worldwide changes in all spheres of life brought up new questions to the process of teaching and learning English as the global language. Traditional triad of questions connected with language teaching and learning process – "whom to teach, what to teach, how to teach" – opens new teaching and learning horizons and adds one more component "who will teach the global language?" Due the complexity of situation it's unlikely to find a universal answer to all these questions. Still some major tendencies and practices can be outlined.

Whom to teach? According to the three-circle Model of World English developed by B. Kashru the major growths in learning English is seen in non-native settings. The countries with the demand of English as an international tool of communication are showing the strongest interest in language learning. According to B. Kashru's three-circle model the spread of English is described in terms of three concentric circles: the Inner Circle - the traditional English-speaking countries (the UK, the USA, Canada, Australia and New Zealand), the Outer Circle - the countries of the post-colonial world (India, Singapore, and others), the Expanding Circle - the countries where English is traditionally taught as a "foreign" language [4]. This dynamics is also observed in a number of reports provided by analytical agencies and educational organizations.

What to teach? Following the idea of non-native contexts expansion, D. Graddol points out that pedagogic practices have started a rapid evolution in order "to meet the needs of the rather different world in which global English is learned and used" [2, p. 85]. Nowadays as fewer interactions in English involve native-speakers the target model of teaching should include pragmatic strategies used by non-natives in intercultural communication, new framework should focus on situations of interactions of "not a native speaker but a fluent bilingual speaker, who retains a national identity in terms of accent, and who also has the special skills required to negotiate understanding with another non-native speaker" [2, p. 87].

The role of learning new strategies in rising non-native context is also mentioned in the works of other researchers (U. Weinreich, O. Kashmilova and other).

The other key questions are "How to teach? Who will teach?" These problems are strongly interconnected with the previous ones and are highly dependable of situation and real educational context. Still a central idea uniting the issue is based on the diversified cultural background and a special role of native culture in the process of the second language acquisition. Modern researches show that the most efficient way to boost motivation and language awareness is to learn the language through comparison of cultures. This approach requires design and implementation of specific materials with the main focus on the local cultural and social contexts. The role of the instructor or teacher in this case can be enlarged by one more function – being a mediator between cultures, which means helping students in comparing, processing, learning information through their native culture. In this case, according to S.G. Ter-Minasova, a non-native English language teacher might have some advantage to the native English language teacher, because the knowledge of native culture can help to reveal and explain hidden difficulties in learning English as the second language and overcome them with the means of native culture [5, p. 34].

Conclusion: Changes of modern global environment have brought the English language to a new status of the global language. Modern tendencies and dynamics in learning English in non-native settings show that the main focus of pedagogic researches is likely to be in the sphere of non-native speakers' needs. Thus new multicultural materials, pedagogic methods and technologies are strongly needed to make learning and teaching process more efficient and up-to-date in the globalized society.

References

1. Crystal D. English as a global language. 2nd ed., Cambridge University Press, 2003. 212 p.

2. Graddol. D. English Next. Why global English may mean the end of 'English as a Foreign Language'. Printed in the United Kingdom by Latimer Trend & Company Ltd, Plymouth © British Council 2006 – 128 p.

3. Held D. The great globalization debate: An introduction // D. Held, A. McGrew (eds.). The global transformations reader: An introduction to the globalization debate (2nd edn). – Oxford: Polity. – 2003. – P. 1–50.

4. Kashru B. B. World Englishes 2000: Resourses for research and teaching // L. Smith (Ed) World Englishes 2000. Honolulu: University of Hawaii Press, 1997. P. 209–251.

5. Ter-Minasova S. G. Yazyk i mezhkulturnaya kommunikatsiya – Moscow: Slovo. — 261 p.

伟大的爱国战争期间科斯特罗马地区的国家 – 教会关系
STATE-CHURCH RELATIONS IN THE KOSTROMA REGION DURING THE GREAT PATRIOTIC WAR

Zinchuk Sergey Mikhailovich
graduate student of the 4th course
Kostroma State University

注解。 作者考虑了1941 – 1945年卫国战争期间国家与俄罗斯东正教会（以下简称中华民国）之间关系的变化过程。

关键词：俄罗斯东正教历史，苏联宗教。

Annotation. *The author considers the process of changing relations between the state and the Russian Orthodox Church (hereinafter - the ROC) during the Great Patriotic War of 1941-1945.*

Keywords: *history of the Russian Orthodox Church, religion in the USSR.*

The relevance of the topic is due to the growing role of the Russian Orthodox Church in modern Russian society. Appeal to historical experience, its lessons, both positive and negative on the part of scholars, statesmen, clergy, helps today to improve state-church relations. However, the times were not so distant past when the struggle against the church was the red thread of the state's religious policy.

By the beginning of World War II, the results of the anti-religious policy of the Soviet state were catastrophic as for the Russian Orthodox Church. The real tragedy of the Russian society was the mass repression of the clergy of the Russian Orthodox Church. For 1929-1936 50 thousand people were convicted, 5 thousand of them were executed. In 1936-1938 about 800 Orthodox bishops were arrested. In the Kostroma region in the period 1930-1940s. 34 priests were subjected to political repression. At the same time, the Great Patriotic War discovered the failure of previous attempts by state structures to liquidate the church as an organization of believers and change the consciousness of people, freeing it from the idea of the existence of God. The war caused an increase in religiosity. In July 1941, the religious community of Labor Sloboda sent a request to the Kostroma authorities for a prayer for the granting of victory, as well as a procession with the aim of attracting more people and increasing the fundraising for the country's defense.

Priests and millions of believers took an active part in providing material assistance to the state. This is the collection of money, jewels, things for the needs of the front, to provide the Red Army with everything necessary. On December 30, 1942, Metropolitan Sergius appealed to believers to donate their savings to the tank column named after Dm. Donskoy. By April 1943, the Kostroma department of the State Bank received more than 93 thousand rubles for the creation of the column. For 1945, all the churches of the Kostroma region collected money - 1,400,000 rubles.

The growth of religious sentiment during the war, the task of mobilizing all the forces of society to fight the enemy, the active patriotic activities of the clergy and believers — all this in 1943 prompted the Soviet leadership to revise the previous course in relations with the Russian Orthodox Church. September 4, 1943 in the Kremlin, Stalin met with the metropolitans Sergius, Alexis and Nikolai. Agreements were reached: on holding the Council of Bishops for the election of the Patriarch, Patriarchal Metropolitan. Sergius asked about the release of the clergy in exile, camps, prisons, as well as providing an opportunity to worship, to move freely in the country, which was approved by Stalin. During the meeting with the metropolitans, the intention of the government to create a special body, the Council for the Russian Orthodox Church, was announced, which was to serve as a kind of mediator between the Soviet leadership and the Church.

By the end of 1943, the central apparatus of the Council for the Affairs of the Russian Orthodox Church was formed. In the Kostroma region, formed on August 13, 1944, the post of authorized Council was introduced from February 21, 1945, but I. Ye. Smirnov actually began work only on March 1, 1945. In his report, he noted that at first he was not provided with premises and equipment. For this reason, he temporarily had to receive visitors in the general department of the regional executive committee. Believers sent to the Council numerous applications for the opening of churches. In the Kostroma region in the period from March 1 to July 1, 1945, believers received 45 applications. 25 of them were reviewed, 12 were postponed by the decision of the regional executive committee, 13 were satisfied and forwarded to the Council on the ROC's affairs. Out of 13 7 applications sent to the Council remained under consideration, according to 6 applications temples were allowed to open. This is 13% of the total number of applications received. There were still a significant number of unoccupied church buildings, in the Kostroma region - 366, which was a reserve for submitting further petitions of believers. 121 building was used for economic and cultural purposes.

In the Kostroma region was observed uneven placement of existing temples. In 14 districts of the region (out of 26 districts) there were none at all. In the third quarter of 1945, the remaining 40 applications were again received - 12. Of the 52 applications, 30 were considered, of which 2 were satisfied, 19. were delayed. Of the 12 applications, 3 were filed for the first time (Kologrivsky, Kadyysky, Bogovarovsky districts) the rest are repeated. To the total number of applications,

this amounts to - 3%. The petitions of the Nerekhtsky district, the village of Emsna, and the Semenovsky district, the village of Spas-Pena are satisfied. Positive conclusions in these cases were given for the reason that church buildings and religious property are in good condition. Individual applications were withdrawn from consideration, statements signed by former church headmen and members of non-existent church councils, due to improper processing of applications, if the application contains fewer than 20 signatures. For the fourth quarter of 1945, 38 applications were received, 29 were considered, 8 were satisfied, 4 were postponed, 17. were withdrawn from consideration because of deficiencies in the application — signed with a pencil, signed on separate sheets. Petitions for opening churches were rejected in cases where the church was closed by the decision of the Soviet authorities, religious property was plundered, and if petitions came from insignificant groups of believers.

Thus, during the years of the Great Patriotic War, the Council for the Affairs of the Russian Orthodox Church and its delegates faced the difficult task of establishing a constructive "dialogue" with the clergy and believers. The functions and tasks of the commissioners were determined by the instructions of the Council on the affairs of the Russian Orthodox Church. The Commissioner of the Council on the Affairs of the Russian Orthodox Church in the Kostroma Region contributed to the realization of the legal rights and interests of the clergy and believers, and revealed violations of laws on their part.

Measures were taken to comply with current legislation. Significant changes affected various spheres of activity of religious organizations and contributed to the expansion of their influence on the population. A Council for the Affairs of the Russian Orthodox Church was created, which was to serve as a kind of mediator between the Soviet leadership and the Church.

References

1. Archive of the Office of the Kostroma diocese. Card file of the clergy of the Kostroma diocese, which were convicted under Soviet law.

2. Vasilyeva O. Yu. The history of the Orthodox Church on the pages of a school textbook // Patriotic history. - 2002. - № 3. - P.45.

3. Vasilyeva O. Yu. Russian Orthodox Church in 1927-1943. // Questions of history. - 1994. - №4. - P.214.

4. Gako. - F.R.-7. - Op.1. - D.2391.

5. Gako. - F.-2102. - Op.1. - D.1.

6. Shkarovsky M.V. The Russian Orthodox Church: state-church relations in the USSR in 1939-1964. - Moscow, 1999.

UDC 639.12

俄罗斯乌拉尔的湖泊捕鱼正在逐步发展
LAKE FISHING IN THE URALS OF RUSSIA IS BECOMING PROGRESSIVE

Mukhachev Igor Semenovich
Doctor of Biological Sciences, Professor,
State Agrarian University of Northern Zauralye
Professor and Consultant of TSU
Tyumen, RF

注解。 介绍了利用加速牧草技术开展商业湖泊养鱼的实践实例。
关键词：湖泊生态渔业改良，混养，小品种，草鱼，鲢鱼，白鲑。

Annotation. *Examples of the practice of developing commercial lake fish farming using accelerated pasture technology are presented.*

Keywords*: ecological-fishery melioration of lakes, polyculture, sterlet, grass carp, silver carp, whitefish.*

Fisheries melioration of lakes in Western Siberia has significant development experience [1], [8], [9]. In the modern period, commercial lakes of fish in the Chelyabinsk, Kurgan, Tyumen, Omsk, and Novosibirsk regions in a number of exploited lakes carry out indigenous and current reclamations that increase the biological productivity of water bodies and increase the catch of commercial fish per 1 hectare of water area compared to traditional fishing and extensive fish production technologies. The main thing is that business leaders and leading experts are convinced of the tangible benefits of land reclamation and show increased interest and creativity in the development and implementation of scientific recommendations [4], [7].

In particular, in 2008, specialists of the SRO - Sladkovsky commodity fish farm began in 2008 to restore and modernize the farm, which worked in the 70-80s as part of the Sibrybproma of the Tyumen Region. And literally from “zero” they achieved tangible results, since the entire annual catch of local fish - gold and goldfish on 14 thousand hectares of lakes of the chambered type before the organization of the SCP in 2008 amounted to only 70 tons. In 2017, the total catch of

farmed fish (sigovy, carp, pike perch, pike) exceeded 1.3 thousand tons, of which 400 g of whitefish, carp –248 tons, pike - 131 tons and pike perch. Indicators of catch of farmed fish by polyculture on some reclaimed small lakes reach 180-250 kg / ha per year.

Very important and with great positive consequences, the workers of the SUC expect from a comprehensive amelioration of the lake. Tavolzhan (Fig. 1), the water area of which together with the island is 10 thousand hectares. In 2008 - during our first survey of the lake ecosystem, the “mirror” of water in the middle of the lake, free from reed beds, did not exceed 1-1.2 thousand hectares.

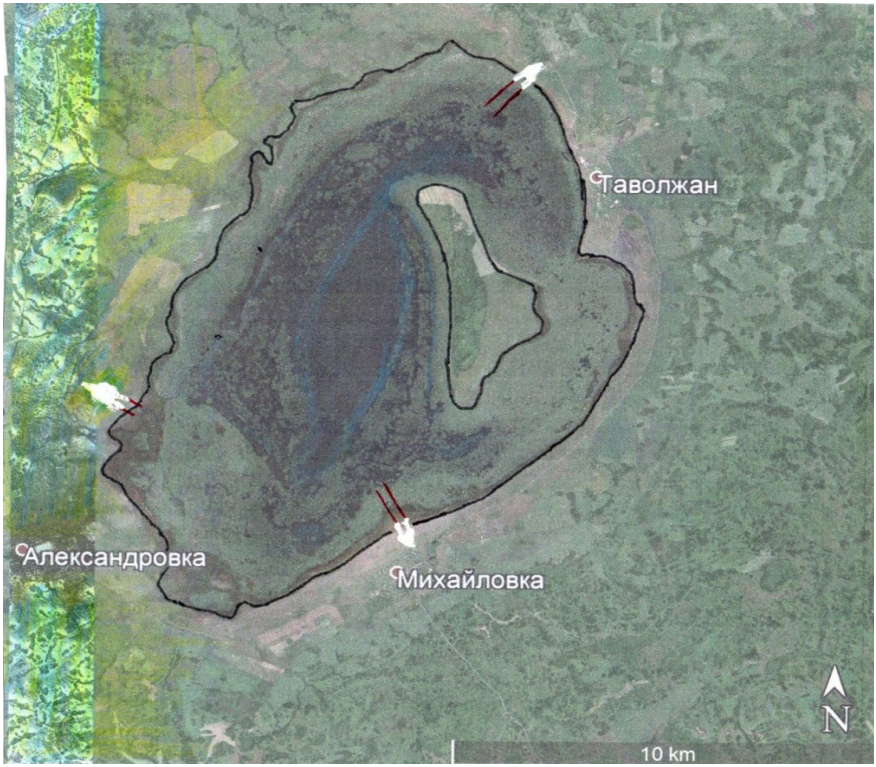


***Fig. 1**. Scheme-plan of Lake Tavolzhan: (white color) indicates the places of construction of canals for the passage of watercraft in three sections of the lake*

The water of the lake during these years was characterized by O.Alekina's classification as sodium chloride with a total mineralization of 11–12 g / dm3.

Formerly, the lake was characterized by "fish-free", since according to the information of local residents for the previous 20 years neither gold and silver carp or lake minnow was present. However, 6 years ago, the lake level began to gradually rise annually by 0.1-0.15 m, and the total salinity of water decreased to 7.5-8.0 g / dm3. This allowed STRH specialists to move the spring of the larvae of peled and pelchira (a hybrid of peled and chira) into the open part of the lake in spring, and thanks to the dug-out reclamation canals (Fig. 2) in advance, in the second half of summer and autumn, to systematically loosen the bottom sediments of the lake including border areas of reed beds.

Fig.2. *The melioration channel (in open water — for the movement of watercraft; in winter — for the installation of turbo aerators and the capture of whitefish that remain in the process of fishing "in open water"*

Due to the movement of the ameliorative silt cultivator not only through the "open" water, but also along the edge of the reed beds, their area began to noticeably decrease as the wind mixing of the water masses and the migration of the "islands" of the reed increased until their complete destruction (Fig. 3).

In the first year of the production experiment, it was possible to catch 40 tons of product yearlings of sigovies weighing 90-120 g / pc with the help of fixed two-barrel nets, and in August-September the fact of "pursuing" a moving boat with bottom sediment loosener was revealed growing siglet yearlings.

Fig. 3. *Floating and gradually collapsing reed islets on Lake Tavolzhan (2018)*

The fish did not get scared of a moving boat with a ripper at all, because they were attracted by pop-up chironomid larvae, mainly Chironomus plumosus. Similar "ameliorative feeding" of whitefish was also noted on the lakes of other fish farms in the Trans-Urals.

In 2018, the total catch of whitefish in the lake. Tavolzhan amounted to 300 tons, and the water area with sparse thickets of reeds, where whitefish are fed, increased to almost 3 thousand hectares (see Fig. 1). The technical amelioration of reed thickets in the Sladkovsky fish farm is planned to be combined with biological amelioration - the introduction of the grass carp's annuals, the production of which will be mastered in local fish hatcheries.

A similar approach to ameliorative impact is required for the lake ecosystem. Saltaim-Tenis with a water area of 26 thousand hectares, whose water, in contrast to the lake. Tavolzhan is hydrocarbonate-calcium and with a very slow decomposition of dead cane that has fallen to the bottom of the reservoir. Our ecological and fishery monitoring [3], [6], [10] allowed for a long time to justify and suggest that the Krutinsky fish factory and the Administration of the Omsk Region introduce effective biological reclamation of the lake based on the constant cultivation of the white carp in the productive polyculture. This will greatly increase the fish productivity of a large lake [5]. The bioecological essence of introducing white carp into a pasture polyculture is that amur actively eats young reed plants and other soft vegetation, turning them into recycled plant fiber, which "fertilizes" the lake with organic matter, optimal for the recycling (utilization) of bacteria. Bacteria multiply their abundance, and also contribute to the growth of biomass and production of organisms of zooplankton and zoobenthos, which are the optimal food for fish zooplanktophages and zoophentophages.

We believe that since the need for a biomeliorator, white carp, is increasing in the Trans-Urals and Western Siberia, the construction of the zonal reproduction complex of herbivorous fish should be accelerated.

In Petukhov district of the Kurgan region on the lake. Matasi, with a water area of 200 hectares, a production experiment is conducted on the development and sustainable cultivation of whitefish sturgeon polyculture. Lake Matasy with a maximum depth of 3.5 m represents a typical forest-steppe karasevoy lake with sodium chloride water and a sum of ions of 3-4 g / dm3. The lake is almost free from hard macrophytes and differs by a small development of soft aquatic vegetation, but with an abundance of gammarus, daphnia magna and other representatives of zooplankton and zoobenthos. Carried out in accordance with zonal bionormativs at the beginning of May 2018, the first introduction of bred fry of sterlet weighing 1.5-2 g / pcs. and 3-4-day larvae of peled and its hybrid forms with chir and nelma with high development of food supply showed good results: on October 10-11, the average mass of juvenile peled were 112 g, sigon hybrids 140-150 g, and juvenile sterlet reached mass 320-480 g / pcs. Farm operating Lake. Matasy, acquired aerators for installation on the reservoir, begins work on the creation of a satellite reservoir with nursery ponds according to the technology of NP Slinkin [7], and also provides effective protection of farmed fish from early prey. The cultivation of commercial polyculture of fish is planned on the basis of the technology of two years of feeding.

The technology of two-year feeding of whitefish and carp, which was introduced on almost all small lakes of CJSC “Kazan fish” of the Tyumen region, allowed to double the catches compared to the technology of one-year-old commercial fish rearing.

Table 1. *Dynamics of commercial fish in the JSC "Kazan fish"*

Total catch of commercial fish, t	**Years**		
	2015	**2016**	**2017**
Total, t	555,0	1157,0	1184,0
including:			
Whitefish (peled, pelchir)	151,0	659,0	556,0
Carp	-	16,0	354,0
Pike	4,0	19,0	43,0
Silver carp	396,0	444,0	212,0
Perch, roach and other fish	4,0	19,0	19,0

An analysis of the work of a number of lake fish farms in the Zauralye shows the real benefits and effectiveness of scientifically-developed complex land reclamation of lakes of the observatory type, which in their natural state represent low-productive ichthyocenoses and low catches of food fish. An increase in the total catch of marketable fish can be achieved through the actual provision of viable planting material to objects from hatcheries directly near intensive feeding farms.

References

1. Berezovsky A.I. Land reclamation in fisheries. - Moscow -Leningrad: KOIZ, 1935.- 76 p.

2. Bogatov I.B. Fish hydrobiology. – Moscow: Food Industry, -1980.- 168 p.

3. Mukhachev I.S., Pivnev I.A., Rybkin V.P. Development of a biological study increase of fish productivity of lakes Ik and Saltaim-Tenis / Report of SibNIIRH. Tyumen: SibNIIRH. 1974.-116 p.

4. Mukhachev I.S. Lake commercial fish farming. - St. Petersburg: Lan publishing house, 2013.-400 p.

5. Mukhachev I.S. The substantiation of the industrial pasture technology of growing commercial fish on the ecological and production potential of Saltaim Tenis Lake // International Scientific and Practical. conf. "Ecological readings-2018". - Omsk: OmGAU, 2018.Part 2. - P.201-214.

6. Rybkin V.P. The fodder base of lakes Ik and Saltaim Tenis and its use by fish // Abstracts of reports to the scientific and practical. Conf. SibrybNIIproekt for the development of the Tyumen fisheries complex. Tyumen: SibrybNIIproekt, 1975.-p.102-103.

7.Slinkin N.P. New methods of intensification of lake fishing and fish farming. - Tyumen: TGSHA, 2009.-151 p.

8. Folitarek S.S. Problems of complex and intensive use of biological resources of lakes in Western Siberia // Biological resources of inland water bodies of Siberia and the Far East. - Moscow: Nauka, 1984. p.33-45.

9. Cherfas B.I. Fish farming in natural waters. - Moscow: Pishepromizdat, 1956. – 468 p.

10.Sherenkova I.P., Chernukho A.A. Lakes of the Krutinsky system of the Omsk region as a base for the organization of highly productive fisheries // Ozernoye and pond farms in Siberia and the Urals. Tyumen: SibNIIRH, 1967.-P.133-140.

物种在浮游动物浮游动物中占主导地位远东海域和北太平洋
SPECIES DOMINANCE IN EPIPELAGIC ZOOPLANKTON OF THE FAR EASTERN SEAS AND THE NORTH PACIFIC

Igor V. Volvenko
Doctor of Biological Sciences,
Chief Researcher of the Pacific Branch of Russian Federal "Research Institute of Fisheries and Oceanography" (TINRO)

注解。利用1984 – 2013年收集的25,512个样本的数据，研究了楚科奇，白令，鄂霍次克，日本海和北太平洋上游浮游动物中物种的优势。由网络dzhedi计划并通过单一技术处理。物种根据其丰度排序表明，在所有水体中，前5种生物量占生物量的约70%，其他 – 约30%，第一种（占优势） – 约30%。总的来说，前五名包括12种，但Parasagitta elegans最先到处都是。根据在单度梯度中占主导地位的物种，整个调查水域被划分为39个自适应区域（总面积最大的是sa-gita的自适应区域）。考虑到物种的第二生物量（优势种+次优势），水域已经分为162个彼得森群落，并考虑到三个最广泛的物种 – 进入391.所有成对的丰度，两个次优势之间的成对相关性和其他物种结果是积极的。这表明最广泛种类的浮游动物不竞争食物或其他重要资源，主导者的变化是由于与竞争无关的因素。

关键词：浮游动物，大规模物种，适应区，竞争，远东海域，北太平洋，上游

Annotation. *The dominance of species in the zooplankton of the epipelagic zone of the Chukchi, Bering, Okhotsk, Japan Seas and the North Pacific has been studied using data from 25,512 samples collected in 1984–2013 by Juday net and processed by the same technique. The ranking of species according to their abundance shows that in all water bodies the first 5 species by biomass make up about 70%, the others - about 30% and the very first (dominant) - also about 30%. In total, the top five include 12 species, but Parasagitta elegans is everywhere in the first place. According to the species dominating in single-degree trapezes, the entire surveyed water area is divided into 39 adaptive zones (the largest in terms of the total area is the adaptive zone of the sagitta). Taking into account the second biomass of the species (dominants + subdominants), the water area is already divided into 162 Petersen-type communities, and taking into account the three most widespread species - into 391. All pairwise correlations between the abundance of dominants, two subdominants, and other species turned out to be positive. This indicates that the most abundant species of zooplankton do not compete for food or other vital resources, the change of dominants is due to factors not related to competition.*

Keywords: *zooplankton, mass species, adaptive zones, competition, Far-Eastern seas, North Pacific, epipelagic*

Marine zooplankton are relatively small drifting organisms that play an important role in the accumulation and transport of matter and energy from primary producers (phyto- and bacterioplankton) to high trophic levels, i.e. in bio-geochemical cycles on a global scale (see, eg, Valdes et al., 2004; Cavan et al., 2017; Steinberg & Landry, 2017). The object of this work is the zooplankton of one of the most productive regions of the World Ocean, which provides a significant portion of the catch of fish and other seafood for Russia, USA, Canada, China, Korea and Japan (FAO ..., 2012, 2014; The state ..., 2014, 2016) .

Among ecologists who have studied the fauna of high and temperate latitudes, the perception of the natural uneven distribution of species by abundance has long been prevalent as it were. In a qualitative formulation, this fact was also noted by Petersen and Boysen-Jensen (1911). Most often, one species (or two, or three) by the number of individuals or biomass significantly exceeds all others. These species are usually called “conspicuous” in this area, either dominant, principal, characteristic or common, and the entire zone, where the shares of these species make up a significant part of the total abundance of all species, is sometimes called the Petersen-type community. If we are talking only about the most mass form, then the zone of its predominance is more correctly called an adaptive zone (Barash, 1973).

To study the dominance in plankton, data were taken from 25,512 samples collected by TINRO employees from a large Juday net from nylon sieve No. 49 (mesh 0.168 mm) with an inlet area of 0.1 m^2 and processed according to a single method (Volkov, 2008) from 27/04/1984 to 09/12/2013 on 235 research cruises in the Chukchi, Bering, Okhotsk, Japan Seas and the North Pacific (Fig. 1). The collection of materials on these survays took place around the clock - day and night. Samples were taken from a depth of 200-250 m to the surface, and in areas with shallower depths — from bottom to surface, whenever possible, year-round and annually on a standard grid of stations that regularly cover the entire Russian EEZ and periodically adjacent areas.

The ranking of species according to their abundance (Table 1) shows that in all the water bodies under consideration, the first 5 species by biomass are about 70%, the others - about 30% and the very first (dominant) - also about 30%. In total, the top five include 12 species, but *Parasagitta elegans* is everywhere in the first place.

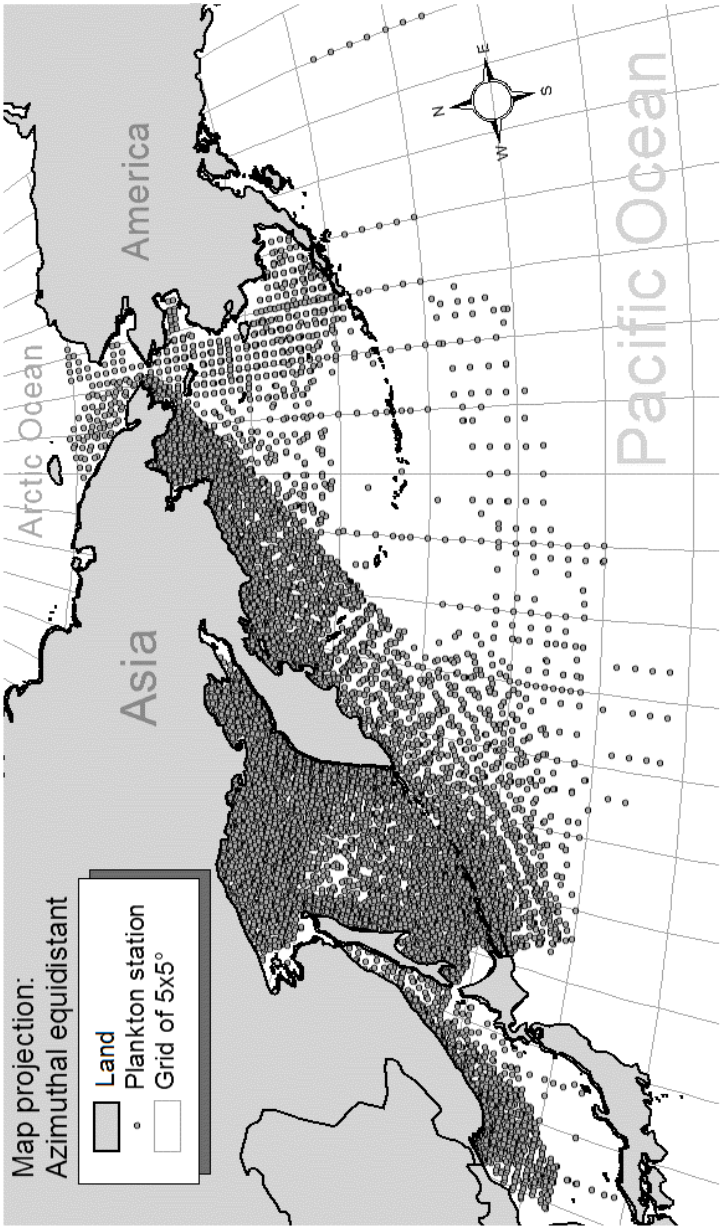


Fig. 1. *Location of plankton stations in the surveyed water area*

Table 1

Weight fractions (%) of the five most abundant and all other species in the net zooplankton from epipelagic water layer of studied water

Basin	Species	Fraction
Chukchi sea	*Parasagitta elegans*	33,1
	Eucalanus bungii	11,6
	Calanus glacialis+marshallae	9,8
	Aglantha digitale	7,8
	Thysanoessa raschii	7,3
	Other	30,4
Bering sea	*Parasagitta elegans*	33,0
	Eucalanus bungii	16,8
	Neocalanus plumchrus+flemingeri	8,3
	Aglantha digitale	6,9
	Calanus glacialis+marshallae	6,3
	Other	28,7
Okhotsk sea	*Parasagitta elegans*	24,6
	Thysanoessa raschii	15,2
	Neocalanus plumchrus+flemingeri	14,2
	Metridia okhotensis	8,7
	Thysanoessa longipes	7,5
	Other	29,8
Japan sea	*Parasagitta elegans*	30,2
	Neocalanus plumchrus+flemingeri	13,8
	Themisto japonica	7,2
	Pseudocalanus newmani	6,7
	Metridia pacifica	6,5
	Other	35,6
Pacific Ocean	*Parasagitta elegans*	26,0
	Neocalanus cristatus	16,1
	Neocalanus plumchrus+flemingeri	14,5
	Eucalanus bungii	8,9
	Aglantha digitale	4,9
	Other	29,7

Note: not in all survays Calanus glacialis were distinguished from C. marshallae, and Neocalanus plumchrus from N. flemingeri, therefore, the calculations for these species are combined.

According to the species dominating in one-degree trapeziums with centers at the intersection points of meridians and parallels, the surveyed water area is divided into 39 adaptive zones (Fig. 2, Table 2), and the sagitta has the largest adaptive zone in total area. Taking into account the second biomass of the species (dominant + subdominant), the water area is already divided into 162 Petersen-type communities, and taking into account the three most widespread species - at 391.

Theoretical models of the rank distribution of species by abundance, for example, the MacArthur model of the "broken stick" (MacArthur, 1957), suggest that the dominant species captures part of a certain limited resource, the second most abundant species captures part of the remainder of this resource, third in abundance - the remainder of the residue, etc., until the resource is divided among all species. These species divide the environment among themselves so that they occupy non-overlapping ecological niches, and the abundance of each species is proportional to the width of its niche. If we assume that the capacity of the environment is limited, and it is filled with living organisms to failure, then according to the principle of competitive exclusion by Gause (1934), the biomass of one of the mass species can be increased only by reducing the biomass of others, and the change of dominants occurs through competitive displacement. In this case, the correlation between the biomass of species of different rank should be negative. If this is not the case, then a statistically significant correlation will not be detected.

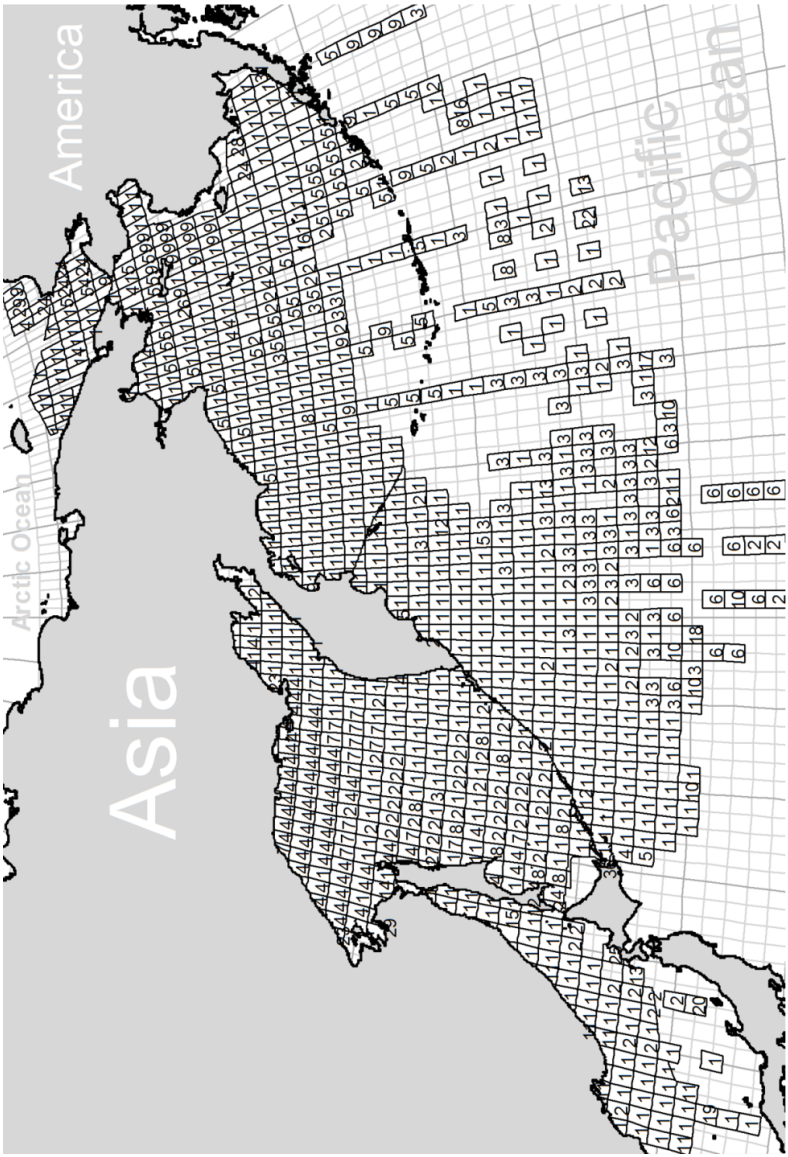


Fig. 2. *39 adaptive zones of species prevailing in biomass in net zooplankton, identified according to data from all stations. Legend in the Table 2*

To test this hypothesis in each one-degree trapezium for which data were available (see Fig. 2), the biomass of the three most mass species and the sum of all the others were calculated. It turned out that all pairwise correlations between the indices of the abundance of dominants, two subdominants, and other species are positive (Fig. 3). This indicates that the most abundant species of zooplankton do not compete with each other for food or other vital resources, the change of dominants is due to abiotic or intrapopulation biotic factors that are not related to competition. Similar conclusions were previously made for the trawl macrofauna of the pelagic zone and the bottom of this water area (Volvenko, Titiayeva, 1999 a, b). This is probably why as a result of natural seasonal migrations and / or perennial waves of abundance of hydrobionts, some mass species easily enter the ecosystems of the Far Eastern seas and the northwestern part of Pacific Ocean and without extraordinary consequences leave these ecosystems (Shuntov, 2000 a, b; Shuntov, Temnykh, 2011). In this case, this is reference to dozens of species, and the biomass of some of such temporary components reaches hundreds of thousands (salmons, saury, mackerels, squids, whales) and even millions of tons (Japanese pilchard).

Table 2

39 adaptive zones of species prevailing in biomass in net zooplankton. The map in fig. 1.

Number on the map	Adaptive zone of	Number of occupied one degree trapeziums
1	*Parasagitta elegans*	573
2	*Neocalanus plumchrus+flemingeri**	88
3	*Neocalanus cristatus*	69
4	*Thysanoessa raschii*	73
5	*Eucalanus bungii*	56
6	*Flaccisagitta maxima*	17
7	*Metridia okhotensis*	18
8	*Thysanoessa longipes*	14
9	*Aglantha digitale*	30
10	*Copepoda* gen. sp.*	5
11	*Pseudocalanus newmani*	10
12	*Metridia pacifica*	7
13	*Euphausia pacifica*	4
14	*Calanus glacialis+marshallae**	8
15	*Thysanoessa inermis*	3

16	*Thysanoessa inspinata*	2
17	*Pseudocalanus* sp.*	5
18	*Beroe cucumis*	3
19	*Paracalanus parvus*	1
20	*Thaliacea* gen. sp.*	1
21	*Calanus pacificus*	1
22	*Euphausiidae* gen. sp.*	2
23	*Limacina helicina*	4
24	*Centropages abdominalis*	10
25	*Themisto japonica*	1
26	*Themisto libellula*	3
27	*Cumacea* gen. sp.*	1
28	*Echinodermata (larvae)**	3
29	*Oithona similis*	4
30	*Neocalanus sp.**	1
31	*Acartia clausi*	2
32	*Gammaridae* gen. sp.*	3
33	*Ostracoda* gen. sp.*	1
34	*Acartia tumida*	1
35	*Oikopleura vanhoeffeni*	1
36	*Pseudocalanus minutus*	3
37	*Dimophyes arctica*	1
38	*Acartia longiremis*	1
39	*Polychaeta* gen. sp.*	1

Note: * - when processing plankton samples, not all individuals are identified to species.

In conclusion, it is necessary to emphasize that only a generalized average multi-year picture is shown here. It does not reflect the periodic change of dominants and subdominants associated with the above-mentioned seasonal and multi-year changes in the abundance of species. The study of the phenomenon of dominance in zooplankton of this region in the dynamics and in connection with changes in the environment is the subject of further work and the following publications.

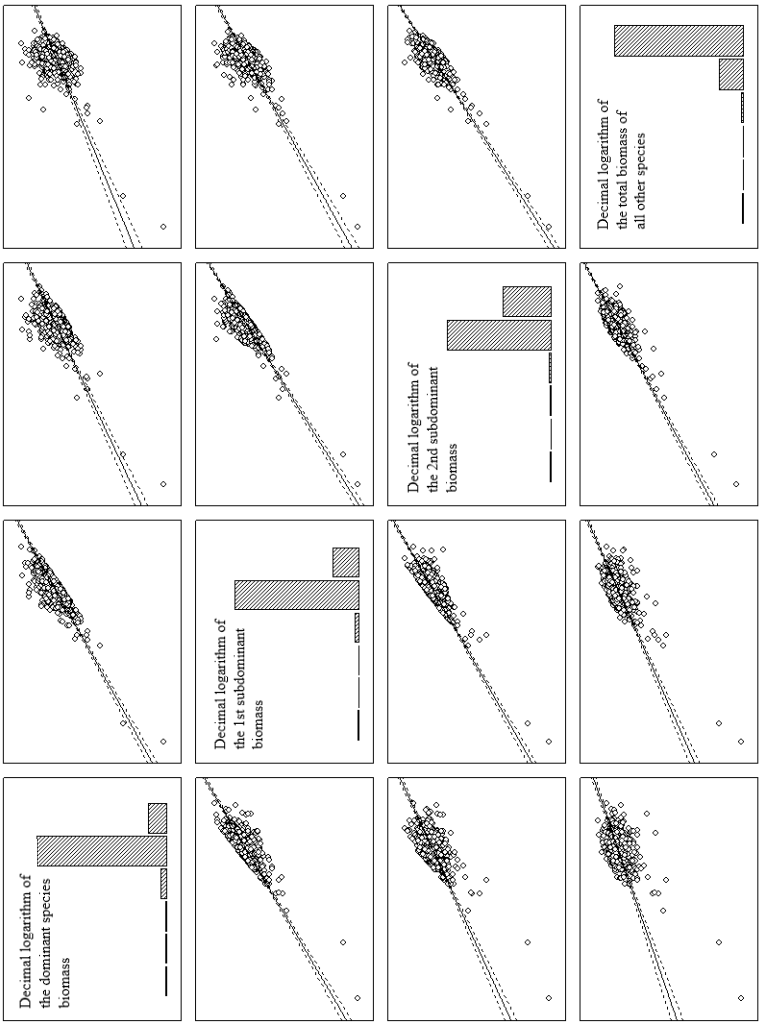


Fig. 3. *Frequency distributions (histograms) of logarithms of biomass dominants, two sub-dominants and the sum of all other types of benthal, as well as pair dependencies between them (graphs). Each point on the graph corresponds to one one-degree trapezium. All correlations between variables are positive and reliable (P <0.0001).*

References

Barash D.P. (1973). Concentration of dominance and adaptive zones. Oikos 24(2), 328-330.

Cavan E.L., Henson S.A., Belcher A., Sanders R. (2017). Role of zooplankton in determining the efficiency of the biological carbon pump. Biogeosciences, 14 (1), 177-186.

FAO yearbook. Fishery and Aquaculture Statistics (Rome: Food and Agriculture Organization of the United Nations, 2012). http://www.fao.org/3/a-i3740t.pdf

FAO yearbook. Fishery and Aquaculture Statistics (Rome: Food and Agriculture Organization of the United Nations, 2014). http://www.fao.org/3/a-i5716t.pdf

Gause G.F. (1934). The Struggle for existence. Baltimore: Williams & Wilkins.

MacArthur R.H. (1957). On the relative abundance of bird species. Proc. Natl. Acad. Sci., 43, 293-295.

Petersen C.G., Boysen-Jensen P. (1911).Animal life of sea bottom, its food and quantity. Rep. of Dan. Biol. St. - Copenhagen, 20, 1-81.

Shuntov V.P. (2000a). Results of the study of macroecosystems of the Far Eastern seas of Russia: problems, results, doubts. FEB RAS Bulletin 1, 19-29.

Shuntov V.P. (2000b). Review of research into macroecosystems of the Far Eastern seas: results, objectives, doubts. In: PICES Annual Report VIII Meeting (October 8-17, 1999), pp. 15-23, Sidney: PICES Press.

Shuntov V.P., Temnykh O.S. (2011). Pacific salmon in marine and ocean ecosystems. V. 2. Vladivostok: TINRO-Center.

The state of world fisheries and aquaculture (Rome: Food and Agriculture Organization of the United Nations, 2014). http://www.fao.org/3/a-i3720e.pdf

The state of world fisheries and aquaculture (Rome: Food and Agriculture Organization of the United Nations, 2016). http://www.fao.org/3/a-i5555e.pdf

Steinberg D.K., Landry M.R. (2017). Zooplankton and the ocean carbon cycle. Annual Review of Marine Science, 9, 413-444.

Valdes L., Harris R., Ikeda T., McKinnell S., Peterson W.T. (2004). The Role of Zooplankton in Global Ecosystem Dynamics: Comparative Studies from the World Oceans. ICES Journal of Marine Science, 61 (4), 441–444.

Volkov A.F. (2008). Technique of collecting and processing the samples of plankton and the samples on nekton feeding (step-by-step instructions). Izvestiya TINRO, 154, 405-416.

Volvenko I.V., Titiayeva E.A. (1999a). Dominance in nekton and macroplankton fauna of epipelagical water layer of the northern Okhotsk Sea. Izvestiya TINRO, 126, 58-81.

Volvenko I.V., Titiayeva E.A. (1999b). Species dominance in the bottom fauna of the northern Okhotsk Sea. Izvestiya TINRO, 126, 670-687.

生物改良成分饲料对生态失调大鼠肠道菌群的影响
EFFECT OF FEED WITH BIOMODIFIED INGREDIENTS ON THE INTESTINAL FLORA OF RATS WITH DYSBIOSIS

Krylova Valentina Borisovna
Doctor of Technical Sciences, Chief Researcher
Gustova Tatiana Vladimirovna,
Candidate of Technical Sciences, Leading Researcher
Federal Scientific Center of Food Systems named after V.M. Gorbatov

注解。 开发了用于对实验动物的疾病进行建模的方案，并且获得了具有生态失调的实验批次的大鼠。 给动物喂食对照和经验丰富的肉类系统。 一项综合研究表明，饲喂具有乳酸菌L. Casei的发育成分的实验动物导致肠道微生物群落的恢复，预防或减少与抗生素相关的副作用，增加实验动物的体重以完成实验性喂养。

关键词：人工生态失调，摄食，改良成分，肠道微生物群落

Annotation. *A scheme was developed for modeling the disease of laboratory animals and experimental batches of rats with dysbiosis were obtained. The animals were fed with control and experienced meat systems. A complex of studies showed that feeding laboratory animals with the developed composition with lactic acid bacteria L. Casei resulted in restoration of intestinal microbiocenosis, prevention or reduction of side effects associated with antibiotics, increase in body weight of laboratory animals to the completion of experimental feeding.*

Keywords: *artificial dysbiosis, feeding, modified compositions, intestinal microbiocenosis*

The intestinal surface area is more than 200 square meters, and numerous microorganisms live on this entire surface. For the most part, these are microbes that are useful and even indispensable for humans, which help digestion, promote the absorption of calcium, iron and other trace elements, synthesize vitamins and amino acids, and inhibit the growth of pathogenic and putrefactive bacteria. All this strengthens the immune system, prevents the development of allergic reactions, enhances the anti-infective and anticancer protection of the body [1, 2].

Various disorders in the intestinal microbiocenosis are defined by the term "dysbiosis" or "dysbacteriosis." In medicine, “dysbiosis” is considered as a cer-

tain state of the intestinal ecosystem with impaired functions of all its constituent components: the macroorganism, its resident microflora and its habitat, the mechanisms of their interaction [3-8].

The distribution of microbiota in the intestine is uneven. Blind, ascending and descending colon colonize mainly bifidobacteria, colon compartments, except for the direct colon - lactobacilli, conditionally pathogenic strains - descending colon and sigmoid colon, streptococci are found in all sections of the colon [9, 10].

One of the causes of intestinal dysbiosis is the use of antibiotics. It is shown that under the influence of antibiotics, not only pathogenic, but also normal microflora is suppressed. The most common clinical forms of enteric dysbiosis are functional diarrhea and maldigestion and malabsorption syndrome.

The main objectives of therapeutic measures are: adequate treatment of the underlying disease, restoration of impaired bowel functions, increasing the overall resistance of the microorganism by stimulating its immune and nonspecific protection, correcting the actual dysbiosis of the colon and small intestine using functional nutrition, pre-, pro- and synbiotics and other antibacterial and antiparasitic drugs [11-13].

In order to survive, any living organism needs nutrition, which would include the necessary nutrients that allow its organs to function normally. According to INTERFAX, the number of pets in Russia has increased by 6.3 million over the past three years, as evidenced by data from Mars Petcare, published for World Animal Day [14]. Russians have become more responsible for pets, including in terms of feeding and veterinary services. But still, the bulk of dogs and cats are found in innocent people, far from "high" cynology and felinology, from exhibitions, club events and ... from knowledge in the field of feeding their pets. And as a result - the wrong diets with low protein, fat, vitamins and high fiber content, lead to serious diseases of domestic animals. The prescription of therapeutic foods for unproductive animals is in some cases part of therapy. Specialized product is indispensable for diseases of the digestive tract, nephrological ailments, allergic manifestations, metabolic diseases.

The meat industry has extensive processing capabilities and enormous potential due to the diverse and unique composition of the main and secondary products of slaughter of industrial animals. The ultimate goal of our research was the development of a functional meat ingredient designed to produce extruded feed additives or feed normalizing the microflora of the gastrointestinal tract of animals and reducing the risk of developing gastrointestinal diseases of agricultural and domestic animals.

The experiments were performed on 40 mature adult white rats, male Wistar runoff (body weight 150 ± 10 g, fluctuation in the group ± 8 g).

Keeping, feeding, caring for animals and removing them from the experiment was carried out in accordance with the requirements of the "Rules of work with the use of experimental animals", International Recommendations (code of ethics) for conducting biomedical research using animals.

The animals were kept in TECNIPLAST type IV S cells under standard vivarium conditions under similar conditions in terms of temperature (20 ± 2 ° C), humidity (48 ± 2%), lighting (from 6.00 to 18.00), with free access to food and water.

The experiment lasted 35 days. During this period, the animals received a balanced, full-fledged standard diet of the vivarium (animal feed, Russia).

Rats were randomly assigned to 4 groups (control and 3 experimental). The first group consisted of intact animals that consumed the standard vivarium ration during the whole experiment. Animals of the experimental groups from the 1st to the 10th day of the experiment were simulated by the associated antibiotic dysbiosis by daily oral administration of 30 ml / head of tetracycline hydrochloride solution at a rate of 600 mg / 1000 ml of distilled water and intramuscular injection of oxytetracycline hydrochloride dissolved in water for injections, 1 time per day, at the rate of 7 mg / kg of body weight during the first 4 days and at a dose of 15 mg / kg of body weight from the 5th to the 10th day [15].

After completion of the simulation, from the 10th to the 35th day, the samples of the model meat systems injected into the diet were administered to the animals. The number of applied samples was calculated according to the results of weighing animals, based on the balance of the diet for protein, according to the scheme:

2nd group of animals - a model meat system containing an unmodified composition of the rumen and pancreas;

Group 3 - a model meat system containing a modified composition of the rumen and pancreas;

Group 4 - a model meat system containing a modified composition of the rumen, pancreas and Lactobacillus casei, strain PB – MP.

Weighing animals was performed every four days of the experiment.

To obtain a modified composition based on the rumen of beef, a ground base was prepared. To do this, the scar was crushed on the top with a hole diameter of 2-3 mm, saline was added, then homogenized. The ground mixture was heated in a water bath at 80 ° C for 20 minutes and then cooled. A crushed pancreas was added to the prepared mass from the rumen in a scar: pancreas ratio of 4: 1 and mixed. Modification of the crushed base was carried out at a temperature of 200 ° C for 18 hours. When using the preparation of the pure culture Lactobacillus casei, the strain PB-MP did not exceed 10^3 the number of microbial cells in the total mass of the mixture.

At the end of the experiment, animals were euthanized in a VetTech chamber using carbon dioxide. In stunned animals, an autopsy was performed with a

visual inspection of the internal organs and the body weight of the animals was measured; then samples of the mucous membrane of the small and blind intestines were collected by gently scraping it with a spatula. To study the microflora of the intestinal mucous membranes, their serial dilutions were prepared, followed by plating on the media and qualitative and quantitative accounting of the isolated microorganisms.

Observations on intact animals (group 1) did not reveal any deviations from the norms of the physiological state throughout the experiment. The rats were mobile and active; muscles in a tone; tactile response saved; the coat is tight to the body, not ruffled, smooth, clean, shiny; elastic skin, without compromising integrity; there are no visible pale pink mucous membranes, no outflows and other signs of inflammatory reactions. The eyes are bright red. Appetite is not broken, urination and bowel movements were within the physiological norm.

In animals of groups 2-4, which from the 1st to the 10th day, simulated diseases were performed, starting from the 3rd day, a depression was noted, a slight decrease in activity, a softening of feces and frequent defecation and urination, a decrease in appetite. within the physiological norm. Further deterioration was noted, more pronounced in the period from the 5th to the 9th day.

Observation of the dynamics of changes in live weight of laboratory animals during the simulation period of an antibiotic associated dysbiosis showed: in animals of the 2nd, 3rd and 4th groups, a decrease in daily gain from 2 days, at the same time on the 5th and 6th day negative gains were observed, the stabilization of the mass of the rats was uneven, only on the 7th and 8th day, but on the 9th day the weight of the animals decreased again. Animals of the 1st intact group stably gained body weight in the period from the 1st to the 10th day on average 3-4% per day (Fig. 1). These data indirectly indicated the presence of intestinal dysbiosis in animals caused by the administration of antibiotics.

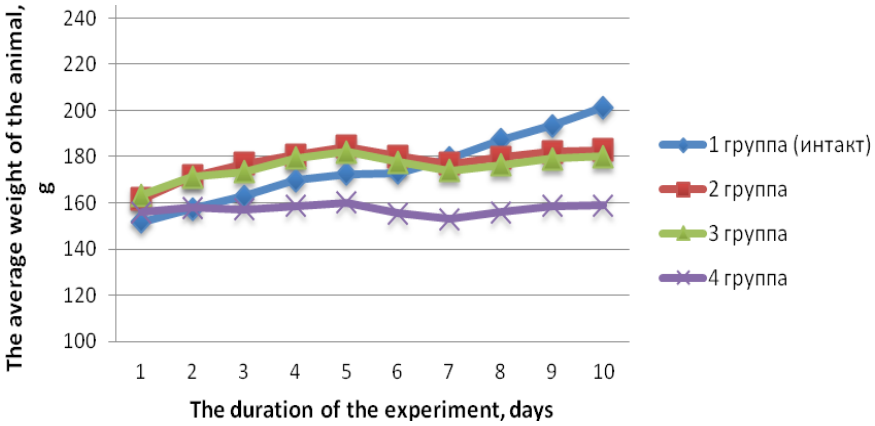


Figure 1 - *Dynamics of changes in the body weight of animals at the stage of modeling antibiotic associated dysbiosis*

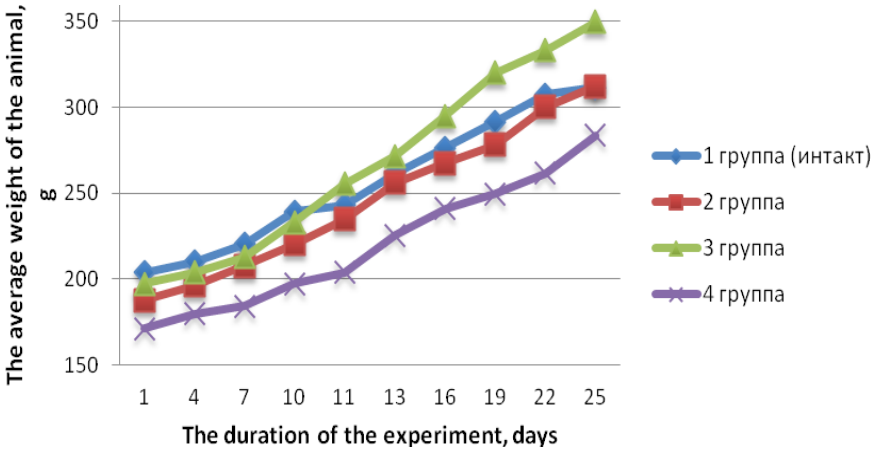


Figure 2 - *Dynamics of changes in the body weight of animals a t the stage of research of therapeutic properties of model meat systems*

An analysis of the dynamics of body mass change during the period of feeding animals with the model meat systems under study revealed a pronounced increase in the mass of all experimental groups of rats (Fig. 2). Rats gained weight on average 5-7 g per day. The fastest recovery of weight and appetite was observed in animals of the 4th group - almost immediately after the cancellation of antibiotics, which can be associated with the normalization of the digestive functions of the gastrointestinal tract, intensive processes of destruction and elimination of antibacterial drugs.

During the feeding of intact and sick animals, the results of studies of microflora of the mucous membrane of the small and blind intestines were obtained. In the small intestine, the final breakdown of nutrients took place. Food gruel was processed under the influence of pancreatic juice and bile, impregnating it in the duodenum, as well as under the influence of numerous enzymes produced by the small intestine glands. The absorption process took place on a very large surface, since the mucous membrane of the small intestine forms many folds. In addition, it is densely dotted with villi - a kind of finger-like protrusions. On epithelial cells of the mucous membrane there are microvilli. All this increases the suction surface of the small intestine hundreds of times. In the cecum, the gruel continued to undergo digestion. Here, with the help of enzymes produced by microbes, cellulose was split and water was absorbed, after which the food masses gradually turned into feces.

The protective functions of normal intestinal microflora are to a considerable extent affected by the introduction of antibacterial drugs into the gastrointestinal tract. In the case under study, against the background of antibiotics, the evolutionarily established ratio of species in the normal intestinal microflora of laboratory animals, quantitative ratios between the most important groups of autologous microorganisms of the organism microorganisms, which may have led to changes in the qualitative composition of the microbial representatives, are specifically violated. This opens the way for pathogenic and conditionally pathogenic representatives of automic microflora, which, when rooted or multiplied in the body, cause diseases, dysfunctions, etc. The correct, established in the process of evolution, the construction of normal microflora, its eubiotic state is restrained, within certain limits, by the conditionally pathogenic part of the automic microflora of the animal.

In the proximal small intestine microflora species are smaller than in the thick. These are lactobacilli, enterococci, sarcins, fungi, the number of bifidobacteria and Escherichia coli is increasing in the lower parts. Quantitatively, this microflora may differ in different individuals. The minimum degree of contamination is possible - from 10^1 to 10^3 / g of content, and a significant one - 10^3 - 10^4 / g.

The most important bacteriological characteristic of these biotypes is the complete absence of obligate anaerobic bacteria and numerous members of the Enterobacteriaceae family (enterobacteria).

Table 1 *- The content of microflora in the mucous membrane of the small intestine*

Intestinal microflora	**1 group**			**2 group**			**3 group**			**4 group**		
Day	11	18	25	11	18	25	11	18	25	11	18	25
Clostridium spp.	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
Yeast, not more than CFU / g	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
Mold, not more than CFU / g	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
E. coli not allowed in g	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
Enterobacteriaceae	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
B. cereus	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
Lactic acid bacteria (ICD)	$4x10^4$	$1x10^7$	$3x10^7$	$3x10^4$	$1x10^7$	$4x10^7$	$3x10^4$	$1x10^7$	$4x10^7$	$2x10^1$	2 types of ICD were found: 1st - $4x10^2$ 2nd - continuous growth	2 types of ICD were found: 1st - $7x10^2$ 2nd - continuous growth

Table 2 - *The content of microflora in the mucosa of the cecum*

Intestinal microflora	**1 group**			**2 group**			**3 group**			**4 group**		
Day	11	18	25	11	18	25	11	18	25	11	18	25
Clostridium spp.	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
Yeast, not more than CFU / g	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
Mold, not more than CFU / g	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
E. coli not allowed in g	n/f	n/f	n/f	n/f	**fnd**	**fnd**	n/f	**fnd**	**fnd**	n/f	**fnd**	**fnd**
Enterobacteriaceae	n/f	n/f	n/f	n/f	**$3x10^2$**	**$9x10^2$**	n/f	**$1x10^2$**	**$4x10^2$**	n/f	**$2x10^1$**	**$8x10^1$**
B. cereus	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f	n/f
Lactic acid bacteria (ICD)	$9x10^3$	$3x10^6$	$7x10^6$	$5x10^4$	$1x10^7$	$4x10^7$	$1x10^5$	$1x10^7$	$4x10^7$	$9x10^1$	2 types of ICD were found: 1st - $1x10^3$ 2nd - continuous growth	2 types of ICD were found: 1st - $5x10^3$ 2nd - continuous growth

In the investigated mucous membrane of the small intestine (Table 1) of all groups of animals, yeasts, molds, enterobacteria, E. coli, clostridia, B. cereus were completely absent. Marked changes in the quantitative and qualitative composition of lactic acid bacteria (ICD). So in the group of animals that ate food with a composition that had lactic acid bacteria in its composition, two types of ICD were found. The growth of lactic acid bacteria convincingly indicates the restoration of intestinal microbiocenosis, preventing the occurrence and reduction of side effects associated with the administration of antibiotics.

Studies of the microflora of the cecum (Table 2) showed that the use of a composition based on modification and without modification of the rumen by pancreatic enzymes in the diet of animals equally affects the restoration of the animal's natural microflora. However, it is necessary to take into account that the body, which is weakened by antibiotics, is easier to digest the modified composition. The number of lactic acid bacteria indicates a clear therapeutic effect and the restoration of the natural microflora of the blind intestine.

The growth of lactic acid bacteria in the small intestine and the caecum clearly indicates the restoration of intestinal microbiocenosis, preventing the occurrence and reduction of side effects associated with taking antibiotics.

The probiotic orientation of the modified compositions was established when feeding laboratory animals.

It has been established that when applying the developed compositions with the pancreas and lactic acid bacteria L. casei leads to a more pronounced increase in body weight of laboratory animals. So, on day 35, weight gain in animals of the 3rd group was 77.3%.

The growth of lactic acid bacteria in the small intestine and the caecum clearly indicates the restoration of intestinal microbiocenosis, preventing the occurrence and reduction of side effects associated with taking antibiotics.

References

1. Ugolev A.M. Membrane digestion. - L: Nauka, 1985. 358 p.

2. Crums L.M. The value of intestinal dysbiosis in the pathogenesis of chronic diarrhea in celiac disease and short small intestine syndrome // Experimental and Clinical Gastroenterology. - 2010. - No. 11. P.58-62

3. Zimmerman Ya.S. Eubiosis and dysbiosis of the gastrointestinal tract: myths and realities // Clinical medicine. - 2013. - №1. P.4-10

4. Pinegin B.V., Maltsev V.N., Korshunov V.M. Intestinal dysbiosis. – Moscow, 1984

5. Zlatkina A. R. Current approaches to the correction of intestinal dysbiosis // Russian Journal of Gastroenterology, Hepatology, Coloproctology. - 1999; 3: 64–67.

6. Antonenko O. M. The role of probiotics in the prevention and treatment of dysbiotic disorders after antibiotic therapy // Consilium Medicum. Enc: Gastroenterology 2009; 1: 51-55.

7. Baranovsky A. Yu., Kondrashina E. A. Dysbacteriosis and intestinal dysbiosis. - SPb., 2000. 209 p.

8. Nissle A. űber die Grundlagen einer neuen ursachlichen Bekampfung der pathologischen Darmfl ora. Dtsch. Med. Wschr. 1916; 42:1181—1184.

9. Korneva, T. K. Dysbacteriosis of the intestines in proctological patients: microbiological aspects // Russian Journal of Gastroenterology, Hepatology, Coloproctology. - 1999; 3: 55-60.

10. Bondarenko V.M., Matsulevich T.V. Intestinal dysbacteriosis as a clinical laboratory syndrome. The current state of the problem. - Moscow: GEOTAR-Media, 2007. - 302 p.

11. Shenderov B.A. Medical microbial ecology and functional nutrition / B.A. Shenderov.- Moscow, Publishing house GRANT .- 1998.- Vol.1.- 288p.

12. Zimmerman Ya. S., Subbotina L.V., Neschislyaev V.A. Microbial antagonism and the rationale for the inclusion of probiotics in complex treatment of Helicobacter pylori-dependent diseases. Wedge. honey. 2010; 4: 35-42 p.

13. Shifrin O.S., Androsova L.N. Antibiotic-associated diarrhea: new possibilities for treatment and prevention. Russian journals gastroenterol., hepatol. and coloproctol. 2003; 5: 82-86.

14. https://www.interfax.ru/russia/

15. Ermolenko E. I. The effect of probiotic enterococci on the functional characteristics of the intestines of rats with antibiotic-induced dysbiosis / E.I. Ermolenko, V.N. Donets, Yu.V. Dmitrieva Yu.Yu. Ilyasov, M.A. Suvorov, L.V. Gromova // Bulletin of the St. Petersburg University. - 2009.- Ser. 11.- Vol. 1 - 157-168 p.

妊娠期慢性全身性牙周炎患者口腔细胞因子状态的特征
FEATURES OF THE CYTOKINE STATUS OF THE ORAL CAVITY IN WOMEN WITH CHRONIC GENERALIZED PERIODONTITIS DURING PREGNANCY

Prohodnaja Victoria Alexandrovna
Doctor of Medicine, Professor of the Department of Dentistry №1, Rostov State Medical University, Rostov-on-Don, Russia
Modebadze Keti Ivanovna
Senior laboratory assistant professor of the Department of Dentistry №1,
Rostov State Medical University, Rostov-on-Don, Russia
Lapina Natalia Victorovna
Doctor of Medicine, Head of the Department of Orthopedic Dentistry, Kuban State Medical University, Krasnodar, Russia

注解。 在慢性全身性牙周炎(CGP)妊娠过程中的一篇文章中，研究了口腔液的特定细胞因子谱。 对于CGP中度的孕妇，与健康供者相比，其特征是在中度升高的抗炎细胞因子浓度下口服液中促炎性白细胞介素（IL）IL-1β，IL-6和肿瘤坏死因子-α的含量急剧增加 IL-4和γ-干扰素含量降低。 中度CGP孕妇的促炎细胞因子优先增加的口服液细胞因子谱的失衡在妊娠中期开始形成，并且发展到妊娠的三个月。

关键词：妊娠，慢性全身性牙周炎，口腔液，细胞因子，妊娠期

Annotation. *In an article in the course of pregnancy in chronic generalized periodontitis (CGP) moderate studied particular cytokine profile of oral fluid. For pregnant women with CGP moderate compared with healthy donors characterized by a sharp increase in the content of proinflammatory interleukins (IL) IL-1β, IL-6 and the tumor necrosis factor-α in oral liquid at moderately elevated concentration of anti-inflammatory cytokine IL-4 and decreased content of γ-interferon . The imbalance of the cytokine profile of the oral liquid with a priority increase of proinflammatory cytokines in pregnant women with moderate CGP begins to form in the 2nd trimester of pregnancy and progresses to the 3 trimester of gestation.*

Keywords: *pregnancy, chronic generalized periodontitis, oral fluid, cytokines, gestational period*

Introduction

The nonspecific mechanism for protecting the oral cavity from bacterial pathogens is represented by several components. These include mechanical factors (barrier function of mucous membranes), the microbiological component (the role of normal microflora), chemical (humoral) and cellular immunological factors of the oral fluid [1]. In case of inflammatory periodontal diseases (IPD), as a result of a decrease in the intensity of apoptosis, the number of phagocytes increases. Activated neutrophils secrete a number of cytokines, which, in turn, provide a prolongation of the cellular response to the pathogen. In chronic generalized periodontitis (CGP), an imbalance is formed between pro-and anti-inflammatory cytokines [2]. Pro-inflammatory cytokines occupy a central place in the pathogenesis of IPD. After the initiation of the inflammatory process in the periodontium, cytokines further support the activation of the cells responsible for their synthesis, triggering the resorption of the alveolar bone [2].

As a result of modern epidemiological studies, it has been shown that pregnant women with moderate and severe CGP increase the risk of fetal growth retardation syndrome, premature birth, low birth weight babies, preeclampsia, and increased maternal mortality [3,4]. Despite the fact that the epidemiological data are sufficient to conclude about the connection between inflammatory periodontal diseases and complications of pregnancy and childbirth, pathogenetic studies revealing the mechanism of communication between these conditions are rare [5]. This circumstance determines the relevance of research in this direction.

Purpose of the study. of the oral fluid.

Materials and research methods. Evaluation of the cytokine status of oral fluid was carried out by determining the content of interleukins (IL) 1β, 4, 6, tumor necrosis factor-α (TNF-α) and interferon-γ (IF-γ) in 42 pregnant women with moderate CGP (clinical group) in the dynamics of the gestational period: the first trimester - 8-12 weeks, the second trimester - 13-27 weeks, the third trimester of pregnancy - 28-40 weeks. For the study, an oral fluid collected on an empty stomach was used in the morning from 8 to 10 am, without stimulation into plastic tubes BD Vacutainer (“BD Bioscience”). The content of pro- and anti-inflammatory cytokines was determined using the enzyme immunoassay using appropriate test systems (Vector-Best, Russia). During the ELISA, an ST3 thermoshaker (Latvia) and an Elisa Washer Human tablet washer (USA) were used, the results were evaluated on a Multilabel Counter 1420 Victor photometer (Finland).

In the two control groups, 31 pregnant women with a physiological pregnancy and the absence of dental diseases and 32 healthy women of the volunteer group were combined. In pregnant patients with physiological pregnancy and the absence of dental diseases, oral fluid was collected in 3 trimester (28-40 weeks).

In the clinical group, the age ranged from 18 to 39 years, among healthy preg-

nant women from 18 to 34 years and in the group of healthy donors from 17 to 40 years. The mean age of pregnant women in the clinical group was 28,1±1,7 years, among healthy pregnant women –

25,8±1,9 years, and in the group of healthy donors – 26,3±2,0 years.

Statistical processing of the results will be carried out using the software package Statistica 7.0.

The results of the study and their discussion.

The content of pro- and anti-inflammatory cytokines in the oral fluid in the test groups is presented in table 1.

Table 1

The content of cytokines in the oral fluid in the groups surveyed (M ± m)

Indicator	Healthy the donors, n=32	Healthy pregnant women, n=31	Clinical group, n=42		
			8-12 weeks (1 trimester)	13-27 weeks (2 trimester)	28-40 weeks (3 trimester)
IL-1β, пг/мл	23,2±2,74	25,6±0,23	94,3±4,6*	156,7±5,7*°	233,1±3,1*°
IL-4, пг/мл	15,2±1,5	26,5±1,7*	27,4±1,2*	36,2±2,3*°	45,8±2,9*°
IL-6, пг/мл	0,89±0,06	3,05±0,08*	15,2±0,9*	17,8±0,8*	22,0±1,9*°
TNF-α , пг/мл	33,4±1,6	35,4±1,1	39,6±5,1	43,2±6,4	100,3±2,1*°
IF-γ, пг/мл	23,8±1,5	27,4±2,3*	18,7±1,1*	19,4±1,4*	22,9±1,3°

Note: * - significant differences compared with healthy donors with p <0,05, ° - significant differences compared with healthy pregnant women without dental diseases.

In pregnant women with a physiologically proceeding pregnancy compared with healthy donors outside this state, the content of proinflammatory mediators IL-1β and TNF-α in the oral fluid did not differ (p>0,05). During pregnancy, there was an increase in the concentration in saliva of the pro-inflammatory mediator IL-6 by 3,4 times (p<0,05) and the anti-inflammatory cytokines IL-4 by 74,3% (p<0,05) and γ-IF in 15,1% (p<0.05).

Pregnant women with moderate CGP, beginning from the 1st trimester, experienced a consistent sharp increase in the content of IL-1β and IL-6 in saliva.

By the 3rd trimester, the concentration of IL-1β in saliva in the clinical group was 10 times higher (p<0.001) compared with healthy donors, and 9,1 times higher (compared to healthy pregnant women) (p<0.001). A high level of IL-1β in saliva in pregnant women with moderate CGP indicated a generalization of inflammatory and destructive reactions in periodontal tissues. After attaching to specific receptors on the surface of local tissues, this proinflammatory mediator promotes the production of adhesive molecules by endothelial cells, which attract polymorphonuclear granulocytes and monocytes to the region of inflammation.

When combined with receptors located on fibroblasts, IL-1β induces the synthesis of collagenase, which delays the formation of collagen and bone, inhibits osteosynthesis [6]. In addition, IL-1β stimulates bone resorption. With the progression of CGP in saliva, the level of IL-1β increases tenfold [7].

In pregnant women with a physiologically proceeding pregnancy compared with healthy donors outside this state, the content of proinflammatory mediators IL-1β and TNF-α in the oral fluid did not differ (p>0,05). During pregnancy, there was an increase in the concentration in saliva of the pro-inflammatory mediator IL-6 by 3,4 times (p<0,05) and the anti-inflammatory cytokines IL-4 by 74,3% (p<0,05) and γ-IF in 15,1% (p<0.05).

Pregnant women with moderate CGP, beginning from the 1st trimester, experienced a consistent sharp increase in the content of IL-1β and IL-6 in saliva.

By the 3rd trimester, the concentration of IL-1β in saliva in the clinical group was 10 times higher (p<0.001) compared with healthy donors, and 9,1 times higher (compared to healthy pregnant women) (p<0.001). A high level of IL-1β in saliva in pregnant women with moderate CGP indicated a generalization of inflammatory and destructive reactions in periodontal tissues. After attaching to specific receptors on the surface of local tissues, this proinflammatory mediator promotes the production of adhesive molecules by endothelial cells, which attract polymorphonuclear granulocytes and monocytes to the region of inflammation. When combined with receptors located on fibroblasts, IL-1β induces the synthesis of collagenase, which delays the formation of collagen and bone, inhibits osteosynthesis [6]. In addition, IL-1β stimulates bone resorption. With the progression of CGP in saliva, the level of IL-1β increases tenfold [7].

In pregnant women in the clinical group in the 3rd trimester, the concentration of IL-6 in saliva was of the highest value and was increased 24,7 times (p<0,001) compared to healthy volunteers, and 7.2 times higher than in healthy pregnant women (p<0,001). IL-6 is responsible for the activation of B-lymphocyte differentiation, their transformation into plasma cells with the subsequent synthesis of immunoglobulins, fixation of complement and secretion of chemotoxic substances [8].

The concentration of TNF-α in the oral fluid in the clinical group compared to healthy volunteers, healthy pregnant women increased only by the 3rd trimester of pregnancy, respectively, 3 (p<0,001) and 2,8 (p<0,001) times. In relation to the first trimester of pregnancy, a statistically significant difference in patients of the clinical group was also formed by the third trimester of pregnancy (100,3±2,1 pg/ml versus 39,6±5,1 pg/ml, p<0,001). This circumstance was unfavorable because TNF-α activates osteoresorption processes by stimulating osteoclasts. A pronounced increase in TNF-α introduces an imbalance between the osteo-forming function of osteoblasts and the osteo-destructive function of osteoclasts in the direction of hyperactivation of the latter [9].

So, the increased content of pro-inflammatory mediators IL-1β, IL-6 and TNF-α in the oral fluid in pregnant women with moderate CGP contributes to the activation of periodontal-destroying inflammatory-destructive processes.

In patients of the clinical group, a significant increase in IL-4 was observed in the oral fluid compared with the first trimester of pregnancy, as well as with the control groups ($p<0,001$) only in the second and third trimesters. IL-4 can be considered as an anti-inflammatory mediator that stimulates B-lymphocytes and inhibits T-helpers of clone 1 [9]. Thus, in pregnant patients with periodontal pathology, the activity of local humoral anti-inflammatory protection due to the increased level of IL-4 increases to 2 and 3 trimesters of the gestational period.

The content in the saliva of γ-IF, as another anti-inflammatory mediator, in pregnant women with inflammatory periodontal diseases was reduced compared to control groups during the entire gestational period.

The revealed results testified to the low activity of the immune humoral protection in the oral cavity in pregnant women with moderate chronic hepatitis C, which contributed to the protracted nature of the existing clinical manifestations of periodontal inflammatory diseases.

Findings:

1. For pregnant women with moderate CGP compared with healthy donors and patients with physiologically proceeding pregnancy and lack of dental diseases, a sharp increase in the content of pro-inflammatory cytokines IL-1β, IL-6 and TNF-α in the oral liquids with a moderately high concentration of anti-inflammatory cytokine IL-4 and a decrease in the content of γ-IF.

2. An imbalance of the cytokine profile of the oral fluid with a priority increase in proinflammatory cytokines in pregnant women with moderate CGP begins to form in the 2nd trimester of pregnancy and progresses to the 3rd trimester of the gestational period.

References

1. Akopova V.A., Bykov I.M., Lapina N. V., Skorikova L.A., Bykova N.I. The impact of the local system state of nonspecific protection of the oral fluid on clinical parameters of periodontal. Kuban Scientific Medical Journal. 2015, Vol.150, № 1, pp. 12-16 (in Russian).

2. Tebloeva L.M., Guseva O.A., Hajdukov S.V. Subpopulation composition of peripheral blood lymphocytes and the cytokine profile in periodontitis. Medical Immunology. 2014, №3, pp. 257-264 (in Russian).

3. Davenport E.S., Williams C.E., Sterne J.A., Murad S. Maternal periodontal disease and preterm low birthweight: case-control study. J. Dent. Res. 2012 . Vol.81. N 5. P.31-38.

4. Lopez N.J., Smith P.C., Gutierrez J. Higher risk of preterm birth and low birth weight in women with periodontal disease. J. Dent. Res. 2012 . Vol.81. N 1. P.58-63.

5. Prohodnaja V.A. The cytokine profile of the oral fluid of pregnant women with inflammatory periodontal diseases. International Journal of Applied and Basic Research, 2015, № 3 (chast' 4), pp. 655-660 (in Russian).

6. Lepilin A.V., Dubrovskaja M.V. Immunological disorders in the formation of periodontal disease in pregnant women. Saratov Journal of Medical Scientific Research. 2010, T. 6, № 2, pp. 392-396 (in Russian).

7. Barer G., Grigorjan S., Postnova N. The role of interferon and other cytokines in the occurrence and development of periodontal disease. Cathedra, 2006, vol. 5, № 3, pp.54-60 (in Russian).

8. Carev V.N., Arutjunov S.D., Ippolitov E.V., Azizova A.S., Korobova E.A. Cytokine profile of blood and gingival fluid plasma residents of Dagestan in chronic periodontitis // Russian Dental Journal. 2012, № 6, pp.18-22 (in Russian).

9. Daurova F.Ju., L'janova D.K., Drozdova G.A, Tarasova T.V., Prytkov V.A., Kulichenko A.A. Effect of anti-inflammatory therapy on the cytokine profile of patients with periodontitis with diabetes. Russian Dental Journal. 2013, № 2, pp.11-13 (in Russian).

局限性前列腺癌患者早期复发过程中肿瘤细胞转录过程调控的特征
FEATURES OF THE REGULATION OF TRANSCRIPTIONAL PROCESSES IN TUMOR CELLS DURING EARLY RECURRENCE IN PATIENTS WITH LOCALIZED PROSTATE CANCER

Bova Philip Sergeevich
Candidate of Medical Sciences, doctoral candidate of the Institute

Kit Oleg Ivanovich
Doctor of Medical Sciences, Professor, Corresponding Member of the Russian Academy of Sciences, General Director of the Institute

Maksimov Aleksej Yur'evich
Doctor of Medical Sciences, Professor, Deputy Director General of the Institute for Advanced Scientific Research

Rostov Research Oncological Institute of the Ministry of Health of Russia. Rostov-on-Don, Russia

注解。 在116例局限性前列腺癌患者中，证实了癌细胞转录潜能的激活和疾病早期复发的机制之一是腺体组织中HIF–kB基因表达的增加。

关键词：前列腺癌，生化复发，基因表达，转录因子

Annotation. *In 116 patients with localized prostate cancer, it was proved that one of the mechanisms of activation of the transcriptional potential of cancer cells and early recurrence of the disease is an increase in the expression of the HIF1α and NF-kB genes in the gland tissue.*

Keywords: *prostate cancer, biochemical recurrence, gene expression, transcriptors*

Introduction

A tumor cell, by altering gene expression, is able to control key mechanisms for growth, reproduction and migration [1]. As a result of a decrease or increase in gene expression, the synthesis of the corresponding protein or non-coding RNA changes [2]. Recently it has been revealed that hypoxia-inducible factor-1alpha (HIF) (HIF-1 alpha, hypoxia-inducible factor 1 alpha) is involved in the activation of transcriptional mechanisms that affect the intensity of proliferation of cancer cells [3], including prostate cancer [4]. Moreover, the increase in HIF-1 alpha ex-

pression in tumor cells is not always associated with hypoxia, but may be due, in particular, to the accumulation of inflammatory mediators [5]. How much control of transcriptional mechanisms in prostate tumor tissue is associated with changes in the expression level of the corresponding transcriptor genes, and how this relationship affects the earlier recurrence of localized prostate cancer (PC), remains unclear.

Purpose. Assess the expression of genes responsible for hypoxia-dependent control of the transcription of tumor cells in patients with localized prostate cancer with biochemical relapses (BR) and without relapses after radical prostatectomy (RPE).

Material and research methods

Patients with prostate cancer after RPE in the serum initially and every 3 months after surgery determined the content of prostate-specific antigen (PSA) by ELISA on a Multiscan-P 2 photometer (Thermo Fisher Scientifi c Inc., Finland). The basis for the conclusion about BR was: exceeding the concentration of PSA in the blood of more than 0,2 ng/ml in three consecutive measurements, carried out with an interval of 2 weeks or more.

The main group included 56 patients with localized prostate cancer in whom BR was detected within two years after RPE. 60 patients with localized prostate cancer in whom relapse was not observed constituted the comparison group. 55 patients from whom surgical prostate biopsy specimens were taken within healthy tissues while removing benign prostatic hyperplasia were combined into a control group.

The age of patients with prostate cancer ranged from 57 to 74 years, averaging 66,7±2,1 years in the main group, and 62,4±2,5 years in the comparison group. In the control group, the average age was 63,1±2,4 years.

Microscopic examination of fixed images of tissue pieces of the prostate gland, taken during surgery, noted the histological type of the tumor, the degree of histopathological differentiation. In all patients of the main group and the comparison group, the histological type of prostate tumor was adenocarcinoma.

Tissue fragments were placed in a tube with 350 μl of the cell lysis buffer and the binding of total RNeasy Mini Kit RNA (Qiagen, Germany), including 1% beta-mercaptoethanol. Extraction, isolation and elution of total RNA was performed according to the instructions of the manufacturer. The concentration of the obtained RNA was measured using a Quant-iTTM RNA Assay Kit (Invitrogen, USA) using a QubitTM fluorometer (Invitrogen, USA).

To obtain complementary DNA (cDNA), 1 μg of RNA was subjected to reverse transcription using the RT-PCR method and Omniscript Reverse Transcriptase Kit reagent kit (Qiagen, Germany) and using 10 pM hexamer primers (TIB MOLBIOL, Germany). Before transcription, RNA was denatured for 5 min at 65°C,

followed by cooling on ice. Omniscript reverse transcriptase was inactivated by heating the reaction mixture for 5 minutes at 93°C. cDNA was stored at -20°C until RT-qPCR analysis. The cDNA was diluted 1:5 before use as a PCR template.

In real-time PCR, ABI Prism system (Applied Biosystems, USA) was used to analyze the expression of HIF1alpha and NFKB1 genes, including ready-made primers and TaqMan probes. TaqMan probes were labeled with a FAM 5'- (6-carboxyfluorescein) fluorescent dye with a TAMPA dye quencher (6-carboxytetramethylrodamine) on a thymidine base near the 3'-end. The reaction mixture contained: PCR buffer [200 mM Tris-HCl (pH 8,4), 500 mM KCl], 4,5 mM MgCl2, 1 mM dNTP, 0,5 U platinum Taq DNA polymerase (Invitrogen, Germany), 0,2 μM of each primer, 120 nM of TaqMan specific probe and 1 μM of 6-carboxy-X-rhodamine (Molecular Probes, the Netherlands). 2 μl of pre-diluted cDNA was used as a template for PCR in a final volume of 25 μl. The conditions of the cycle were as follows: primary denaturation of 94°C - 3 min; 45 cycles: 94ºC –20 s, annealing and elongation of the primer at a specific temperature for each gene for 30 s. Determination of the expression of each PCR-RV gene was performed three times.

HPRT1 (Hypoxanthine phosphoribosyl transferase 1) gene (NM_000194, GenBank) was used as a reference gene. For the HPRT1 gene, ready-made primers from the company Roche Applied Science (Germany) of the LightCycler-h-HPRT 181 1,97 system (Housekeeping Gene Set) were used.

For real-time PCR, a Bio-Rad CFX96 thermocycler (Bio-Rad, USA), specialized Bio-Rad software CFX Manager (ver. 2.1) was used. Quantitative assessment of gene expression was calculated by the $2^{-\Delta\Delta Ct}$ method [6]. The relative level (Expr) was defined as the ratio of the medians of the calculated parameters for each gene in the main group and the comparison group with prostate cancer to the same indicator in the control group, as well as between the main group and the comparison group (the multiplicity of increase or decrease in gene expression of one group relative to the second).

Samples of tumor tissue for immunohistochemical studies were prepared by the standard method. The immunoperoxidase method (EnVision/HRP, Dako Cytomation, Denmark) was used to detect the HIF-1alpha protein, and the number of positive cells was counted per 1000 cells to evaluate the expression of HIF-1alpha. The ranking of the number of positive tumor cells was as follows: 10–25% of positive cells — 1+; 26–50% - 2+; > 50% - 3+. In addition, a qualitative assessment of cell staining was performed - cytoplasmic, nuclear or mixed type of staining.

Statistical processing of the results was performed using the STATISTICA 10 program (StatSoft, USA).

Research results

The distribution of patients in the main group, depending on the clinical stage of prostate cancer, was as follows: cT1c –3/56 (5,3%), cT2a - 5/56 (8,9%), cT2b

- 21/56 (37,5%), cT2c - 27/56 (48,2%). A high degree of histopathological differentiation (≤6 points on the Gleason scale) was found in 6/56 (10,7%), moderate (7 points on the Gleason scale) in 45/56 (80,4%) and low (8-10 points on the Gleason scale) in 5/56 (8,9%) patients.

In the comparison group, the prostate cancer stages were as follows: cT1c - 3/60 (5%), cT2a - 3/60 (5%), cT2b - 21/60 (35%), cT2c - 33/55 (55%). A high degree of histopathological differentiation (≤6 points according to Gleason) occurred in 8/60 (7,1%), moderate (7 points according to Gleason) - in 48/60 (91,6%) and low (8-10 points according to Gleason) - in 4/60 (1,3%) patients.

Depending on the risk of relapse of prostate cancer, 116 patients of the main group and the comparison group after surgery were divided into four subgroups: very low (n=4), low (n= 10), intermediate (n=93) and high risk (n=9) according to the generally accepted classification of D'Amico et al. [7].

In the presence of early BR in patients of the main group, the number of cells with the expression of factor HIF-1alpha (p=0,0003), as well as the number of cells with nuclear cytoplasmic staining (p<0,0001), sharply increased. The conjugation between these two signs was statistically significant. Localization of HIF-1alpha expression in the cell is of fundamental importance. When conducting IHC studies, the HIF-1alpha protein under normal conditions is found at a very low level in the cytoplasm [8]. During hypoxia or when the factor is activated by other transcriptional molecules, HIF1alpha stabilizes and moves to the nucleus. When transported to the nucleus, HIF1alpha plays the role of a transcriptional factor [9].

The expression of HIF-1alpha expression in tumor tissue in patients with prostate cancer, depending on early recurrence, is presented in Table 1.

Table 1

The severity of the expression of HIF-1alpha in the tumor tissue in patients with prostate cancer depending on early recurrence

BR	n	Expression of HIF-1alpha				Type of staining	
		0	1+	2+	3+++	ctp	ncl-ctp
No	60 (100%)	2 (3,3%)	17 (28,3%)	38 (63,4%)	3 (5%)	28 (46,7%)	32 (53,3%)
Yes	56 (100%)	1 (1,8%)	9 (16,1%)	35 (62,5%)	11 (19,6%)	15 (26,8%)	41 (73,2%)
p (c	116	p=0,06 (c				p=0,043 (c	

Note: ctp-cytoplasm, ncl-ctp – nucleus-cytoplasm

Analysis of conjugation between early recurrence of the disease and expression of HIF-1 alpha in tumor tissue in patients with localized prostate cancer allowed us to establish only a tendency (p = 0.06) to increase the number of cells with a pronounced and decrease the number of cells with a weakly expressed

expression of factor HIF-1 alpha in the main group compared with the comparison group. However, in the compared groups, a statistically significant difference occurred regarding the number of tumor cells depending on the localization of HIF-1 alpha in the cell. In patients with early recurrence of prostate cancer, the number of cells with nuclear localization of the hypoxia-dependent factor (73,2%) increased ($p=0,04$) compared with the comparison group (53,3%).

As a result of the study, a pronounced (more than 1,5) and statistically significant increase in the expression of the HIF1alpha gene by 4,9 times ($p<0,001$) and the NFKB1 gene by 3,8 times ($p<0,001$) was found in the main group compared to the control group. In the comparison group relative to the control group, expression of the HIF1alpha and NFKB1 genes was higher to a lesser extent: 1,8 times ($p<0,05$) for HIF1 alpha and 1,9 times ($p<0,05$) for the gene NFKB1. A comparative analysis of gene expression in tumor tissue samples in the main group compared with the comparison group showed an increase ($p<0.05$) of the relative indicator for both the HIF1 alpha gene (2,7 times) and the NFKB1 gene (2 times).

The kappa-B nuclear factor is a key transcription factor controlling cell proliferation. The factor HIF-1 alpha, while reducing partial tension in tissues, can increase the transcriptional potential of nuclear factors kappa-B [10]. The NF-kB factor itself also activates HIF-1 alpha under normoxia conditions [5]. Unidirectional enhancement of the expression of HIF-1 and NF-kB factors in prostate cancer cells is due to the close and direct correlation of the expression levels of the corresponding genes (correlation coefficient 0,71, $p<0,001$). Consequently, transcriptional processes in the tumor tissue of the prostate gland are activated, including due to increased expression of the gene responsible for the synthesis of hypoxia-inducible transcription factor.

Findings

1. In patients with localized prostate cancer after RPE, the development of biochemical recurrence is associated with an initial increase in the expression of the HIF1 alpha and NFKB1 genes that control transcriptional processes in the tumor.

2. With early recurrence in patients with localized prostate cancer in tumor tissue, the number of cells with nuclear localization of HIF-1 alpha is higher compared with patients without biochemical recurrence.

References

1. Kit OI, Vodolazhsky D.I., Kutilin DS, Maleyko M.L., Dvadnenko K.V., Enin Y.S., Gudueva E.N., Ilchenko S.A. The relative copy numbers of apoptosis-regulating genes as an indicator of the malignancy of the tissues of the stomach // Successes of modern natural science. - 2015; 3: 40-5.

2. Zarrei M., MacDonald J.R., Merico D., Scherer S.W. A copy number variation map of the human genome // Nature Reviews Genetics. – 2015; 16: 172–83.

3. Iommarini L., Ghelli A., Gasparre G., Porcelli A.M. Mitochondrial metabolism and energy sensing in tumor progression // Biochim Biophys Acta. – 2017; 1858: 582–90.

4. Jung S.N., Yang W.K., Kim J., Kim H.S., Kim E.J., Yun H. et al. Reactive oxygen species stabilize hypoxia-inducible factor-1 alpha protein and stimulate transcriptional activity via AMP-activated protein kinase in DU145 human prostate cancer cells // Carcinogenesis. – 2008; 29: 713–21.

5. Dengler V.L., Galbraith M., Espinosa J.M. Transcriptional regulation by hypoxia inducible factors // Crit Rev Biochem Mol Biol. – 2014; 49: 1-15.

6. Livak K., Schmittgen T. Analysis of Relative gene expression data using real-time Quantitative PCR and the 2(-Delta Delta C(T)) // Method. Methods. – 2001; 25(4): 402−28.

7. D'Amico A.V., Whittington R., Malkowicz S.B., Schultz D., Schnall M., Tomaszewski J.E., Wein A. Combined modality staging of prostate carcinoma and its utility in predicting pathologic stage and postoperative prostate specific antigen failure. Urology. 1997 Mar; 49 (3A Suppl): 23-30.

8. Kietzmann T., Mennerich D., Dimova E.Y. Hypoxia-inducible factors (HIFs) and phosphorylation: impact on stability, localization, and transactivity // Front. Cell Dev. Biol. – 2016; 4: 11.

9. Dery M.A., Michaud M.D., Richard D.E. Hypoxia-inducible factor 1: regulation by hypoxic and non-hypoxic activators. // Int. J. Biochem. Cell. Biol. – 2005; 37: 535–40.

10. Benitez D.A., Hermoso M.A., Pozo-Guisado E. et al. Regulation of cell survival by resveratrol involves inhibition of NF-kB - regulation gene expression in prostate cancer cells // Prostate. – 2009; 69: 1045-54.

根据功能，生化和免疫学测试的结果评估牙种植的有效性的方法
WAYS TO EVALUATE THE EFFECTIVENESS OF DENTAL IMPLANTATION ACCORDING TO THE RESULTS OF FUNCTIONAL, BIOCHEMICAL AND IMMUNOLOGICAL TESTS

Maksyukov Stanislav Yuryevich
Doctor of Medical Sciences, Head of the Department of Dentistry №2,

Pilipenko Konstantin Dmitrievich
Postgraduate of the Department of Dentistry №2

Mironycheva Ksenia Valerievna
Postgraduate of the Department of Dentistry №2

Rostov State Medical University, Rostov-on-Don, Russia

注解。 在79名患有广泛牙齿内含物和末端缺损的患者中，确定与使用标准可折叠钛螺钉植入物相比，立即加载具有纳米结构钛的“纳米级4”纳米结构钛牙种植体的牙齿植入在骨整合质量方面具有优势。 来自合金VT-6：植入物的稳定性增加，在植入周围区域的炎症不太明显。

关键词：牙种植，骨整合，肿瘤坏死因子-α，C-反应蛋白，periotestometry，纳米结构钛。

Annotation. *In 79 patients with extensive dental inclusions and end defects it was determined that dental implantation with immediate loading of «Nano-Grade 4» nanostructured titanium dental implants with nanostructured titanium has advantages in quality of osseointegration in comparison with the use of standard collapsible titanium screw implants from the alloy VT-6: there was an increase in stability of implants, less pronounced inflammation in the peri-implantation zone.*

Key words: *dental implantation, osseointegration, tumor necrosis factor-alpha, C-reactive protein, periotestometry, nanostructured titanium.*

Introduction

The goal of dental implantology is the integration of artificial materials with the tissue environment and the long-term functioning of this complex as a whole [1,2]. Medical equipment titanium is used as the main material for the manufacture of dental implants, since oxide compounds on its surface contribute to the fixation and functioning of morphogenetic proteins and blood proteins involved in the construction and restructuring of bone tissue [3].

The material of the dental implant, its strength properties, processing and surface condition, the area of contact with the bone tissue, the temporal characteristics of the orthopedic dental treatment have a significant impact on the evolution of the "titanium surface - bone" interface. The use of nanotechnologies and nanomaterials is one of the promising ones in this direction [4]. The biophysical properties of nanostructured titanium led to the possibility of its use in the manufacture of single-stage non-separable implant immediate load [5]. Currently, the use of dental implants from nanostructured titanium is justified in individual publications on experimental animals [6]. There are practically no clinical dental studies, which led to the relevance of this study.

The aim of the work was to assess the stability of intraosseous implants and inflammatory markers of peri-implant and oral fluid in patients with extensive included and terminal defects of the dentition 6 and 12 months after one-stage dental implantation with monolithic and collapsible implants of different structured titanium alloys with subsequent non-removable treatment.

Materials and research methods

The study was conducted on 32 healthy donors without dental pathology (control group), 79 patients with extensive included and end dentition defects. The patients were divided into two groups: group 1 (n=34) - patients who underwent one-stage dental implantation with immediate loading with non-separable conical-shaped dental implants made of nano-structured titanium of the brand "Nano-Grade 4". Nanostructured titanium of the brand "Nano-Grade 4" has a grain size of 50-150 nm, while grains of the remaining titanium alloys, including titanium of the brand "Grade 4" have a size of about 1000 nm. According to materials research, nanostructured titanium of the Nano-Grade 4 brand has the greatest margin of safety compared with titanium alloys, which makes it possible to support a small diameter of 1,85 mm. The monoimplant had a self-tapping screw (d – 3,7; 4,0; 4,2; 4,5 mm; h - from 7,4 mm to 12,95 mm), a polished base (d 1,85 mm, and h - from 2,6 mm to 20 mm from screw to the lowest point of the abutment), abutment 7,5 mm in height, tapered at 12°, the surface of the abutment facing the mucous membrane of the alveolar process had a dome-shaped rounding. The abutment of the implant had six flat edges and six cuts on the lateral surface, which impeded the rotational movement (de-cementation) of the crown, there was no need for additional treatment (preparation of the stump) of the implant. In patients with group 2 (n=45), standard collapsible titanium screw implants from a conventional alloy BT-6 were used for single-stage dental implantation with immediate loading. All patients were prosthetic with fixed dentures with molded structures based on dental implants. Mono-implant of nanostructured titanium was fixed by cementing in a fixed denture in place of a missing tooth.

Criteria for inclusion of patients in the study: extensive included or terminal

defects of the dentition, age up to 75 years, informed consent to the use of biological fluids of the oral cavity for research. Exclusion criteria: decompensation of somatic diseases, diabetes mellitus, osteoporosis, long-term systematic administration of glucocorticoids.

All patients were under dynamic observation after the operation of the installation of dental implants. Antiseptic treatment of the surgical wound area and observation was carried out on 1, 3, 5, 7, 14, 30, 90 days after surgery. The main clinical methods for analyzing the results of dental implantation included collecting history, visual and instrumental assessment of the condition of the near-implant mucosa and the stability of the artificial dental support. The levels of C-reactive protein (C-RP) and tumor necrosis factor-α (TNF-α) were determined on days 1, 7, 14, 30 and 90 in the oral and peri-implantation fluid.

The C-RP study was performed using the latex diagnosticum "CRP - latex test". TNF-α was determined by the ELISA using the ProCon diagnostic kit (Protein Contour LLC, Russia).

Oral fluid was collected by spitting into a sterile glass tube for 5 minutes without pre-stimulation. The volume of oral fluid was about 20 ml. The contents of the tubes were centrifuged for 15 minutes at 8000 rpm and the supernatant was separated (the supernatant), in which cytokines were then determined. Peri-implantation fluid (RV) was collected by inserting 5 minutes into the gap on the mesial side of the abutment of standardized paper strips (Periopaper TM, Proflow, Amityville, USA). The number of pancreas was determined by the area of the impregnated portion of the strip (in mm2). Eluates were obtained by placing the strips with the pancreas in Zindorf containing 0,5 ml of 0,9% NaCl solution with periodic shaking for 4 hours.

Evaluation of the stability of intraosseous implants was performed using the periotestometry method and the Periotest instrument from Siemens (Germany).

Statistical analysis was performed using the program STATISTICA 10.0 (StatSoft Inc., USA).

Results

According to the results of periotest, conducted in the first 3 months after implantation, it was found that the stability of dental implants in group 1 was higher compared to group 2, as evidenced by lower Periotest indices. Consequently, the method of periotestmetry proved better osseointegration of the dental implant.

Table 1

Dynamics of the "Periotest" test indicators in clinical groups after dental implantation

Group	Days after surgery				
	1	7	14	30	90
1 (n=34)	-4,3±0,3	-5,6±0,4	-6,5±0,3	-6,9±0,4	-7,0±0,5
2 (n=45)	-3,5±0,2	-5,5±0,5	-5,6±0,4	-5,8±0,2	-5,9±0,3
p	p_{1-2}<0,05	p_{1-2}>0,05	p_{1-2}<0,05	p_{1-2}<0,05	p_{1-2}<0,05

The rough surface of the abutment in implants allows microbial pathogens to penetrate the peri-implantation tissue over the rough surface, resulting in inflammation and impaired integration of the implant with the bone. In addition, the traumatic effect on jaw tissue in patients of group 2 due to the large size of the abutment and their lesser variability, taking into account the local status, was more pronounced. The intensity of inflammation in the fluids of the peri-implantation zone and in the oral fluid in the early postoperative period was studied using acute-phase inflammation proteins.

Initially, in the oral fluid the level of C-RP in group 1 was 6,3±0,4 mg/l, in group 2 6,5± 0,5 mg/l. The concentration of TNF-α in the oral fluid in group 1 was 36,7±2,2 pg/ml, in group 2 35,1±3,1 pg/ml. The dynamics of markers of inflammation in the biological fluids of the oral cavity in the early postoperative period in patients of clinical groups are presented in table 2.

At 1, 7, and 14 days after surgery, the level of C-RP and TNF-α in the oral and peri-implantation fluid increased in two clinical groups, followed by a decrease in the concentration of the studied inflammatory markers 30 and 90 days after surgery. However, in group 1, the content of acute-phase inflammation proteins C-RP and TNF-α in the biological environments of the oral cavity increased with a less pronounced gradient (p<0,05) compared with group 2. Thus, the level of C-RP in the oral fluid compared with the initial value in group 1 in 1, 7 and 14 days after surgery increased by 3,4 (p<0,05), 9,4 (p<0,05) and 2,8 (p<0,05) times, and in group 2 – 5,1 (p<0,05), 14,2 (p<0,05) and 4,6 (p<0,05) times, respectively. The level of TNF-α in the oral fluid compared with the initial value in group 1 in 1, 7 and 14 days after surgery increased by 1,9 (p<0,05), 2,1 (p<0,05) and 1,8 (p<0,05) times, and in group 2 – 2,9 (p<0,05), 4,5 (p<0,05) and 4,7 (p<0,05) times, respectively. In the peri-implant fluid, the concentration of inflammatory markers was higher compared to oral fluid.

Table 2

Dynamics of acute phase inflammation proteins in the early postoperative period in patients of clinical groups

Показатель	Group	Days after surgery				
		1	7	14	30	90
Oral fluid						
C-RP, mg/l	1 (n=34)	21,4±1,2	59,4±2,3	17,5±0,9	6,2±0,4	5,8±0,6
	2 (n=45)	33,2±1,6	92,4±2,0	30,1±1,5	8,7±0,7	7,5±0,4
	Control (n=32)	4,7±0,5				
p		$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2<0,01}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2<0,001}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2<0,001}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2>0,05}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2<0,05}$
TNF-a	1 (n=34)	71,2±2,6	75,3±2,5	67,2±2,5	55,4±1,7	46,1±1,1
	2 (n=45)	100,4±3,2	158,9±3,7	164,3±3,1	135,7±2,6	86,2±2,3
	Control (n=32)	33,4±2,6				
p		$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2\leq0,001}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2\leq0,001}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2\leq0,001}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2\leq0,001}$	$p_{1-к<0,001}$ $p_{2-к<0,001}$ $p_{1-2\leq0,001}$
Peri-implantation fluid						
C-RP, mg/l	1 (n=34)	32,5±1,9	78,2±3,1	34,5±1,3	15,7±0,8	11,2±0,6
	2 (n=45)	55,4±2,4	113,5±1,8	56,3±2,5	44,9±2,0	30,7±1,5
p		$p_{1-2<0,001}$	$p_{1-2<0,001}$	$p_{1-2<0,001}$	$p_{1-2<0,001}$	$p_{1-2<0,001}$
TNF-a	1 (n=34)	92,3±2,3	90,5±1,8	76,8±2,1	69,3±2,3	53,4±1,4
	2 (n=45)	127,5±2,7	174,5±2,6	175,2±3,6	154,3±2,5	91,2±1,9
p		$p_{1-2<0,001}$	$p_{1-2<0,001}$	$p_{1-2<0,001}$	$p_{1-2<0,001}$	$p_{1-2<0,001}$

Note: the significance of differences between groups was evaluated using the Mann-Whitney test.

Findings

1. The use of one-stage dental implantation with immediate loading with non-separable dental implants of conical shape made of nanostructured titanium of the brand “Nano-Grade 4” was accompanied by an increase in their stability, stability, less pronounced inflammation in the peri-implant zone.

2. More pronounced inflammation in the early postoperative period in patients with single-stage dental implantation with immediate load using standard collapsible titanium screw implants of alloy BT-6 was accompanied by a decrease in the stability of the implants according to the results of periotestometry.

References

1. Bulycheva E.A., Trezubov V.N., Alpatyeva Yu.V., Azarin G.S., Lobko Yu.V. Creating the optimal position of the occlusal surface of extended implant prostheses // Institute of Dentistry. - 2016. - №2. - p.54-56.

2. Ushakov A.I., Serova N.S., Yuryev E.M. Planning and selection of osteoplastic materials for dental implantation with bone deficiency. // Clinical dentistry. -2016. -№ 2. - p.50-54.

3. Mate-Sanchezde de Val J.E., Calvo-Guirado J.L. The use of polymer abutments for fixing permanent restorations. Clinical and experimental study of new hybrid abutments on the basis of PEEK, reinforced with ceramics, with a titanium platform // New in dentistry. - 2016. - №6. - p.60-69.

4. Pavlova T.V., Nesterov A.V., Pavlova L.A. Bone tissue regeneration in the application of nanoimplants // Archives of Pathology. - 2013. - №6. - p.22-26.

5. Solntsev Yu.P., Pryakhin E.I. Nanotechnology and special materials: a textbook for universities. SPb.: KHIMIZDAT, 2007. -176 p.

6. Khasanova L.R. The prospect of using implants from nanotitan in dentistry // Medical Bulletin of Bashkortostan (Ufa). -2010. - Vol.5, №1. – p.62-64.

雅库特尼古丁成瘾连接基因DAT的分子遗传学分析
MOLECULAR-GENETIC ANALYSIS OF THE CONNECTION GENE DAT WITH NICOTINE ADDICTION IN YAKUTIA

Diakonova Aleksandra Timofeevna
Junior researcher of the laboratory of heritable pathology;
Federal State Budgetary Scientific Institution
"Yakut Science Center of Complex Medical Problems"
Pavlova Nadezhda Ivanovna,
Candidate of Biological Sciences,
temporary acting chief scientific officer - head of the laboratory of heritable pathology;
Federal State Budgetary Scientific Institution
"Yakut Science Center of Complex Medical Problems"
Kurtanov Khariton Alekseevich,
Candidate of Medical Sciences,
Chief Scientific Officer - Head of the Department of Molecular Genetics,
Federal State Budgetary Scientific Institution
"Yakut Science Center of Complex Medical Problems"

抽象。 该研究的目的是确定DAT（SLC6A3）基因（rs27072）在生活在萨哈共和国（雅库特）境内的成年人群中与吸烟有关的作用。 为此，100人进行了原型分型。评估rs27072多态性与吸烟相关性的结果表明，患有尼古丁成瘾的人群中吸烟风险等位基因（G）的频率比非吸烟人群高13.01%。 因此，作为这项研究的结果，我们发现DAT（SLC6A3）基因的这种多态性并未揭示该患者样本中与尼古丁成瘾的关联。 然而，DAT（SLC6A3）基因仍然是作为易于依赖吸烟的基因的重要候选者。

关键词：吸烟，尼古丁成瘾，DAT（SLC6A3）基因

Abstract. *The purpose of the study was to determine the role of the DAT (SLC6A3) gene (rs27072) in relation to smoking in the adult population living in the territory of the Republic of Sakha (Yakutia). For this, 100 people were progenotyped. The results of the evaluation of the association of the rs27072 polymorphism with smoking showed that the frequency of the smoking risk allele (G) in the group of people suffering from nicotine addiction is 13.01% higher than in the non-smoking population. Thus, as a result of this study, we found that this poly-*

morphism of the DAT (SLC6A3) gene did not reveal a connection with nicotine addiction in this sample of patients. However, the DAT (SLC6A3) gene is still an important candidate as a gene for susceptibility to dependence on smoking.

Key words: *smoking, nicotine addiction, DAT (SLC6A3) gene*

Introduction

Cigarette smoking remains widespread. Smoking harms almost all systems of the human body and is a habit that is not easy to get rid of. Tobacco smoking causes physiological and psychological dependence and, moreover, is associated with social and cultural factors. Despite widely recognized risks, about a third of the world's adult population continues to smoke tobacco [1].

According to the World Health Organization (WHO), tobacco products lead to six million deaths among people who use tobacco, and more than 600,000 people among smokers who are exposed to second-hand tobacco smoke. WHO estimates that tobacco contains more than 7,000 chemical compounds, 60 of which are known or suspected carcinogens, i.e. cause changes in cellular organisms that prove by cytotoxic means. Eleven substances in tobacco smoke (2-naphthylamine, 4-aminobiphenyl, benzene, vinyl chloride, ethylene oxide, arsenic, beryllium, nickel compounds, chromium, cadmium and polonium-210), the International Agency for the Study of Effects on the First Group of Carcinogenic Substances (with proven carcinogenic effects) [2].

The existence of a central pathophysiological mechanism of development and dependence on psychoactive substances under genetic control is assumed. This mechanism does not depend on the amount of psychoactive substances and the profound neurochemical changes on which nicotine dependence depends. Which determines the biological base of its own predisposition. However, the findings from previous studies explain that cigarette smoking is a very complex process, influenced by various factors such as age, gender, environment [1]

The dopamine transporter gene (DAT , SLC6A3), located on the short arm of chromosome 5 (5p15.3), is involved in the control of dopaminergic transmission. The rs27072 polymorphism of the DAT (SLC6A3) gene is associated with more severe symptoms of alcohol withdrawal syndrome, such as convulsions. Many authors report that the dopamine transporter gene is associated with hyperactivity and attention deficit syndrome (ADHD). A link was also found between the dopamine transporter gene and the onset age for tobacco and alcohol use. Several studies by Jorm et al. (2000), Perkins et al. (2008), Laucht et al. (2008), Sieminska et al. (2009) mainly in the Caucasian population, suggested that the allele of this polymorphism increases the risk of smoking, whereas studies in the Japanese population Yoshida et al. (2001) showed a link between this genotype and smoking. Earlier Ohmoto et al. (2013) also examined the effects of polymorphisms on ethnicity. In studies of Barr et al. (1993) associations between variant

alleles ANKK1 / DRD2 and DAT (SLC6A3) and smoking It has been suggested that the presence of the ANKK1 / DRD2 Taq I allele together with allele A DAT (SLC6A3) increases cravings for cigarettes, which are induced by stress and reward smoking and causing addiction. In addition, several studies have suggested that, compared with non-carriers, carriers of the SLC6A3 A allele have a lower risk with early onset of smoking. [6]

Lerman et al. (2003) insisted that SLC6A3 has an effect on smoking cessation. Vandenbergh et al. (2002) with co-authors investigated the relationship between the DAT (SLC6A3) gene and smoking. In a sample of adult volunteers who did not smoke, current smokers and those who quit smoking. Also found that it is necessary to separate a group of an excellent group of people who have never smoked. [3, 4, 8]

The purpose of this work was to study the association of the SLC6A3 rs27072 locus to identify the association with nicotine addiction.

Materials and methods.

The experimental part of the work on genotyping the rs27072 polymorphism of the DAT (SLC6A3) gene was carried out in the laboratory of hereditary pathology of the Department of Molecular Genetics of the Yakutsk Scientific Center for Complex Medical Problems. For the study, DNA samples from the collection of the bio logical material of the YPC KMP were used using the "Genome of Yakutia" University of Ukraine (reg. # USU_507512). The study involved residents of the Republic of Sakha (Yakutia). The study was conducted with the written consent of the participants. DNA samples of 97 people, 45 men and 52 women, were studied.

Genomic DNA was extracted from the peripheral blood of each participant using an Excell biotech (Russia) DNA extraction kit in accordance with the manufacturer's instructions. The DNA concentration in each sample was determined on a spectrophotometer for measurement in micro volumes of Implen Nano Photometer (Germany). Single nucleotide polymorphisms (SNPs) were determined using polymerase chain reaction (PCR). Amplification of the gene region containing the polymorphic variant was carried out with standard primer pairs produced by LLC Biotech-Industry, Moscow.

Detection of PCR products was performed using horizontal electrophoresis in a 2% agarose gel plate with the addition of ethidium bromide — a specific intercalating fluorescent DNA (RNA) dye — using standard Tris-acetate buffer at a field strength of ~ 20 V / cm for 30 minutes.

After PCR, amplification was subjected to restriction using the MspI endonuclease (SibEnzyme LLC, Novosibirsk) for 3 hours at 37 ° C. RFLP products were detected by horizontal electrophoresis in a 4% agarose gel plate with the addition of ethidium bromide using standard Tris-acetate buffer at a field strength of ~ 20 V / cm for 45 minutes (Figure 1)

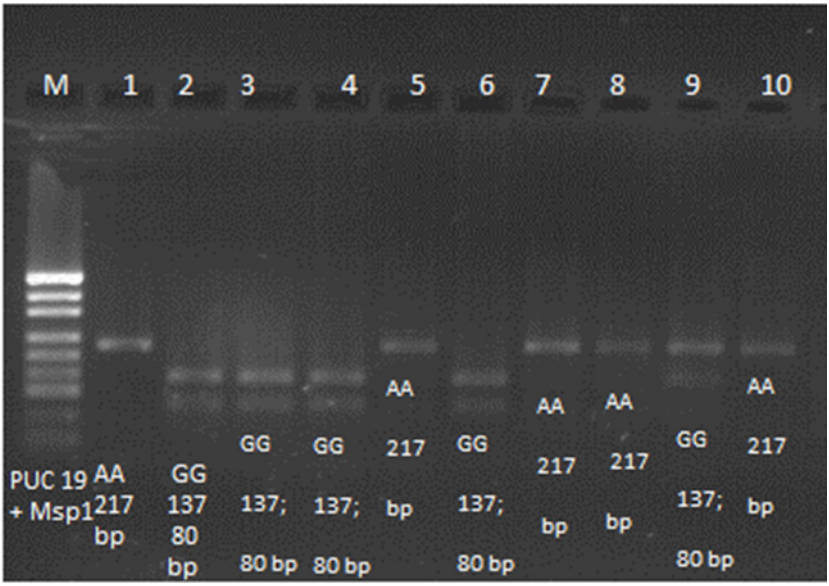


Figure 1. *Electrophoregram of the amplification product of the DAT (SLC6A3) gene region in 4% agarose gel.*

Note. Tracks number 1, 5, 7, 8, 10, - genotype AA; No. 2, 3, 4, 6 and 9 - GG genotype; M - marker PUC19 / + Msp I. Bp - base pairs.

Interpretation of the results of genotyping was performed on the basis of various band templates: GG genotype 137, 80 bp, AG genotype 217, 137 and 80 bp, AA genotype 217 bp

Statistical analysis of the results of the study was conducted using the program: "Office Microsoft Excel 2010". Correspondence of genotype distributions to expected values at Hardy-Weinberg equilibrium and comparison of frequencies of allelic variants / genotypes was performed using Pearson criterion X (x-square) for contingency tables 2x2, calculating odds ratio (OR), 95% confidence interval (95% CI) . Differences were considered significant at $P < 0.05$

Results and discussion.

As a result of the genotyping of the rs27072 polymorphism of the DAT (SLC6A3) gene, it was established that the frequency of occurrence of the GG genotype prevails among all the examined individuals and amounts to 69.1%. The frequency of the G allele was 80.9% (Table 2).

The results of the evaluation of the association of the rs27072 polymorphism of the DAT (SLC6A3) gene showed that the frequency of occurrence of the A al-

lele associated with smoking in a sample of smokers and non-smokers does not have a significant difference. However, in the sample of smokers, the number of carriers of the homozygous AA genotype exceeded the number with that in the non-smoking sample twice. Analysis of the data between the samples of men and women showed the same results between these two groups.

An analysis of the association of the DAT (SLC6A3) rs27072 polymorphism of association with nicotine addiction indicated that there were no statistically significant differences between carriers of different genotypes not only in the examined group as a whole, but also separately in men and women (Table 1).

№	Compared groups	The frequency of occurrence of genotypes, abs. (%)			Allele frequency, %		OR (95% CI), P	p
		AA	AG	GG	A	G	Risk allele A	
1	Smokers	5 (10,2)	7 (14,28)	37 (75,51)	17 (17,34)	81 (82,65)	1,247 (0.389 -1.636)	0.537
2	Non smoking	2 (4,16)	16 (33,33)	30 (62,5)	20 (20,83)	76 (79,16)		
3	Smokers women	1 (4,4)	2 (8,7)	20 (86,9)	4 (8,7)	42 (91,3)	0,991 (0.100 -1.091)	0.061
4	Non smoking women	1 (3,5)	11 (37,9)	17 (58,6)	13 (22,4)	45 (77,6)		
5	Smokers men	4 (13,8)	5 (17,3)	20 (68,9)	13 (22,42)	45 (77,58)	9,125 (0.916- 10.041_	0.061
6	Non smoking men	1 (4,34)	2 (8,69)	20 (86,95)	4 (8,7)	42 (91,3)		

Findings. Conclusion

The results of the study of polymorphism in the population of smokers among residents of the Republic of Sakha (Yakutia) found that the frequency of occurrence of the G allele prevails among all the examined individuals.

Thus, as a result of this study, we found that this polymorphism of the DAT (SLC6A3) gene did not reveal a connection with nicotine addiction in this sample of patients. However, the DAT (SLC6A3) gene is still an important candidate as a gene for susceptibility to dependence on smoking.

To further investigate the predisposition to nicotine addiction, we need to increase the sample of the population of smokers and non-smokers.

Thanks.

The study was conducted in the framework of research on the study of the genetic structure and burden of hereditary pathology of populations of the Republic of Sakha (Yakutia).

References

1. Aleksandrov A. A., Aleksandrova V. Yu. Smoking prevention: the role and place of the psychologist // Psychology questions. - 1999. - no. 4. - p. 35-42.

2. Tobacco WHO. Newsletter number 339. 2013 Tabak VOZ. Informatsionnyi byulleten 'N 339. 2013 g. (Rus)

3. Jorm A, Henderson A, Jacomb P, Christensen H, Korten A, Rodgers B et al. Associated with a polymorphism of the dopamine transporter gene. Am J Med Genet2000; 96: 331–334.

4. Lerman C, Swan G. Non-replication of genetic association studies: is it all folks? Nicotine Tobacco Res 2002; 4: 247–249.

5. Michelaugh S, Fiskerstrand C, Lovejoy E, Bannon M, Quinn J. The dopamine transporter gene (SLC6A3) variable number of tandem repeaters. J Neurochem 2001; 79: 1033-1038.

6. Ohmoto M. et al. Genetic influence of the dopamine receptor, the dopamine transporter, the Japanese population // BMC genetics. - 2014. - T. 15. - №. 1. - p. 151.

7. Sander T, Harms H, Podschus J, Finckh U, Nickel B, Rolfs A et al.Allelic association of a dopamine transporter. Biol Psychiatry 1997; 41: 299–304. doi: 10.1111 / j.1530-0277.2011.01509.x

8. Vandenbergh D, Bennet C, Grant M, Strasser A, O'Connor R, Stauffer R et al. Tantalizing repeater (VNTR) polymorphism: can be different. Nicotine Tobacco Res 2002; 4: 333–340.

在多形象医院的条件下实施国家计划的一些结果

SOME RESULTS OF THE IMPLEMENTATION OF THE STATE PROGRAM IN THE CONDITIONS OF MULTI-PROFILE HOSPITAL

Lee Marina Vladimirovna
graduate student
of the Department of Public Health and Preventive Medicine
School of Biomedicine, Far Eastern Federal University
Kiku Pavel Fedorovich
MD, Professor
Director of the Department of Public Health and Preventive Medicine;
School of Biomedicine, Far Eastern Federal University
Beniova Svetlana Nikolaevna
Doctor of Medical Sciences
Professor of the Department of Public Health and Preventive Medicine;
School of Biomedicine, Far Eastern Federal University

注解。 以多学科医疗组织GBUZ区域临床医院2号为例，评估了“2013 – 2020年滨海边疆区医疗保健发展”国家计划的一些指标的实现程度。 该研究审查了旨在加强物质和技术基础的措施的实施情况，提高了公众对提供服务条件的满意程度; 介绍现代医疗信息系统。

关键词：健康发展，国家计划，人口满意度。

Annotation. *The assessment of the degree of achievement of some indicators of the state program "Development of Healthcare of the Primorsky Territory for 2013-2020" by the example of a multidisciplinary medical organization GBUZ Regional Clinical Hospital No. 2 is presented. The study reviewed the implementation of measures aimed at strengthening the material and technical base, increasing the level of public satisfaction with the conditions of service provision; introduction of modern medical information systems.*

Key words: *health development, state program, population satisfaction.*

In accordance with the Strategy for Health Development until 2020, preserving and strengthening the health of the population is one of the key and topical issues in improving the social policy of the Primorsky Krai.

Its main goal is to increase the life expectancy of the population of Primorsky

Krai, to strengthen their health and reduce mortality from the most significant diseases by ensuring the availability of quality medical care to every inhabitant of the region, increasing the efficiency of medical services, the volumes, types and quality of which should correspond, on the one hand, to morbidity and the needs of the population, on the other - the modern achievements of medical science.

In 2012, the State Program of Primorsky Krai “Development of Primorsky Krai Healthcare for 2013-2020” was approved in this area (Resolution of the AIC No. 1237-pa dated December 7, 2012) (hereinafter referred to as the Program). The program covers the most pressing health problems of Primorsky Krai. The Program identifies organizational measures, the implementation of which will allow the achievement of a number of target indicators, which in turn will affect the improvement of the health status of the population of Primorsky Krai on the basis of improving the quality and accessibility of medical care [1,2]. Since 2013 and to date, all state medical organizations of the Primorsky Territory (hereinafter referred to as the MoD PC) are participating in the implementation of the activities of this Program.

The State Budgetary Healthcare Institution "Regional Clinical Hospital No. 2" (hereinafter referred to as GBUZ KKB No. 2) is one of the largest multidisciplinary medical institutions of the Primorsky Territory, providing the region's population as specialized, including high-tech medical care, and all types of ambulatory care. It includes a non-stop hospital with 585 beds and a clinic with an attached population of more than 50,000 people.

The study of the degree of achievement of the indicators and the implementation of the Program’s activities on the example of this medical organization can be of practical value both for optimizing the activity of the State Budgetary Health Institution KKB No. 2 and for applying this experience to study the performance of other health institutions of the Primorsky Krai and the health system of the region as a whole [4, five].

In this article we will look at the implementation of some program activities and the achievement of target indicators within the framework of 2 subprogrammes of the Program for the period 2014-2017:

1. Subprogram 1. Formation of an effective system of organization of medical care ..

2. Subprogram 2. Improvement of medical care, promotion of public health and the formation of a healthy lifestyle.

As part of the implementation of Subprogramme 1, the implementation in GBUZ KKB No. 2 of the program activity "Ensuring the activities, development and strengthening of the material and technical base of health care institutions" was considered. In order to ensure optimal conditions for the implementation of the diagnostic and treatment process, compliance with the sanitary and anti-epi-

demic regime in the period from 2014-2017, a number of architectural, planning and design solutions were carried out with a complete repair of all the components of the premises of a number of structural units of GBUZ KKB No. 2. In 2014-2017, large-scale repair work was carried out: overhaul of 13 structural units, 18 new chambers were opened; repair of premises with a total area of more than 7,000 square meters; completed landscaping. Over the past three years, more than 26 large units of diagnostic medical equipment have been acquired; more than 300 units of equipment for air disinfection and sterilization of medical products; more than 100 units of specialized equipment.The large-scale renovation of the medical equipment park, the improvement of the working conditions of medical personnel had a positive impact on the quality of medical care, which made it possible to achieve 100% fulfillment of the target indicator "the number of patients treated in accordance with the standards of medical care".

Increasing patient comfort in hospital departments, opening new wards for optimal hospital placement, improving the conditions in the outpatient unit, new modern repair of diagnostic and auxiliary departments, and assistance both in the clinic and in the hospital, significantly improved the target indicator "population satisfaction level medical care. "

Independent assessment of the conditions of service in medical organizations is one of the program activities under Subprogramme 1.

This assessment is one of the forms of public control and is carried out in order to provide citizens with information about the quality of the conditions for the provision of services by medical organizations, as well as to improve the quality of their activities [3]. We analyzed the results of an anonymous questioning of patients in inpatient treatment, outpatient admission at the clinic, as well as the results of the Independent assessment of the quality of the conditions of service provision in the health facility KKB No. 2 posted on the website of the Ministry of Health of the Russian Federation for 2014-2017. grow since 2014 and remained at a high level. According to the results of an independent survey, in 2017, 97.3% of respondents were satisfied with the quality of the conditions for providing medical care to GBUZ KKB No. 2. Thus, over the past three years, the level of patient satisfaction with the provision of medical care in GBUZ KKB No. 2 has remained at a high level.

Another event we have reviewed is the implementation of modern information systems in healthcare institutions in the Primorsky Territory under the Subprogramme 2.

In order to fulfill this event, the following have been done:

1. The Russian project "Lean Polyclinic" has been implemented. An electronic medical record based on the medical information system MIS "DOKA +" has been introduced. A remote appointment service is connected to the doctor. The

call center is organized. The information terminal “Preliminary appointment to the doctor” is installed. The full record is made on the Internet through the website of the institution and the electronic registry. The format of the work of the registry has changed - it has become open, the work of the Call Center and the InfoMate can significantly reduce the time spent on the appointment and the waiting time.

2. The Central Archive of Medical Images of Primorsky Territory information system with the Teleradiology module is connected and actively used. Telemedicine consultations are conducted. A 16-slice CT scanner is connected to the system.

3. In the hospital, the issuance of coupons for receiving the FMP was organized in the Subprogram of Monitoring of the GMP of the Ministry of Health, which significantly simplified the procedure for issuing the ICP as part of the basic program of the CCGT.

The implementation of the event "The introduction of modern information systems" has allowed to increase the time the doctor works directly with patients 2 times; reduce the time to make an appointment with a doctor; shorten the queue, the patient's waiting time for the doctor’s appointment at the office. Impact of the event “Introduction of Modern Information Systems” on the target indicators “Mortality reduction”; “Mortality of the population from diseases of the circulatory system” requires a more thorough study after the completion of the Program in 2020.

CONCLUSION. During the three years of the implementation of the state program, large-scale and costly measures were carried out successfully, which at this stage allowed to achieve some target indicators:

• Improving the comfort of staying in hospitals and clinics, reducing waiting times at clinics and hospitals, optimizing the work of the registry, providing a wide range of medical services ensure a consistently high level of public satisfaction with medical care.

• thanks to the acquisition of new modern equipment, improved conditions for performing medical procedures, the number of patients treated with the standards reaches 100%.

• The introduction of new information technologies has improved the availability and quality of medical care by optimizing processes and eliminating losses.

References

1. The state program of the Primorsky Territory "Development of Healthcare of the Primorsky Territory" for 2013–2020. Access mode: https://docviewer.yandex.ru/view/ (request date 04.02.2019).

2. The state program of the Russian Federation "Healthcare Development". - Access mode: http://rosminzdrav.ru/ministry (request date 04.02.2019).

3. Voyt L.N., Demidenko N.L. Study of public opinion on the quality of outpatient polyclinic and emergency medical care (for example, Blagoveshchensk city) // Far Eastern Medical Journal. - 2013. - №3. - p. 122-125

4. Kazakova E.V. Indicators of the activity of the health care system in the subjects of the Russian Federation on the territory of the FEFD // Far Eastern Medical Journal. - 2018. - №2. - p. 93-97.

5. Semenov V. Yu. Some results of the implementation of health care modernization programs in the Russian Federation // Health care manager. - 2016.- №10. - p.16-23.

UDC 519.6 – 611.06

基于遗传算法计算肝脏体积的公式
THE FORMULA FOR CALCULATING THE VOLUME OF THE LIVER BASED ON THE GENETIC ALGORITHM

Martinovich Miroslav Vladimirovich
Ph.D.Tech.Sciences, Acc. Professor
Federal State Budgetary Educational Institution of Higher Education «Novosibirsk State Technical University», Novosibirsk, Russia
Izranov Vladimir Aleksandrovich
Doctor of Medical Sciences, Professor
Kazantseva Natalya Vladimirovna
Ph.D .Med.Sciences, Acc. Professor,
Federal State Autonomous Educational Institution of Higher Education «Immanuel Kant Baltic Federal University», Kaliningrad, Russia,

注解。 为了移植学目的，精确确定肝脏体积的困难决定了寻找更准确的计算算法的需要。 主要问题是各种先前提出的公式在计算中的偏差百分比很高。 由于人类基因型的原因，肝脏的体积受到人类学特征的多样性的影响，因此，我们选择遗传算法进行肝脏体积计算的开发

Annotation*. The difficulty of precise determining the liver volume for the purpose of transplantology dictates the need of searching for a more accurate algorithm for its calculating. The main problem is a high percentage of deviations in the calculations by various previously proposed formulas. The volume of the liver is influenced by the diversity of anthropological characteristics, due to human genotype, thus, we have chosen the genetic algorithm for the liver volume caculating formula development*

The aim of this work was to develop a new formula for calculating the volume of the liver based both as on a genetic algorithm for ultrasonic volumetry of inner organs, taking into account anthropometric data (height, age), actual linear dimensions, as volumetry data obtained on an isolated cadaveric livers.

Research methods:

1) measuring the linear dimensions of the liver according to the method of ultrasound (TRL - thickness of the right lobe, OVS - oblique vertical size, CCSLL - cranio-caudal size of the left lobe), as well as the volume of the separated liver in corpses by determining the volume of the displaced fluid;

2) development of the formula for calculating the volume of the liver using a genetic algorithm.

Conclusion: the proposed method of development the formula for calculating the volume of the liver based on a genetic algorithm. The formula has the form of a polynomial:

$$V = A_0 + A_n \sum_{n=1}^{N} \prod_{m=1}^{M} (X_{n,m})^{P_{n,m}} .$$

It is shown that the resulting formula is more precise than the previously proposed.Using the genetic algorithm, a new formula for calculating the volume of the liver has been developed:

$$V = 113 + 16{,}6 \times \text{ТПД}^{-1} \times \text{КВР}^{3/2} + 3{,}92 \times 10^{-5} \times \text{Рост} \times \text{ТПД}^{5/2} - 2{,}23 \times 10^{-7} \times \text{Рост}^{5/2} \times \text{Возраст}^{2} + 2{,}11 \times \text{ККЛД}$$

The proposed algorithm can be used to obtain volumetric formulas for other organs during radiological studies.

关键词: 线性回归, 多项式, 肝容量, 肝脏大小, 超声, 放射学。

Key words: *linear regression, polynomial formula, liver volumetry, liver size, ultrasound, radiology.*

The problem of ultrasonic volumetry of the liver in recent years in connection with the demands of transplantology and clinical medicine is becoming increasingly important [20; 22; 25; 28]. Until recently, CT and MRI imaging technologies occupied the leading place in the lifetime determination of the liver volume, being the “gold standard” of the method [6; 7; 14; 17]. Ultrasonic volumetry of the liver, until recently, remained the subject of scientific research [9; 10] and is not yet included into the routine diagnostic standard. This is due to the complexity of the shape and large size of the liver (in comparison with other organs).

In recent years, J. Childs (2014-2016) proposed a new formula [9-12], suggesting the possibility of a wider implementation of the method to the routine diagnostic process. However, the authors themselves point out the imperfection of the formula and our previous studies [2] demonstrate a high standard deviation error of the formula from the real volume of the liver.

The aim of this study was the development ofa new formula for calculating the liver volume for ultrasound organ volumetry. We have chosen a genetic algorithm for forming the liver volume formula after measuring the linear dimensions (similar to using ultrasound), the volume of the isolated cadaveric liver (by

determining the volume of the displaced fluid when the liver is immersed in it) and anthropometric data (height, age).

Material and methods

1. A material withdrawal for measuring the linear dimensions of the liver (cm) and its volume (cm^3) using the liquid displacement method was carried out on cadaver preparations of non-fixed liver removed from the abdominal cavity of a corpse during a forensic autopsy. Among the investigated corpses were 18 men and 13 women aged from 28 to 96 years.

2. The measurement of the linear dimensions of the liver was carried out on sections of both lobes according to the principles of determining the size of the liver during an ultrasound study [3; 4; 5]. For measurements according to the principles used in the ultrasound study, two liver incisions were made in the para-sagittal plane. The right lobe was cut at the level of the most prominent point of the diaphragmatic surface corresponding to the right dome of the diaphragm. The left lobe was dissected in close proximity to the crescent ligament.

On the cut of the right lobe, the following dimensions were measured: cranio-caudal size (CCS), (OVS) - oblique vertical size and (APS) anterior-posterior size, (TRL) - thickness of the right lobe).

3. Method of calculating the volume of the liver.

To design the formula for calculating the volume of the liver, a genetic algorithm (GA) was used, the main points of which are described in the work of D. Whitley [30]. A brief description of the genetic algorithm:

This is a universal global optimization algorithm. “Universal” means that using a genetic algorithm, arbitrary objects can be optimized (if the object's variable parameters are available to change and the degree of “optimality” of the changed object can be measured), “global” means that it searches for optimum globally, regardless of local behavior of the optimality function (thus, not stopping at local optima)

The algorithm is constructed by analogy with the mechanism providing adaptation to ecological niches in the animal world. Its main provisions are:

- each attribute that we want to influence is assigned a “gene” (most often this number); a gene can take on a value in our chosen range; The process of converting a parameter to a gene is called coding;

- all signs of the object being optimized, on which we want to influence, after encoding, form an “instance” with a specific set of genes, determined by the signs of the object;

- having a copy, you can decode its genes (genotype), and having received the values of the parameters of the object (phenotype), set these parameters to the object; after that, you need to “test” the resulting object - measure it on a real object or make a calculation using a model (or formula).

Moreover, the result of "testing" should be a number that decreases as it approaches the optimal state in the case of minimization (or increases in the case of maximization). This number is called the value of the "fitness" of the instance.

- several copies are created with randomly filled genes (one population in the simplest case)
- fitness is calculated for each generation instance. The better the fitness, the higher the chances of an instance to participate in the formation of the next generation.
- after this, genetic operators are applied to generation instances, the main ones are:
- mutation - minor changes in one of several genes of the specimen
- interbreeding - the exchange of several genes between generations
- selection - a direct hit to the next generation or as participants in mutation or crossing.

As a result, the next generation is formed with the same number of copies, fitness is again calculated for this new generation, etc. This cycle is repeated until one of the conditions for stopping the algorithm is fulfilled - the achievement of the desired fitness value, population degeneration (the overwhelming proportion of identical instances, which makes crossing meaningless), the number of generations or others.

A feature of the implementation of the genetic algorithm used in this work is that during the execution the best (most adapted) copy is currently saved. To this end, Ebest$= \infty$ is set at the beginning of the algorithm, and when calculating the fitness E, if the instance has less than Ebest, the instance is saved, and Ebest is replaced with E (Fig.6, Yes branch)

Consider the featers in more detail:

Instance phenotype: a formula is optimizating, approximating real volumes of a liver as a function of its size and anthropometric data: height, age, gender.

The formula itself has the form of a polynomial:

$$V = A_0 + A_n \sum_{n=1}^{N} \prod_{m=1}^{M} (X_{n,m})^{P_{n,m}} \quad (1)$$

where:

V –liver volume assessment;

$A_0 \dots A_N$ – numerical factors (coefficients);

N –the number of power polynomial members;

M – the number of factors in each power term;

$X_{n,m}$ - one of the liver sizes from Table 3;

$P_{n,m}$ – degree at $X_{n,m}$

For example, the formula might look like this (note that since the genetic algorithm does not check the dimensions in the formula for repetition, an optimized formula for completing the algorithm needs to be checked for simplification)Ж

$$V = 2242 + 1021 \cdot КК\Pi Д^{0.5} - 7451 \cdot К\Pi Р^{-1} \cdot ТЛД^{0.5} \cdot ТП Д^{-0.5}$$

In the listed parameters, the authors attributed the phenotype $X_{n,m}$ and $P_{n,m}$; the gene for $X_{n,m}$ was an integer (the number of the size in the list of dimensions), the gene for $P_{n,m}$ the real number; total number of genes in instance 2 • N • M.

The restrictions on the formula included N, M, as well as the range and multiplicity with which $P_{n,m}$ it can be specified. The numerical coefficients $A_0 \ldots A_N$ were calculated numerically as linear regression coefficients for the power polynomial terms given by the genetic algorithm (see Fig. 6), the calculation $A_0 \ldots A_N$ does not refer to the genetic algorithm itself.

The fitness was calculated as the RMS value of the difference between real and calculated by the formula volumes of the liver; the purpose of optimization was to minimize this value.

Comparison of known formulas with the proposed formula:

The comparison was carried out according to the following parameters: Absolute error

$$Ea_i = Vcalculation_i - Vexperiment_i$$

Relative error:

$$Er_i = \frac{Vcalculation_i - Vexperiment_i}{Vexperiment_i} \times 100\%$$

RMS absolute error:

$$Esa = \sqrt{\frac{1}{Im}\sum_{i=1}^{Im} Vcalculation_i - Vexperiment_i}$$

RMS relative error

$$Esr = \sqrt{\frac{1}{Im}\sum_{i=1}^{Im} \frac{Vcalculation_i - Vexperiment_i}{Vexperiment_i}} \times 100\%$$

where *i* – data line number;
Im – the number of data lines;
$Vcalculation$ – calculated liver volume;
$Vexperiment$ – experimentally measured liver volume.

Results

Several formulas were obtained that are comparable with each other by the mean-square error. Among them, the formula with the smallest maximum error is chosen.

$$V = 113 + 16.6 \times \text{ТПД}^{-1} \times \text{КВР}^{3/2} + 3.92 \times 10^{-5} \times \text{Рост} \times \text{ТПД}^{5/2} - 2.23 \times 10^{-7} \times \text{Рост}^{5/2} \times \text{Возраст}^{2} + 2.11 \times \text{ККЛД}$$

(liver size was measured in mm, height in cm, age in years, liver volume in cm^3).

In our previous work [2], we evaluated the possibility of measuring the volume of the liver based on the linear dimensions of an organ using five formulas proposed for ultrasonic volumetry [9; 15; 16; 3; 29], and it was shown that the optimal formula for calculating the volume of the liver on the basis of the linear dimensions of the organ from the standpoint of the smallest deviation of the calculation result from the real volume of the liver is J. Childs formula [11; 12].

In this regard, all subsequent comparisons of the proposed formula are given in comparison with the formula of J. Childs.

The proposed formula on our data demonstrates a significantly higher accuracy compared to the formula of J. Childs. The absolute error of measuring the volume of the liver according to the formula of J. Childs was from -802 to +480 cm3, against -369 to +238 cm^3 (more than 2 times decrease);

RMS absolute error of 308 cm^3. against 158 cm3 (a decrease of 1.95 times);

RMS relative error of 21.7% versus 11.8% (a decrease of 1.92 times);

the relative error lies in the range from -41.5% to + 52.9% against the range from -19.4% to + 19.1% (a decrease of more than 2 times).

Discussion

Existing volumetric formulas today [11; 12; 15; 16; 29] developed on the basis of regression analysis. Our proposed method of developing a volumetric formula using GA has the advantage of allowing us to automatically obtain a more accurate formula for calculating the volume of the liver, based on a large set of dimensions available for measurement, among an extremely large number of variants of such a formula, and in a reasonable time.

Estimation the number of possible options for the calculation formula, starting from the formula (1).

We first consider a formula with one power term (N = 1). In this case, the number of options will be based on the fact that each argument enters a power term no more than 1 time.

$$\text{Nвар1} = \frac{\text{Nпер}!}{(\text{Nпер} - \text{M})!} \times \frac{1}{\text{M}!} \times (\text{Nст})^{\text{M}}$$

where:

Nпер – total number of variables available for analysis (we used 10);

M – the number of factors in the polynomial; used up to 4;

$\frac{\text{Nпер}!}{(\text{Nпер}-\text{M})!}$ - the number of combinations of arguments, taking into account the fact that each argument enters a power term no more than 1 time;

M! – the number of possible permutations of the arguments in the power term, dividing by M!, we take into account the commutativity of the product, that permutations do not change it;
Nст – the number of possible degrees of one argument;

where:
Nst.plus –maximum degree $P_{n,m}$; used 3;
Nst.minus –minimum degree ни $P_{n,m}$; used 3;

Kst.mult – degree multiplicity $P_{n,m}$; used 2 (i.e. $P_{n,m}$ may take values 1/2, 2, 3/2 et ct.).
In our case:
Nst = (3+3)*2 = 12
Than:

$$N_{вар1} = \frac{10!}{(10-4)!} \times \frac{1}{4!} \times 12^4 = 4354560$$

As the second member of the polynomial, you can use any, except the first, it means:

$$N_{вар2} = N_{вар1} - 1$$

And so on. For a polynomial with 4 power terms, the number of options will be:

$$N_{вар1} \times N_{вар2} \times N_{вар3} \times N_{вар4} =$$

Obviously, this number of options cannot be verified in a reasonable time. As a result of the use of a large initial set of possible formulas, the formula proposed by us has a number of fundamental differences from the known formulas. “Regression” formulas for calculating the volume of the liver use only the linear dimensions of the organ as arguments. In our formula, there is a combination of the linear dimensions of an organ, anthropometric data (height) and age. Interestingly, the gender factor was not accepted by the genetic algorithm as a significant that improves the accuracy of the formula. We believe that it is the combination in the formula of linear dimensions, height and age that causes a higher accuracy of the results of the proposed formula.

For effective use of the formula proposed in the routine ultrasound abdominal cavity examinations, several conditions must be met.

The first condition. Measurement technique.

Using the approach to measuring the right lobe seems us optimal for estimating the size of three dimensions in the parasagittal plane. OVS and TRL with this approach have minimal error in measurements.

CCSRL with some constitutional features of patients may be understated, since the most distant upper point of the right dome of the diaphragm is not in-

cluded in the section. In this regard, CCSRL is excluded from the formula for calculating the volume.

We use OVS - oblique vertical size, which within this approach to measurement is as close as possible to MRI measurements [26].

We believe that the method of measuring of OVS during oblique scanning along the mid-clavicular line from subcostal access [4; 5] gives underestimated results due to the inability to strictly fix the lower edge of the liver for the starting point of measurement. Apparently, this method gives a regular error to underestimate the results. It can be used when using the standards proposed in the manuals [4; 5], but allows to estimate only a conditional value, which does not reflect the volume of the liver.

Apparently, this method gives a regular error to underestimate the results. It can be used when using the standards proposed in the manuals [4; 5], but allows to estimate only a conditional value, which does not reflect the volume of the liver.

We believe that various methods of medical imaging should strive to maximize the approximation of the results of measuring linear dimensions.

The second condition. Estimation of calculated volume. Clinical assessment of the patient's liver volume is possible from the standpoint of determining the standard volume. The concept of standard volume was formulated in the 90s of the last century in connection with the development of transplantology.

Standard (due) volume is the volume of the liver, which is calculated on the basis of constitutional features and anthropometric data for a particular individual, while being a reliable reflection of the hepatic metabolic needs of the individual [21; 27].

Over the past decades, many formulas have been proposed for determining the standard volume of the liver, which is caused by the desire of researchers to find the optimal formula that takes into account the ethno-territorial characteristics of the population [24].

In our previous work [1], it was shown that the most accurate formula for calculating the standard liver volume is A. Chouker's formula [13], which can be recommended as a reference estimation of the liver volume in the Kaliningrad region of the Russian Federation.

In the authors opinion, the proposed algorithm for the synthesis of polynomial formulas can also be used to obtain volumetric formulas for other organs in radiological studies.

Summary and conclusions:

Using GA, a new formula for calculating liver volume has been developed:

$$V = 113 + 16{,}6 \times \text{ТПД}^{-1} \times \text{КВР}^{3/2} + 3{,}92 \times 10^{-5} \times \text{Рост} \times \text{ТПД}^{5/2} - 2{,}23 \times 10^{-7} \times \text{Рост}^{5/2} \times \text{Возраст}^{2} + 2{,}11 \times \text{ККЛД}$$

The proposed formula surpasses the existing volumetric formulas in accuracy and can be recommended for use in ultrasound diagnostics.

References

1. Izranov V.A., Kazantseva N.V., Martinovich M.V. et al. Evaluation of the accuracy of the calculation of the standard volume with ultrasound liver volumetry // Bulletin of the Baltic Federal University named after I. Kant. Series of Natural and Medical Sciences. 2017, №3. Pp. 37-50.

2. Izranov V.A., Ermakov A.V., Gordova V.S., et al. Selection of the optimal formula for ultrasonic volumetry based on the linear dimensions of the liver. Bulletin of the Baltic Federal University named after I. Kant. Series of Natural and Medical Sciences. 2017, №4. Pp. 39-47.

3. Kapustin S.V., Pimanov S.I., with the participation of Pascalin S. Ultrasound study in tables and diagrams (ed. 2nd), Vitebsk: Vitebsk State University Press, 2005 - 64 p.

4. A practical guide to ultrasound diagnostics. General ultrasound diagnostics / Ed. V.V. Mitkova. - Moscow: Vidar-M Publishing House, 2013. 720 p.

5. Practical ultrasound diagnostics: a guide for doctors: 5 tons. T.1. Ultrasound diagnosis of diseases of the abdominal cavity / ed. G.E. Trufanova, V.V. Ryazanov. M .: GEOTAR-Media, 2016. 240 pp.

6. Bora A., Alptekin C., Yavuz A., et al. Assessment of liver volume with computed tomography and comparison of findings with ultrasonography // Abdom. Imaging. 2014. Vol. 39. P. 1153–1161.

7. Borchert D., Schuler A., Muche R. et al. Comparison of Panorama Ultrasonography, Conventional B-Mode Ultrasonography, and Computed Tomography for Measuring Liver Size // Ultrashall. in Med. 2010. Vol. 31. P.31-36.

8. Carr D., Duncan J.G., Railton R. et al. Liver volume determination by ultrasound: a feasibility study // Br. J. Radiol. 1976. Vol. 49. P.776-778.

9. Childs J.T., Esterman A., Thoirs K.A. Ultrasound measurements of the liver: an intra and inter-rater reliability study // Australian journal of ultrasound in medicine. 2014. Vol. 17(3). P. 113-119.

10. Childs J.T., Esterman A.J., Phillips M., Thoirs K.A., Turner R.C. Methods of determining the size of the adult liver using 2D ultrasound: a systematic review of articles reporting liver measurement techniques // J. Diagn. Med. Sonogr. 2014. Vol. 30. P.296–306.

11. Childs J.T., Esterman A.J., Thoirs K.A., Turner R.C. Ultrasound in the assessment of hepatomegaly: A simple technique to determine an enlarged liver using reliable and valid measurements // Sonography. 2016. Vol. 3. P. 47–52.

12. Childs J.T., Esterman A.J., Thoirs K.A. The development of a practical and uncomplicated predictive equation to determine liver volume from simple linear ultrasound measurements of the liver // Radiography. 2016. Vol. 22. P.125-130.

13. Chouker A., Martignoni A., Martin Dugas M. et al. Estimation of Liver Size for Liver Transplantation: The Impact of Age and Gender // Liver Transplantation. 2004. Vol. 10, No 5. P. 678–685.

14. D'Onofrio M., De Robertis R., Demozzi E. et al. Liver volumetry: Is imaging reliable? Personal experience and review of the literature // WJR 2014. Vol. 6(4). P. 62–71.

15.Elstein D., Hadas-Halpern I., Azuri U., Abrahamov A., Bar-Ziv Y., Zimran A. Accuracy of ultrasonography in assessing spleen and liver size in patients with Gaucher disease: comparison to computed tomographic measurements // J. Ultrasound Med. 1997. Vol. 16(3). P. 209–211.

16.Glenn D., Thurston D., Garver P., Beutler E. Comparison of magnetic resonance imaging and ultrasound in evaluating liver size in Gaucher patients // Acta Haematol. 1994. Vol. 92(4). P.187–189.

17.Hiroshige S., Shimada M., Harada N. et al. Accurate preoperative estimation of liver-graft volumetry using three-dimensional computed tomography // Transplantation. 2003. Vol. 75. P. 1561-1564.

18.Hwang S., Lee S.G., Kim K.H. et al. Correlation of blood-free graft weight and volumetric graft volume by an analysis of blood content in living donor liver grafts // Transplant. Proc. 2002. Vol. 34. P. 3293-3294.

19.Kitajima K., Taboury J., Boleslawski E. et al. Sonographic preoperative assessment of liver volume before major liver resection // Gastroenterol. Clin. Biol. 2008. V. 32. № 4. P. 382–389

20.Leung N.W., Farrant P., Peters T.J. Liver volume measurement by ultrasonography in normal subjects and alcoholic patients // J. Hepatol. 1986. Vol. 2(2). P.157-164.

21.Lin X.Z., Sun Y.N., Liu Y.H. et al. Liver volume in patients with or without chronic liver diseases // Hepatogastroenterology. 1998. Vol. 45(22). P.1069-1074.

22.Niehues S.M., Unger J.K., Malinowski M., et al Liver volume measurement: reason of the difference between in vivo CT-volumetry and intraoperative ex vivo determination and how to cope it // Eur. J. Med. Res. 2010. Vol. 15. P. 345-350

23.Patlas M., Hadas-Halpern I., Abrahamov A., et al. Spectrum of abdominal sonographic findings in 103 pediatric patients with Gaucher disease // Eur. Radiol. 2002. Vol. 12. P.397- 400.

24.Pomposelli J.J., Tongyoo A., Wald C. et al. Variability of Standard Liver Volume Estimation Versus Software-Assisted Total Liver Volume Measurement // Liver transplantation. 2012. Vol. 18. P. 1083-1092.

25.Rasmussen S.N. Liver volume determination by ultrasonic scanning // Br. J. Radiol. 1972. Vol. 45. P. 579 -585.

26.Roloff A.M. et al. Accuracy of simple approaches to assessing liver volume in radiological imaging // Abdom. Radiol. 2016. Vol. 41. P.1293–1299.

27.Urata K., Kawasaki S., Matsunami H. et al. Calculation of child and adult standard liver volume for liver transplantation // Hepatology. 1995. Vol. 21(5). P.1317-1321.

28.Xiaoqi Lv , Yu Miao, Xiaoying Ren et al. The study and implementation of liver volume measuring method based on 3-dimensional reconstruction technology // Optik. 2015. Vol.126. P. 1534–1539.

29.Zoli M., Pisi P., Marchesini G. et al/ A rapid method for the in vivo measurement of liver volume // Liver. 1989. Vol. 9(3). P.159-163.

30.Whitley D. A genetic algorithm tutorial// Statistics and Computing. 1994. Vol. 4 (2), P. 65–85.

UDC 159.9.072

心理情绪障碍的短期心理矫正，表明外科医生的心理情绪状态
SHORT-TERM PSYCHOLOGICAL CORRECTION OF PSYCHO-EMOTIONAL DISORDERS OF A PROBLEM PSYCHO-EMOTIONAL STATE AMONG SURGEONS' DOCTORS

Kekteeva Yulia Igorevna
Assistant
Gardanova Zhanna Robertovna
Doctor of Medical Sciences, Professor, Head of the Department
Vladimir Igorevich Esaulov
Assistant
Pirogov Russian National Research Medical University
Badusheva Darina Vitalevna
Student
Kalmyk State University.

注解。 检查了20名外科医生，以诊断其情绪倦怠综合征（EBS）的表现。 该调查使用临床访谈，问卷调查和心理诊断测试进行。 在接受调查的一半中，EBS的体细胞表现与个体和反应性焦虑，亚表达增加相结合。 在调查和测试之后，所有20名受访者都与心理学家进行了5-7次会议（如果需要，可以选择继续）。 提供协助研究和解决各种心理问题，以及放松技巧的培训。 诊断和短期精神矫正的结果可用于预防外科医生情绪倦怠的EBS和心理矫正措施。

关键词：外科医生，职业压力，情绪倦怠，心理诊断测试，焦虑，抑郁，预防，精神矫正。

Annotation. *20 surgeons were examined to diagnose their manifestations of emotional burnout syndrome (EBS). The survey was conducted using clinical interviews, questionnaires, and psychodiagnostic tests. In half of the surveyed, somatic manifestations of the EBS were identified, in combination with elevated personal and reactive anxiety, subdepression. After the survey and testing, all 20 surveyed were offered 5-7 sessions with a psychologist (with the option, if desired, to continue). Offered assistance in researching and solving various psychological problems, as well as training in relaxation techniques. The results of diagnostics and short-term psychocorrection can be useful for the prevention of EBS and*

psycho-corrective measures in the development of emotional burnout in surgeons.

Keywords: *surgeons, occupational stress, emotional burnout, psychodiagnostic tests, anxiety, depression, prevention, psychocorrection.*

Introduction. Medical activity is accompanied by intensive workload, high saturation of professional contacts with various people. Often among them are patients with a complex nature and difficult to communicate.

The long-term work of doctors in conditions of intensive contacts, chronic working overload, the need for maximum mobilization of forces and rapid response in regularly arising non-standard situations leads to a high risk of developing EBS. This fully applies to surgeons. Manifestations of EBS can be expressed in the form of loss of interest in work, the emergence of a formal attitude to their duties, a sense of emotional exhaustion, a decrease in professional self-esteem, and health problems [1–4]. It was noted that emotional burnout can be a prerequisite for the development of serious chronic problems with physical health, and contribute to the emergence of persistent psychosomatic pathology [1].

The above phenomena can often be observed with increasing work experience in the specialty, and work in conditions of irregular working hours, characteristic of the work of surgeons [1-6]. At the same time, the doctors of this specialty. the possibility of prevention and short-term psychocorrection in the development of burnout syndrome is not fully understood.

The aim of the work is to study the possibilities of preventing EBS in surgeons with the formation of self-regulation skills, as well as the readiness to work with a psychologist in the mode of short-term psycho-correction in cases of emotional burnout syndrome.

Materials and methods: 20 surgeons working in the surgical departments of medical institutions in Moscow were examined. All examined were male, aged 30 to 45 years.

Primary interviewing and examination with a set of psychological tests (MVI professional burnout questionnaire, Beck Depression Scale, Spielberger-Hanin situational and personal anxiety level scale, Quality of Life Test SF-36, Personality Accentuation Test, SAN Test - "State of health, activity, mood").

The state dynamics was monitored with the help of surveys during classes, subjective assessment of well-being. In addition, dynamic blood pressure and heart rate measurements were performed.

After undergoing psychological testing and familiarization of the surveyed with the obtained data, several sessions (5-7 total) with a psychologist were offered, aimed both at working with the identified psychological problems of the surveyed and training on self-management skills with the inclusion of a number of psychotherapeutic techniques.

Psychocorrectional sessions with a psychologist were conducted in a mode of approximately 1-1.5 hour classes every 5-7 days. An integrative psychotherapeutic approach was taken as the basis of psychocorrectional studies.

Results and discussion: The study focused on the study of the possibilities of preventing EBS in surgeons with the development of self-regulation skills, as well as the readiness to work with a psychologist in the mode of short-term psychocorrection in cases of emotional burnout syndrome.

At the same time, the specifics of the psycho-emotional state of the patients were studied, the intensity of anxiety-depressive disorders, the presence or absence of EBS, the interest of the examined surgeons for correction (if EBS and psychoemotional disorders were present) or prevention of these disorders in the short-term psychocorrectional mode was clarified.

The data obtained during the survey and questioning confirmed the presence of more than half of the examined people (12 people), which were typical for the emotional burnout syndrome, psycho-emotional disorders and somatic symptoms. Subjects mainly complained of exhaustion, sadness, intense stress, internal discomfort, sleep disturbances.

Among the most frequent violations were noted: chronic fatigue at work (15 people), irritability (14 people), internal stress (8 people), low mood (5 people), loss of interest and indifference to work (7 people).).

It was noted that the increase in these manifestations was observed with increasing work experience, and reached a peak by about forty years with a duration of work of more than 10 years, and lasted up to 45 years.

Testing with the MVI professional burnout questionnaire allowed more than half of the examined doctors to identify elevated levels of "emotional exhaustion", manifested by a sense of emotional emptiness and fatigue associated with work. According to the survey results, in 9 out of 20 according to the MBI test data, some EBS phenomena were noted.

Testing questionnaire A. Beck showed no depression in 12 out of 20 people. The remaining 8 examined examined indicators characteristic of subdepression. At the same time, not all of the surveyed who showed a subdepressive level had complaints of low mood.

The test results by the Spielberger-Khanin questionnaire indicated on the whole a small number of individuals with elevated levels of personal and reactive anxiety. The total number of examined surgeons aged 30-45 years, prone to anxiety, was less than a quarter (4 people).

Specific was the reaction to the very procedure of the survey and testing of the part of the examined doctors. More than a quarter of the surveyed (6 people) did not show much interest in the diagnostic results. In the initial conversation, almost half of the surveyed (11 people) answered questions in monosyllables, saying that they participated in testing only at the request of their superiors.

As noted above, all 20 surveyed after testing and interviewing were offered several individual psychocorrectional sessions with a psychologist, regardless of the obtained indicators of psycho-emotional state.

The participants of the survey were offered assistance in researching and solving various psychological problems, as well as training in stress relief techniques based on standard psycho-relaxation exercises in Jacobson [7], elements of out-training [8], short-term positive therapy [9], a number of resource techniques NLP and Ericson hypnosis [10-12].

A short-term work with a psychologist was envisaged in the case of a desire expressed by the participants in the study to continue communication on topics of interest to the subjects examined, a total number of not more than 5-7 sessions.

According to the results of the survey and further work with the psychologist, it was noted that out of 20 people, about a quarter (8 people) abandoned the psychological correction after 1-2 classes, saying that "they do not see any problems" for correction. In a more detailed analysis of the reasons for refusal, various variants of "refusal motivation" were identified.

Variants of the reasons for the rejection of psycho-correctional work by a psychologist in the first classes

• Denial of any problems in the somatic and psycho-emotional spheres - 4 people.

• Lack of time for the proposed classes, excessive employment - 7 people.

• Reluctance to discuss your life with a psychologist - 2 people.

• Lack of interest in the proposed classes -3 people.

• Without explanation, -1 person.

Thus, the most frequent reason for the refusal of classes was the references to "lack of time for the proposed classes, excessive employment" (7 people). In some cases, 2 or more reasons for failure were mentioned. Among those who refused to take the proposed classes, one third were those surveyed who showed signs of EBS during the survey and questionnaire.

The greatest interest in the classes was shown by young doctors with a short work experience, and with low rates of anxiety and depression, as well as those doctors after 40 years who had elevated levels of depression and anxiety, and had trouble sleeping.

The classes conducted by the psychologist with the 12 agreed surveyed were based on an integrative psychotherapeutic approach. In each case, if necessary, psychotherapeutic techniques were used, including elements of neuro-linguistic programming, Ericksonian hypnosis, art therapy, positive therapy, psycho-muscular relaxation techniques, and auto-training elements [4,8-12].

At the first lesson, the results of the personal survey results obtained during psychodiagnostics were summarized, a brief description of the essence of EBS

was given. After getting acquainted with the obtained results, a short course of psychocorrectional classes for 1-2 months was proposed, focused on rescuing one's own state, unloading psycho-emotional stress, learning how to quickly reduce internal discomfort with the help of self-regulation exercises [7-12]. The classes were offered both individually and in small group mode.

In addition to teaching self-regulation skills, reducing existing stress, and performing various resource exercises [7–12], these exercises introduced the ability to switch to another type of activity, more optimally distribute working time, and practical recommendations for calculating their workload (based on elements of time management, coaching) [13]. The main exercises used were the “Eisenhower Matrix” technique, the “timekeeping” technique, self-management (self-organization of their own time).

The general course of study for the main group of 12 people lasted for 5-7 lessons. Sessions with a psychologist were conducted in the mode of approximately 1-1.5 hour classes once every 5-7 days. The basis of psychocorrectional classes, as noted above, was taken integrative psychotherapeutic approach.

All 12 people who have completed short-term psychologist studies have noted their usefulness for themselves, improved well-being, a subjective reduction in internal discomfort, and a more relaxed attitude to stressful working situations. 2 out of 12 even expressed regret with a limited number of classes, and expressed their readiness to undergo periodic training with a psychologist "for unloading" and solving situationally arising psycho-emotional problems.

Conclusion: Successful prevention of burnout syndrome in surgeons can be based on an understanding of the specifics of work associated with a high psycho-emotional and communicative workload. At the same time, timely diagnosis of the initial manifestations of emotional burnout is necessary.

With the appearance of psycho-emotional disorders typical of EBS, it is advisable to provide psychological assistance aimed at stopping the existing symptoms, with the inclusion of an integrative psychocorrectional effect.

It is advisable to introduce periodic testing of personnel of surgical departments in order to identify signs of EBS, conduct a course of educational and unloading exercises aimed at preventing this type of occupational pathology.

References

1. Balakhonov A.V., Belov V.G., Pyatibrats E.D., Pyatibrats A.O. Emotional burnout of medical workers as a prerequisite for asthenia and psychosomatic pathology // Bulletin of St. Petersburg University - 2009. - V. 11. - № 3. - P. 57-71.

2. Sidorov P.I. Burnout syndrome // Medical newspaper. - 2005. - №43 (8.06.2005)

3. Kaibyshev V.T. Professionally determined lifestyle and health of doctors in the conditions of modern Russia // Occupational Medicine and prom. ecology. - 2006. No. 12. - P. 21–26.

4. Vodopyanova N.E., Starchenkova E.S. Burnout syndrome: diagnosis and prevention. - 2nd ed. - SPb.: Peter, 2011. - 223 p.

5. Nikolaev E.L. What worries a health worker in the workplace: the psychological context for the prevention of occupational stress // Bulletin of Psychiatry and Psychology of Chuvashia - 2015. - Vol.11. - № 3. - p. 27-45.

6. Marchenko-Tyabut DA, Golovach A.A. Personal and reactive anxiety in doctors of various specialties // Medicine. - 2005. №2. - p. 79 - 81.

7. Kammatari J., Baskakov V.Yu. 10 + 1 relaxation methods. -Moscow: Institute of Humanitarian Studies. - 2012. -160 p.

8. Filatov A.S. Autogenic training. -Kiev, Zdorov'ya. -1979. - 144 p.

9. Ahola T, Furman B. Short-term positive psychotherapy. - SPb.: Publishing House Speech - 2000. - 220 p.

10. Kovalev SV Healing with the help of NLP. - Moscow: Publishing house: KSP +. - 2006. - 542 p.

11. Gordeev MN Hypnosis: A Practical Guide. 3rd ed. – Moscow, Publishing house of the Institute of Psychotherapy, 2005. - 240 p.

12. Gordeev MN, Gordeeva EG. NLP in psychotherapy. – Moscow, Publishing house: Psychotherapy. -2008. - 272 p.

13. Arkhangelsk G. Time Drive. How to manage to live and work. - Moscow: Mann, Ivanov and Ferber, 2012. - 272 p.

东西伯利亚的动态气候和鸟类区域在XX的下半部分 – 从XXI世纪开始
DYNAMICS CLIMATE AND BIRD AREAS OF THE EAST SIBIREAN AT SECOND HALF OF XX - BEGINNING OF XXI CENTURIES

Mel'nikov Yuri Ivanovich
Candidate of Biological Sciences
Head of the Graduate School, Federal State Budgetary Institution "Baikal Museum of the Irkutsk Scientific Center"

抽象。根据东西伯利亚多年的研究和文献分析，提供了20世纪下半叶和21世纪初气候变化和鸟类动态的材料。这一时期的特点是气候急剧变暖，同时中亚地区发生了非常强烈和广泛的干旱，导致鸟类大规模迁徙到北方。在东西伯利亚的不同地区，记录了84至95种新的鸟类。然而，它们中的大多数属于流浪物种。在水鸟和水禽的常见种类中，分布的南部边界没有变化，但是它们的最佳范围是高纬度地区，这导致该生态群鸟类大规模迁移到北方。与此同时，原生沙漠和草原物种在其纬度区内移动，并在其北部边界上以少量记录。这些反应差异是由于所使用的站的性质。第一组鸟类使用在所有自然区域和高空带中发现的区域内栖息地。因此，它具有非常宽的范围并且具有非常动态的空间结构。

关键词：东西伯利亚，滨鸟和水禽，气候动态，范围，新物种，反应差异。

Abstract. *Based on years of research in Eastern Siberia and an analysis of the literature, materials are presented on climate change and the dynamics of bird ranges in the second half of the 20th and early 21st centuries. This period was characterized by a sharp warming of the climate and was accompanied by the development of very strong and extensive droughts in Central Asia, which caused massive movements of birds to the north. In different regions of Eastern Siberia, from 84 to 95 new bird species have been recorded. However, most of them belong to stray species. In common species of shorebirds and waterfowl, the southern borders of distribution did not change, but the optimum of their ranges went to high latitudes, which caused massive movements of birds of this ecological group to the north. At the same time, native desert and steppe species moved within their latitudinal zone and were noted on their northern borders in small numbers. These differences in reactions are due to the nature of the stations used. The first group of birds uses intrazonal habitats found in all natural zones and high-altitude belts. Therefore, it has very wide ranges and is characterized by a very dynamic spatial structure.*

Key words: *Eastern Siberia, shorebirds and waterfowl, climate dynamics, ranges, new species, differences in reactions.*

The first half of the 20th century on the territory of Northern Asia belongs to late Glacial climatologists, which, compared to modern times, was distinguished by more severe climatic conditions (Mukhina et al., 1965; Levi et al., 2017). In this regard, the composition of the fauna of birds at that time was poorer and quite specific (Gagina, 1961; Mel'nikov, 2016). The second half of this century was distinguished by a rapid and rather strong increase in the surface temperature of air. Obvious warming began from the beginning of the second half of the 20th century in Africa with the development of strong and prolonged droughts, gradually shifting from west to east (Koshelenko, 1983; Mel'nikov, 2009). In the late 60s - early 70s of the last century, Mongolia, China and the southern outskirts of the eastern regions of Russia were characterized by very strong and prolonged droughts, sometimes almost completely covering these countries (Koshelenko, 1983). A special analysis of the reasons for their appearance showed that they were associated with a sharp change in the circulation of the Earth's atmosphere, due to the level of solar activity (Zherebtsov et al., 2011; 2013).

Increased solar activity at this time was accompanied by a pronounced warming of the climate. A marked increase in surface air temperature was observed in the cold period of the year. Warming began to develop in high latitudes (at the beginning of the 60s of the last century), and later (in the mid-to-end of the 60s) in temperate and low latitudes. It is associated with the growth of the meridional and noticeable weakening of the zonal circulation of the atmosphere in the northern hemisphere of the Earth (Zherebtsov et al., 2011; 2013). The manifestation of these processes was greatly influenced by the nature of regional conditions, as indicated by many authors (Shimaraev, Starygina, 2010; Zherebtsov et al., 2011; 2013; Berezhnih et al., 2012; Obyazov, 2012; Mel'nikov, 2016a; 2016b; Levi et al ., 2017). In this regard, each large region always has specificity in climate dynamics. A full study of the specifics of climate influence on natural processes cannot be elucidated without taking into account its regional peculiarities.

The change of latitudinal transfer of air masses to meridional transfer coincides with the period of extensive and severe droughts in Asia (1958-1964) (Mel'nikov, 2016a; 2016b). In the North Atlantic sector, this change occurred in the late 50s - early 60s of the last century (Zherebtsov et al., 2011; 2013). Initially, droughts were observed in Africa and Western Asia, then, consistently covering the southern regions of Middle Asia, gradually shifted to the east. With a slight delay (from the middle to the end of the 60s), a similar situation began to be observed in the Pacific sector. As a result, there was a sharp decrease in the intensity of the northwest transfer of air masses, and the monsoons in the Pacific sector shifted to more

northern coastal areas. In the last five years, dry periods have been observed in the northern regions of Eastern Siberia (Irkutsk Region and Trans-Baikal Territory).

This is what led to the development of catastrophic droughts in China and Mongolia during this period (1968–1978) (Mel'nikov, 2009; 2016a; 2016b; Zherebtsov et al., 2011; 2013; Levi at. al., 2017) . It was in the second half of the 20th century that very extensive droughts were characteristic of the temperate latitudes of the northern hemisphere of the Earth. With a very high probability, this process is associated with a weakening of the zonal atmospheric circulation, due to which the temperature of adjacent regions is equalized and the warming up of the central regions of Asia is intensified, which led to a marked increase in surface air temperature (Mel'nikov, 2016a; 2016b; 2018). In the eastern regions of Russia, several seats with an elevated temperature significantly exceeding the average temperature throughout the northern hemisphere of the Earth were formed. These seats include the south of Eastern Siberia with the adjacent regions of Mongolia and China (Shimaraev, Starygina, 2010; Zherebtsov et al., 2011; 2013; Berezhnikh et al., 2012; Obyazov, 2012; Mel'nikov, 2016a; 2016b). That is why the effects of climate warming are most pronounced here.

The significant influence of the monsoons on the climate of the eastern regions of Russia is emphasized by its recent changes. The sharp weakening of the north-west transfer of air masses and the movement to the north of the Siberian frontal zone led to the development of a long low-water period in Central Asia and adjacent areas of Eastern Siberia (Mel'nikov, 2009; 2016; Berezhnyh et al., 2012; Obyazov, 2012). There is a clear increase in surface air temperature from east to west. For 1891-2004 in Khabarovsk, warming was 1.1º C/100 years, Chita was 1.7º C/100 years, and on the lake Baikal 1.9 ºC/100 years (Mel'nikov, 2018). This indicates the enormous influence of the monsoons, which reduce the level of warming, on the climate of coastal regions. The climate is changing from south to north. The highest level of warming was recorded in the flat regions of Mongolia and China adjacent to Russia — 2.2º C/59 years (1951–2009), and to the north it gradually decreases to 1.2º C/100 years, and outside Eastern Siberia below. In mountainous areas, it varies from 1.9º C/100 years in the south to 1.0-1.5º C/59 years in the north of the Baikal region (Berezhnyh et al., 2012; Obyazov, 2012; Mel'nikov, 2018).

Modern climate warming is very well expressed in the late winter and early spring periods. At this time accounts for at least half of the contribution to the value of the trend of average annual temperatures. In the summer months, the warming trends are much less, but they are reliable at the 5.0% level. In other periods, trends in temperature increase are insignificant, or statistically unreliable (Obyazov, 2012). The intensity of precipitation is well connected with these trends. Their deposition increases with a decrease in average annual air temperature. The

importance of warming is emphasized by the fact that with the beginning of the XXI century, there is an increased background temperature of the surface air layer (Obyazov, 2012).

The collected materials leave no doubt that the modern period in Eastern Siberia is characterized by significant climatic changes. Most of the authors, assessing the nature of this phenomenon, consider it global. Indeed, if the basis of such estimates is to take the coverage of the territory, i.e. the scale of territorial climate change, they can be considered global (Koshelenko, 1983; Krivenko, 1991; Mel'nikov, 2016). At the same time, there is another approach, which allows to measure these changes in the scale of geological or rather space time, which also deserve special consideration (Levi at al., 2004; 2017). Planet Earth is an open system and its state is significantly affected by space. Among the most possible causes that can affect the Earth's climate are changes in the intensity of solar insolation associated with the solar energy release regime, as well as fluctuations occurring on the earth itself (Levi at al., 2004; 2017).

Recent analyzes of the influence of solar activity on the Earth's atmosphere have shown that it affects the geomagnetic activity of the Earth (Zherebtsov at al., 2011; 2013). These parameters determine the change in the epochs of its warming and cooling periods (Levi at al., 2004; Zherebtsov at al., 2011; 2013). Most likely, short-term cooling and warming are due to solar activity. Since it is characterized by a cyclical nature of such cycles should be identified in the Earth's climate. Indeed, a detailed analysis of tree-ring chronologies over long periods of time confirms cyclical climate changes (the Yamal tree-ring chronology of 7,200 years and others). The present period corresponds to a very strong warming (based on the temperatures of the beginning of summer), comparable only to the period around 250 AD (Voronin at al., 2014).

At the same time, it should be borne in mind that the climatic response to the influencing factors (heliogeophysical disturbances) is characterized by a considerable spatial and temporal non-uniformity and has a regional character (Zherebtsov at al., 2011; 2013). It should be noted that five centuries-old climate cycles, with a duration of 1500–2000 or a few more years, have already been singled out (Shnitnikov, 1957; Krivenko, 1991). In addition, according to many authors, shorter secular and intrasecular climatic cycles associated with solar activity lasting 3-4, 7-14, 30-45, and 70-120 years stand out well. The duration of these cycles is in good agreement with the cycles identified in the process of analyzing various materials obtained in studying the natural cyclicity of various processes occurring on the Earth (Levi at al., 2004). According to many authors, the current climate warming corresponds to a cycle of a centuries-old level with a duration of about 2000 years, beginning and ending with a warm-dry period (Krivenko, 1991; Mel'nikov, 2009; 2016; 2018). It is in the present period that its ending is observed, which causes strong climatic changes.

These processes, along with the general warming of the Northern Hemisphere (especially in Central Asia), determined the general dynamics of the fauna of the birds of Eastern Siberia. As a result of these changes, significant changes were observed in the birds of Central Asia and its bordering regions, due to changes in its structure, species structure and numbers (Gagina, 1961; Krivenko, 1991; Mel'nikov, 2009; 2016a; 2016b; 2018). At this time there were observed mass migrations of shotrbirds and waterfowl from the southern parts of the areas to their northern boundaries (southern and southeastern directions). In addition, there were noticeable movements of birds from the western and, to a much lesser extent, northern directions. In the latter case, this is obviously determined by a significant increase in the arctic and north-atlantic transfers of air masses. Probably, birds are addicted to strong air currents and are brought into the interior of North Asia.

At the end of the first half of the 20th century, the habitat of 376 bird species was established in Eastern Siberia (Gagina, 1961). It must be borne in mind that this number is determined not only by the registration of new species, but also by the modern works of the systematics of birds. Some of the subspecies identified in the first period of research have now received species status. However, the main part of the observations refers to the species that had this status in the first half of the past century. Special analysis of materials shows that currently 471 species of birds are registered in Eastern Siberia, i.e. their fauna increased by 95 species, including categories of settled, nesting migratory, migratory, to fly a long way, occurring only in summer, only hibernating and escaping birds and cages.

During the period of evictions, the overwhelming majority of new species were found exclusively in single individuals or in small groups of 2-3 and up to 5 birds. At the same time, the initial stages of the evictions of numerous species of birds from the territory of Central Asia had the form of mass expansions. They have been recorded since the late 50s – early 60s of the last century (Mel'nikov, 2009; 2016; 2018) and formed by numerous species that use wetland meadows and shallow lake systems for nesting, often of very large areas. During this period, this region was covered by very extensive, severe and often catastrophic droughts (Koshelenko, 1983; Levi at al., 2004; Mel'nikov, 2009; 2016; 2018; Berezhnikh at al., 2012; Obyazov, 2012). Despite the obvious connection of mass evictions of birds with large droughts of the modern period, the reality of its existence has been proven quite recently (Mel'nikov, 2004; 2009; 2010; 2016a; 2016b) and is currently not disputed by anyone.

In the 80s of the last century, after the cessation of extensive dryness in Central Asia, there was a tendency for these species to return to their original areas. At the same time, on the northern borders of them (down to the Central Yakutsk lowland), small nest foci of new species remained, significantly increasing the diversity of birds of Eastern Siberia. In the south of Eastern Siberia and in Central

Asia, by this time, the number of many common bird species has drastically decreased, replacing the former nesting sites to northern areas. The mixing of their optimum areas in this direction in some cases exceeded 500 km (Mel'nikov, 2009; 2016a; 2016b).

The termination of severe droughts did not lead to an increase in watering in Central Asia, since a long low-water period was established here (Berezhnikh at al., 2012; Kirilyuk at al., 2012; Obyazov, 2012). With such a draining of the territory from the original areas, a new noticeable outflow of birds to the adjacent territories was observed (the second wave of mass evictions). It was associated with further natural restructuring of the lake systems of Mongolia, China and the southern margins of Eastern Siberia, accompanied by a significant decrease in the area of wetland habitats (primarily wet meadows) (Mel'nikov, 2004; 2009; 2010; 2016a; 2016b). With the intensification of the general desiccation of Central Asia in Eastern Siberia, birds began to appear, more characteristic of steppe and highland biomes. They formed the third wave of species excretion, while very small (Mel'nikov, 2016a; 2016b; 2018).

Special analysis of the materials shows that among new species of birds, to fly a long way species (in different regions from 43.6% to 70.9%), not previously recorded in the territory of the region, predominate. Among them, the share of nesting migratory birds (in different regions from 9.7% to 35.9%) is significantly inferior to fly a long way species. The proportion of migratory birds is also relatively small - in different regions from 7.7% to 19.4%. The remaining categories of birds are found in small quantities. At the same time, among the main ecological groups of birds (shorebirds and waterfowl, forest, bush, meadow, steppe and mountain), found in the category of to fly a long way species, there is clearly a larger share of shorebirds and waterfowl - 51.0%. Taking into account other ecological groups of birds that also use wetland ecosystems, it reaches 75.5%. Consequently, despite the fairly high species richness of new species, their main core is formed by birds of wetland ecosystems (Mel'nikov, 2018).

Given the environmental situation characteristic of the period under study, this combination of species is not surprising. The main part of shorebirds and waterfowl, with the exception of typically southern and steppe species, have extensive ranges in which there is a consistent use of the southern and northern sections. For all species of a this ecological group of birds, cyclical dynamics of their areas, clearly associated with the level of watering of the territory, are characteristic. It is associated with the natural dynamic state of the steppe ecosystems of Central Asia and adjacent territories, caused by successions dependent on cyclical climate fluctuations. This feature of this group of birds has been discussed in detail in recent decades, and as a result, the concept of cyclical dynamics of waterfowl areas has been developed, which, in most cases, is applicable to shorebirds (Krivenko, 1991;

Mel'nikov, 2009). In accordance with this concept, the development of another warm-dry epoch of a centuries-old climate cycle with a duration of about 2,000 years is very likely to be ending. The lakes of the desert and steppe zones are in damped stages of succession and many shallow lake systems have completely dried up, and the river flow has significantly decreased. To a lesser extent, such changes are characteristic of the northern parts of the forest-steppe, although the level of their irrigation also decreased significantly. Characterized by the expansion to the north of almost all species of shorebirds and waterfowl, and in many cases, forest birds (Kirilyuk at al., 2012; Mel'nikov, 2004; 2009; 2010; 2016a; 2016b; 2018).

Considering these materials, it is necessary to keep in mind that wetland ecosystems are intrasonal habitats found in all natural zones and mountain belts. Therefore, high dynamism of bird areas is possible in them, as a reflection of the qualitative state of the habitats associated with the cyclical development of successions caused by climatic changes. They determine the significant changes in the species structure and distribution of coastal birds. To a much lesser extent, such climate changes are reflected in the primordially desert and steppe species of birds. Their redistribution is observed within the limits of the main habitat zone, and only in extremely unfavorable conditions are some species to fly a long way located beyond the northern boundaries of their ranges. They are characterized by a very high resistance of areas and a high level of adaptation to the habitat in their zones (with the exception of species of wetland ecosystems). Due to the very high rarity in the border areas of different natural areas, their movement is hardly noticeable.

Consequently, for the shorebirds and waterfowl, a dynamical spatial structure is extremely characteristic (Melnikov, 2009). Very strong changes in their areas are observed at the boundaries of climatic cycles not below the secular level, but, as a rule, they are most characteristic of the boundaries of such cycles of centuries-old levels, lasting 1500-2000 years or more (Krivenko, 1991; Melnikov, 2009; 2010; 2016a ; 2016b; 2018). The areas of this group of birds constantly pulsate depending on the prevailing climatic situation. At present, small intrasecular (7–14 years), large intrasectoral (35–40 years, sometimes 19–22 years) and secular (80–120 years) climatic cycles are already confidently distinguished. And only long-term trends of centuries-old climate cycles can determine unidirectional shifts of the boundaries of their areas far to the north or south. The evictions are one of the main adaptations of birds of this complex to living in extremely dynamic and unstable wetland ecosystems. Even within centuries-old climatic cycles, the dynamics of the areas of shorebirds and waterfowl birds has a cyclical character, determining the periodic change of their displacements along the north-south-north type. Perhaps this pattern is also peculiar to birds characteristic of specific natural zones, but this question requires further deeper and longer research.

At the same time, new species of birds registered in Eastern Siberia, as a rule, are very small in number and only a small number of them can reach a noticeable abundance and even nest in separate, most optimal plots of their areas (marsh terns in the Selenga delta and the mouth of the Irkut River). However, some of them can reach the Central Yakut Lowland and nest here in small numbers (Mel'nikov, 2009). Even fewer new species of birds can reach very high abundance. Classical examples, gray heron *Ardea cinerea*, Great Cormorant *Phalacrocorax carbo*, Gray duck *Anas strepera*, *Podiceps cristatus* and some other species. As a rule, all of them are sufficiently stenobiont species and their high numbers are due to mass evictions to the most favorable plots of their areas only during certain periods of their cyclical dynamics. Since this phenomenon is observed in them quite rarely (in cycles not below the age level), over the course of the life of one generation of researchers, an opinion can be formed about the high stability of their areas. And only very long observations allow us to distinguish their cyclical nature, which is characteristic of the main part of the shorebirds and waterfowl.

The very low abundance of new species, characteristic of their main number, even relating to shorebirds and waterfowl, indicates that the centuries-old cyclical dynamics of the areas have been repeated many times already. Even at the optimal stages of centuries-old cycles (maxima of warm-dry phases) for eviction, the climatic changes taking place are reflected little in the optima of their areas, which explains their extremely low numbers in Eastern Siberia at this time. Considering that this is characteristic of the last centuries-old climate cycle, which ends in our time and is characterized by a significant warming of the climate, such small numbers of evictions may be due to the initial low level of abundance. Despite the large number of new species, their overall contribution to the bird population structure is relatively small (if we exclude a very small number of numerous species). They significantly increase and complicate the species richness, but have little effect on the overall abundance of birds. At their main part, the areas are located far from the southern borders of Russia. Nevertheless, the study of this phenomenon has a great scientific interest and allows you to find out a number of issues related to their development of new territories, the dynamics of areas, general changes in population and the nature of the influence of limiting factors in extreme periods of life cycles.

Despite significant changes in the current climate, the general tendency to its warming cannot be considered global. The observed climate fluctuations do not affect the main geospheres of the Earth, including the biosphere. According to leading researchers, such changes cannot be considered global (Levi et al., 2004). Undoubtedly, the Earth's climate has never been constant. It changed all the time and its fluctuations did not always lead to a significant change in the geospheres. An analysis of recent materials based on sufficiently accurate and continuous data suggests that, despite widespread climate change in the northern hemisphere of the Earth, covering very large areas, they are still, so far within the natural limits, repeatedly observed fluctuations.

Such changes have been repeatedly observed throughout the development of human civilization and did not lead to catapult changes in the biosphere. At the same time, the peculiarities of the distribution of flora and fauna over the territory of the Earth, undoubtedly, in such cases changed significantly.

Conclusion

An analysis of all materials collected in Eastern Siberia reliably shows that a well-marked climate warming in the second half of the 20th and early 21st centuries affected, first of all, the boundaries of the areas and numbers of shorebirds and waterfowl. Noticeable changes are typical for all species of birds, but the degree of their documentation does not allow it to be unambiguously shown for many species (especially for birds of forest ecosystems). For the shorebirds and waterfowl, the principal moment determining their noticeable mass evictions to the northern borders of the areas are large and prolonged droughts in Central Asia, occurring at the maximums of warm-dry phases of climatic cycles not below the secular level. However, the most indicative in this respect are the warm-dry phases of centuries-old climate cycles, one of which, with a very high degree of probability, falls on the modern period. To the same extent, this is also true for the maxima of wet-cold periods of cycles of this level, as a rule, attributable to glacial periods.

Significant changes in areas and abundance, as well as characteristic responses of shorebirds and waterfowl to warming, are due to the specificity of their habitats. Wetland ecosystems are intrazonal habitats found in all natural zones and altitudinal belts. This is the reason for the vastness of their areas and the high dynamism of the south-north-south spatial structure.

Changes in the boundaries of their areas have the form of pulsations. However, a pronounced warming in the cycles of centuries-old levels leads to a gradual population of regions of unstable nesting and a shift to the north of the optimum areas. In addition, a marked advance to the north of typically southern bird species is characteristic. The same changes in the areas of native desert and steppe bird species are expressed very weakly. For them, the distribution within their latitude zone is more characteristic, and to their northern borders a very small number of species is evicted, and their numbers here are very small. Despite the currently observed large-scale climate changes, first of all, in the northern hemisphere of the Earth, covering very large areas, they are still within the natural fluctuations that have already occurred repeatedly. Since the noted climate fluctuations do not affect the main geospheres of the Earth (including the biosphere), the general tendency towards climate warming cannot be considered global. Even in the climatic cycles of centuries-old levels, the dynamics of bird areas is cyclical. Every time we undoubtedly deal with their temporary expansion or reduction and increase in numbers, albeit very extensive in time. Within one or two generations of researchers, it is possible to form clear ideas about the sustainable expansion or reduction of the bird ranges, although in reality it is only a matter of the long-term pulsation of their areas.

References

1. Berezhnikh T.V., Marchenko O.Yu., Abasov N.V., Mordvinov V.I. Changes in the summer circulation of the atmosphere over East Asia and the formation of long low-water periods in the basin Selenga river // Geography and natural resources, 2012. № 3. p. 61-68.

2. Voronin V.I., Khantemirov R.M., Naurzbaev M.M. Ultra-long Siberian tree-ring chronologies - reliable archives for paleoclimatic reconstructions // Development of life in the process of abiotic changes on the Earth: materials of the III scientific-practical conference (September 23-30, 2014, Listvyanka, Irkutsk Oblast, Russia). Novosibirsk: Institute Geography of name V.B. Sochava Press, 2014. p. 409-415.

3. Gagina T.N. Birds of Eastern Siberia (List and distribution) // Trudy State Reserve "Barguzinsky", 1961. Vol. 3. p. 99-123.

4. Zherebtsov G.A., Kovalenko V.A., Molodykh S.I., Rubtsova O.A. Patterns of climate change in the XX century and the main physical processes responsible for these changes // Izv. Irkutsk State Universitat. Ser. "Earth Sciences", 2011. Vol. 4, No. 1. P. 87-108.

5. Zherebtsov G.A., Kovalenko V.A., Molodykh S.I., Kirichenko K.E. Influence of solar activity on the temperature of the troposphere and ocean surface // Izv. Irkutsk State Universitat. Ser. "Earth Sciences", 2013. Vol. 6, No. 1. P. 61-79.

6. Kirilyuk V.E., Tkachuk T.E., Kirilyuk O.K. The Impact of Climate Change on Habitats and Biota in Dauria // Problems of Adaptation to Climate Change in Daurian River Basins: Environmental and Water Management Aspects (Proceedings of the State Nature Reserve "Daursky", issue 5). Chita: Publishing house "Express", 2012. P. 4-62.

7. Koshelenko I.V. Drought and Control: Overview. Obninsk: Publishing house VNIIGMI-WDC, 1983. 56 p.

8. Krivenko V.G. Waterfowl and their protection. M.: Publishing house "Agroindustrial",1991. 271 p.

9. Levi K.G., Yazev S.A., Zadonina N.V. Global natural and climatic changes in the history of the Earth - historical monitoring of natural anomalies in Siberia and the possibilities of their prediction // Modern geodynamics and dangerous natural processes in Central Asia. Irkutsk: Institute Earth's Crust Press, 2004. P. 23-46.

10.Levi K.G., Voronin V.I., Miroshnichenko A.I., Kozyreva E.A., Alexandrova A.K. Heliogeodynamics. Natural aspects of global solar minima. Irkutsk: Publishing house of Irkutsk State Universitat, 2017. T. 2, Vol. 1. 547 p.

11. Mel'nikov Yu.I. Extreme droughts and their influence on the nesting areas dynamics of the waders of the Baikal region // Waders Eastern Europe and Northern Asia: study and protection. Ekaterinburg: Ural State Universitat Press, 2004. P. 138-144.

12.Mel'nikov Yu.I. Cyclic climate changes and the dynamics of bird ranges in the south of Eastern Siberia // Palearctic Ornithogeography: Current Problems and Prospects. Makhachkala: Publishing House of the Dagestan State Pedagogic Universitat, 2009. P. 47-69.

13.Mel'nikov Yu.I. The structure of the area and the ecology of the Asiatic Dowitsher Limnodromus semipalmatus (Blyth, 1848). Irkutsk: Scientific Center of the Siberian Branch of the Russian Academy of Medical Sciences, 2010. 284 p.

14.Mel'nikov Yu.I. Modern fauna of birds in the basin of Lake Baikal and features of its formation // Izv. Irkutsk State Universitat. Ser. "Biology. Ecology", 2016a. Vol. 16. P. 62-83.

15.Mel'nikov Yu.I. Modern Climate and Dynamics of Bird Fauna lake Baikal (Eastern Siberia) // Academic science – problems and achievements X: Proc. Conf. (24-25 October 2016, Sc, USA). North Charleston: Create Space Publ., 2016b. Vol. 2. P. 1-13.

16.Mel'nikov Yu.I. New species of birds in the basin of Lake Baikal: analysis of the species and ecological structure // Izv. Irkutsk State Universitat. Ser. "Biology. Ecology", 2018. T. 24. P. 25-48.

17.Mukhina L.I., Preobrazhensky V.S., Tomilov G.M., Fadeeva N.V. Natural zoning // Prebaikalia and Transbaikalia. Natural conditions and natural resources of the USSR. M: Science, 1965. P. 323-336.

18.Obyazov V.A. Climate change and the hydrological regime of rivers and lakes in the Daurian ecoregion // Problems of adaptation to climate change in the Daurian river basins: environmental and water management aspects (Trudy of the State Nature Reserve "Daursky", issue 5). Chita: Publishing house "Express", 2012. p. 24-45.

19.Shimaraev M.N., Starygina L.N. Zonal atmospheric circulation, climate and hydrological processes on Baikal (1968-2007) // Geography and natural resources, 2010. No. 3. P. 62-68.

20.Shnitnikov A.V. The variability of the total moisture content of the continents of the Northern Hemisphere // Zapiski Geographicheskogo obshchestva. New series. M.-L.: Academy of the Sciences USSR Press, 1957. Vol. 16. 336 p.

利用新的复合改良剂提高哈萨克斯坦农业部门的土壤肥力
USING THE NEW COMPLEX MELIORANT TO IMPROVE SOIL FERTILITY IN THE AGRICULTURAL SECTOR OF KAZAKHSTAN

Karpenko Nina Petrovna
Doctor of Technical Sciences, Professor
Russian State Agrarian University
Moscow Timiryazev Agricultural Academy
Moscow, Russia
Seytkaziev Adebai Sadakbaevich
Doctor of Technical Sciences, Professor
Taraz State University named after M.Kh. Dulati
Taraz, Kazakhstan
Egemberdiev Daulet Kanatovich
PhD student
Taraz State University named after M.Kh. Dulati
Taraz, Kazakhstan

注解。 调查了使用哈萨克斯坦Zhambyl地区石膏降解土壤增加其肥力的可能性。 已经提出了一种新的基于磷石膏的复合生物计量器，其可以用作钙和硫的来源并且与牛粪一起使用并添加压碎的骆驼刺。 该方法可以减少氮和有机物的损失，估计为40%。 该方法具有能量效率，改善了土壤的物理化学和生物学性质，并有助于提高作物产量。

关键词：生物多样性，磷石膏，粪肥，产量，腐殖质，作物。

Annotation. Investigated the possibility of using gypsum degraded soils of the Zhambyl region of Kazakhstan to increase their fertility. A new phosphogypsum-based complex biomeliorant has been proposed, which can be used as a source of calcium and sulfur and be used in conjunction with cattle manure with the addition of crushed camel's thorn. This method allows to reduce the loss of nitrogen and organic matter estimated to 40%. The method is energy efficient, improves the physico-chemical and biological properties of the soil and contributes to the increase in crop yield.

Keywords: biomeliorant, phosphogypsum, manure, yield, humus, crops.

In Kazakhstan, almost 200 million hectares of land is under threat of degradation, which is manifested in a high degree of soil salinity and an increase in their area. In these areas there is a significant decrease in land productivity and low yields of agricultural crops. In addition, such processes as soil erosion and deflation (more than 30 million hectares), salinization, chemical pollution and salinization of soils (60 million hectares), dehumification of arable land, etc. are recorded. [1].

In the republic there is an acute problem of restoring degraded lands and increasing their fertility based on the use of new ameliorants, mainly from local waste [2]. One of the ways to solve this problem is to use non-traditional ways to increase the fertility of unproductive land. This method consists in the application of a new biomeliorant containing phosphogypsum, with the simultaneous introduction of organic fertilizer (cattle manure) and the addition of a chopped camel thorn. The composition of the new biomeliorant includes phosphogypsum, which has the ability to form an impermeable film on the surface of a soil with a high content of sodium.

The use of phosphogypsum in agriculture is a promising task not only for the Republic of Kazakhstan, but also in other regions of the world that produce mineral fertilizers. In Kazakhstan, a large amount of phosphogypsum is formed annually (it is formed at landfills and tailing dumps) and its accumulation continues to increase annually by about 1 million tons. Phosphogypsum is a by-product of the chemical industry in the production of phosphoric acid and contains 92% gypsum. Phosphogypsum can be effectively used in the branches of the agricultural sector of Kazakhstan, because it contains a number of valuable components (silicon, iron, titanium, magnesium, aluminum and manganese). In addition, phosphogypsum has a broad advantage over natural gypsum and can be used in agricultural reclamation of saline, unproductive degraded and sodic soils, as well as in order to protect land areas from radiation, during the recultivation of hydrocarbon contaminated soils, etc. [3].

The analysis showed that phosphogypsum can be used: for melioration of salt licks (soil desalinization) mixed with lime for melioration of acidic soils, as part of organic-mineral mixtures and fertilizer ameliorates (1 ton of phosphogypsum contains 0.6 ... 4.5% P_2O_5), for composting with biological products and organic fertilizers, for use as sulfur or silicon fertilizer [4, 5, 6]. It was established that the introduction of phosphogypsum at a dose of 0.2 ... 0.4 t / ha can satisfy the needs of agricultural plants in this element [7]. The need for phosphogypsum agriculture in the country to eliminate alkalinity and soil salinity is estimated at 2.5-3.2 million tons.

When gypsum is applied, a non-impermeable crust is formed on the soil surface and it is very poorly soluble in soil compounds, which slows down the pro-

cess of sodium displacement. In turn, phosphogypsum acts on the soil more effectively than natural gypsum, as it is better dissolved in soil compounds, which is also a source of sulfur and calcium for plant nutrition. The results of the experiments indicate an increase in the effectiveness of biomelioarant with the combined application of manure and phosphogypsum, providing a weak acid reaction, an increased level of Ca and an improvement in the plant availability of sulfur [8, 9].

To study the prospects of using gypsum degraded soils to reduce soil alkalinity and increase their fertility, field experiments were conducted to assess the effect of biomeliorant and phytomelioration on the water-air regime of gray soils, biological activity and yield of fodder crop "African Millet". Experimental experiment was carried out at the site of the landfill of Taraz State University named after M.Kh. Dulati with various agrotechnical methods [10, 11].

In the selected area, the soil cover has the following agrochemical characteristics: the thickness of the humus layer is 107 cm, the humus content is 2.2% (decreasing to 150% at a depth of 150 cm), total nitrogen is 0.15 ... 0.188%, gross phosphorus - 0.29%, mobile phosphorus - 20 ... 22 mg / kg of soil, gross potassium - 1.5 ... 2.0%, pH - 4.8 ... 6.0, physical clay content - 70 ... 75%, density of the upper horizon soil - on average 1.42 g / cm^3, specific gravity of the solid phase of the soil - 2.62 g / cm^3, porosity - 40 ... 50%.

The experiments included the use of various doses of fertilizers in order to study the basic single, complex and integral agrochemical parameters of the soil. The results of the experiments are shown in the table.

The results of field experiments showed that the combined mixing of phosphogypsum and manure, including a significant amount of mineral colloids, with organic waste and camel thorn, leads to intensive aggregation and the creation of favorable soil structure conditions for growing crops. The yield increase is observed by 28.4 ... 35.3% with the introduction of a biomeliorant at the rate of 10 tons per hectare, depending on the method of receiving agricultural technology. When plowing the soil to a depth of 20 ... 25 cm, the yield increases by 35.3%. There is a prolonged moisture retention and the effect of phosphogypsum on low solubility, which has a positive effect on the physical and chemical properties of the soil.

The introduction of the proposed new bio-meliorant into the soil showed that its action markedly improves the structure of the soil cover and improves agronomic indicators. Humates that are introduced into the soil with a biomeliorant are in stable calcium and potassium forms, in contrast to sodium humates contained in the soil environment. This contributes to the fixation of organic matter in the soil and the improvement of the soil structure, air and food regime [12].

Table - *Doses of biomeliorant introduction into the soil and its agrochemical characteristics*

№ № п/п	Dose making biomeliorant t / ha in liquid form in a ratio of 1:20	Ways loosening	Field germination at %	Height before 1st cut, cm	Height before the 2nd cut, cm	Green weight 1st cut centners per hectare	Green mass 2nd mowing centners per hectare	Yield seed, centners per hectare	Percent increase yield,%
1	control	Loosening to a depth of 8-12 cm chisel	70	83	76	80	84	20,4	–
2	5		83	97	91	93	88	25,6	25,4
3	10		89	99	94	95	90	26,2	28,4
4	15		88	98	93	94	92	25,8	25,5
5	5	Plowing to a depth of 20-25cm	84	99	94	96	91	27,1	32,4
6	10		93	102	96	101	93	27,6	35,3
7	15		91	99	95	95	95	26,5	28,6

Improvement of soil agrochemical parameters occurs as a result of the formation and structure formation of the colloidal fraction, which are formed in the presence of fyushogypsum dihydrate, saturation of the soil absorbing complex with phosphogypsum and the introduction of valuable nutrient biogenic elements (phosphorus, potassium, etc.) with the biomeliorant [13].

Conclusion. The use in the agricultural sector of the proposed complex biomeliorant, produced by anaerobic fermentation with simultaneous application of cattle manure and shredded camel thorn, leads to a significant improvement in the physicomechanical properties of saline and sodic soils and its structure. Through the use of technology with the use of a new biomeliorant, the structure of the pore space of the soil is improved, the content of stable biological valuable microaggregates increases, their water resistance increases, moisture capacity improves, and porosity significantly increases, which has a positive effect on the development of root mass of plants. The introduction of the proposed biomeliorant helps to increase the amount of nutrient organic substances and increase the biological activity of the soil. Thus, the proposed technology with the use of a new biomeliorant on the unproductive and degraded lands of the Zhambyl region of Kazakhstan allows increasing soil fertility and increasing the yield of agricultural products.

References

1. Vereshchagin A.N. Chemical melioration of solontsovs of the steppe zone of Northern Kazakhstan. Dissertation's abstract. - Novosibirsk. - 1987. - 19 p.

2. Temporary methodological guidelines for conducting soil-reclamation surveys, drawing up design estimates and melioration of alkaline soda-saline irrigated soils of the Kazakh SSR. - Alma-Ata. - 1985. - 84 p.

3. Zinkovskaya T.S. The effect of the joint use of phosphate rock and phosphogypsum on acidic soils // In the book. Problems of reclamation of household waste, industrial and agricultural production. - Krasnodar. - 2010. - p. 161-163.

4. Muravev E.I., Dobrydnev E.P., Belyuchenko I.S. Prospects for the use of phosphogypsum in agriculture // Ecological Bulletin of the North Caucasus. - 2008. - Vol.4. - № 1. - p. 31-39.

5. Muravev E.I. Effect of phosphate fertilizer production wastes on surrounding landscapes. - Krasnodar: Publishing house KubGAU. - 2008. - 358 p.

6. Muravev E.I., Dobrydnev E.P., Belyuchenko I.S. Prospects for the use of phosphogypsum in agriculture // Ekol. Herald Sev. Caucasus. - 2007. - Vol.4. - № 1. - p. 107-115.

7. Aristarkhov A.N. Agrochemistry of sulfur. - Moscow: VNIIA. - 2007. - 272 s.

8. Okorkov V.V. Prospects and ways of using phosphogypsum on acid soils // In the book. Problems of reclamation of household waste, industrial and agricultural production. - Krasnodar. - 2010. - p. 156-161.

9. Kremzin N.M. Fertilizer and chemical melioration of sodic soils of Kuban, used under rice // Abstract. Cand. diss. - Moscow. - 1990. - 23 p.

10. Baibekov R.F., Shilnikov I.A., Akanova N.I. and others. Scientific and practical recommendations on the use of phosphogypsum neutralized as a chemical ameliorant and sulfuric fertilizer. - Moscow: VNIIA. - 2012. - 42 p.

11. Gukalov V.V. The effect of phosphogypsum on the development and productivity of winter wheat // I Vseros. scientific conference "Problems of reclamation of household waste, industry and agricultural production." - Krasnodar: Publishing house KubGAU. - 2009. - pp. 32-34.

12. Belyuchenko I.S., Gukalov V.V., Melnik O.A. et al. Influence of phosphogypsum on the development and yield of winter wheat sowings // Ecological Bulletin of the North Caucasus. - 2009. - Vol.5. - №1. - p. 84-86.

13. Belyuchenko I.S., Muravev E.I. Influence of industrial and agricultural waste on the physico-chemical properties of soils // Ecological Bulletin of the North Caucasus. - 2009. - Vol.5. - № 1. - p. 84-86.

模糊公式中逆多阶段赋值问题的研究
INVESTIGATION OF THE INVERSE MULTI-STAGE ASSIGNMENT PROBLEM IN A FUZZY FORMULATION

Osipov Gennadiy Sergeevich
Doctor of Technical Sciences, Head of the Department
Sakhalin State University

注解。 阐述了在具有模糊对应关系的多阶段公式中求解逆分配问题的理论和方法论基础。 提出了将耗时的逆问题引入优化问题的概念，即使在使用经典搜索方法时任务具有空集解决方案时也能保证找到所需的匹配。 Wolfram Mathematica符号数学包中模糊关系方程求解方法的实践认识。

关键词：逆分配问题，模糊匹配。

Annotation. *Theoretical and methodological bases of the solution of the inverse assignment problem in a multi-stage formulation with fuzzy correspondences are formulated. The concept of bringing the time-consuming inverse problem to the optimization problem is proposed, which guarantees finding the desired match even when the task has an empty set of solutions when using classical search methods. Practical approbation of the method of solving fuzzy relational equations in the symbolic mathematics package of Wolfram Mathematica.*

Keywords*: inverse assignment problem, fuzzy matches*.

One of the most important components of modern intellectual expert and advisory systems is the procedure for solving inverse problems (problems of "diagnostics"), which are fundamentally difficult and weakly structured due to the incompleteness and inaccuracy of the information used.

Therefore, the purpose of this study is to develop a methodological framework and study one of the important tasks of the decision-making theory - the assignment problem, given that the decision usually has to be taken in fuzzy conditions.

Let be $\left(M = M_0\right), M_1, M_2, ..., M_{s-1}, \left(M_s = N\right)$ – finite clear sets.

The inverse problem is investigated:

$$\tilde{X} \circ \tilde{\mathbf{A}} = \tilde{Y}, \tag{1}$$

where $\tilde{X} = \tilde{X}\left(M, M_1\right) = \iint\limits_{M \times M_1} \frac{\mu_{\tilde{X}}\left(m_0, m_1\right)}{\left(m_0, m_1\right)}; m_{(\square)} \in M_{(\square)}$ – incoming corre-

spondence with the field of departure M - a multitude of applicants for the occupation of target professional activities;

$\tilde{\mathbf{A}} = \overset{s-1}{\underset{t=1}{\circ}} \iint\limits_{M_t \times M_{t+1}} \frac{\mu_{\tilde{A}_t}(m_t, m_{t+1})}{(m_t, m_{t+1})}; m_{(\square)} \in M_{(\square)}$ – the sequence of compositions of fuzzy correspondences that determine the stages of evaluation of applicants on a cascade of various indicators;

$\tilde{Y} = \tilde{Y}(M, N) = \iint\limits_{M \times N} \frac{\mu_{\tilde{Y}}(m_0, m_s)}{(m_0, m_s)}; m_{(\square)} \in M_{(\square)}$ – targeted compliance with the area of departure M and the area of arrival N - the list of areas of professional activity.

For example, when $s = 3$, equation (1) takes the form:

$$\tilde{X}(M, M_1) \circ \underbrace{\tilde{A}_1(M_1, M_2) \circ \tilde{A}_2(M_2, N)}_{\tilde{\mathbf{A}}} = \tilde{Y}(M, N) \tag{2}$$

The semantic interpretation of the sets M_1 and M_2 is determined by the specifics of the problem being solved, for example, it can be a list of mastered academic disciplines and a set of competences or skills associated with academic disciplines obtained in the learning process.

For specificity, let the matrix representations of correspondences be given:

$$A_1 = \begin{pmatrix} 0.7 & 0.9 & 0.6 \\ 0.8 & 0.6 & 1.0 \\ 0.6 & 0.9 & 0.6 \\ 0.7 & 0.8 & 0.5 \end{pmatrix}, \quad A_2 = \begin{pmatrix} 1.0 & 0.8 \\ 0.7 & 0.9 \\ 0.5 & 0.9 \end{pmatrix}, \quad Y^0 = \begin{pmatrix} 0.7 & 0.8 \\ 0.8 & 0.9 \end{pmatrix}.$$

Table 1 shows examples of applying to the equation (2) the implications in the form of the most frequently used in practice triangular norms.

Table 1

Use of various triangular norms

***t*- norm**	**Equations** $\left(i=1,2\left(j=1,2\right)\right)$
$T_M\left(a,b\right)=\min\left(a,b\right)$	$\max\left(\min\limits_{k=1,4}\left(x_{ik},\max\left(\min\limits_{l=1,3}\left(a_{kl},b_{lj}\right)\right)\right)\right)=y_{ij}^0$
$T_P\left(a,b\right)=a\cdot b$	$\max\limits_{k=1,4}\left(x_{ik}\cdot\max\limits_{l=1,3}\left(a_{kl}\cdot b_{lj}\right)\right)=y_{ij}^0$
$T_W\left(a,b\right)=\max\left(a+b-1,0\right)$	$\max\left(\max\limits_{k=1,4}\left(x_{ik}+\max\left(\max\limits_{l=1,3}\left(a_{kl}+b_{lj}-1,0\right)\right)-1,0\right)\right)=y_{ij}^0$

In this case, the inverse problem reduces to two (*i = 1, 2*) independent systems of two (*j = 1, 2*) equations. The sets of solutions to the inverse problem are presented in table 2.

Table 2

Problem Solving with Different Implications

***t*-norm**	**Many solutions**
T_M	$\left\{\begin{array}{l}\left[\begin{array}{llll}0\le x_{11}\le 0.8 & 0\le x_{12}\le 0.7 & \left[\begin{array}{l}0\le x_{13}\le 0.8\\ x_{13}=0.8\end{array}\right. & \begin{array}{l}0.8\le x_{14}\le 1\\ 0\le x_{14}\le 1\end{array}\\ x_{11}=0.8 & 0\le x_{12}\le 0.7 & 0\le x_{13}\le 0.8 & 0\le x_{14}\le 1\end{array}\right.\\ \left[\begin{array}{llll}0\le x_{21}<0.9 & \left[\begin{array}{l}0.8\le x_{22}<0.9\\ 0.9\le x_{22}\le 1\end{array}\right. & \begin{array}{l}0.9\le x_{23}\le 1\\ 0\le x_{23}\le 1\end{array} & \begin{array}{l}0\le x_{24}\le 1\\ 0\le x_{24}\le 1\end{array}\\ 0.9\le x_{21}\le 1 & 0.8\le x_{22}\le 1 & 0\le x_{23}\le 1 & 0\le x_{24}\le 1\end{array}\right.\end{array}\right.$
T_P	$\left\{\begin{array}{l}\left[\begin{array}{llll}0\le x_{11}<0.99 & \left[\begin{array}{l}0\le x_{12}<0.88\\ x_{12}=0.88\end{array}\right. & \begin{array}{l}x_{13}=0.99\\ x_{13}=0.99\end{array} & \begin{array}{l}x_{14}=1\\ 0\le_{x14}\le 1\end{array}\\ x_{11}=0.99 & \left[\begin{array}{l}0\le x_{12}<0.88\\ x_{12}=0.88\end{array}\right. & \begin{array}{l}0\le x_{13}\le 0.99\\ 0\le x_{13}\le 0.99\end{array} & \begin{array}{l}x_{14}=1\\ 0\le x_{14}\le 1\end{array}\\ 0\le x_{21}\le 1 & x_{22}=1 & 0\le x_{23}\le 1 & 0\le_{x24}\le 1\end{array}\right.\end{array}\right.$
T_W	$\varnothing$

Currently, there is no universal effective method for solving inverse problems in fuzzy formulation. Necessary and sufficient conditions for the existence of solutions are given, for example, in [1].

To search for the desired match (if the inverse problem is unsolvable), an auxiliary optimization problem is formulated [2]:

$$\begin{gathered}(D,f): f=\left\|X \circ \mathrm{A}-Y^{0}\right\| \rightarrow \min \\ D=\left\{x \in X: \forall x \in[0,1]\right\}\end{gathered}, \tag{3}$$

where $Y^{0}(M,N)$ – observable (target) match.

Solving problem (3) allows us to find a match *X*, which provides the minimum deviation of the solution to the inverse problem (1) from the observed match Y0.

Table 3 shows the solutions of the problem (3) with the initial data used by the Nelder-Meade method in the *Wolfram Mathematica* symbol math package [3].

Table 3.

Optimization Problem Solutions

***t*-norm**	**Optimization problem solution**
T_M	$X=\begin{pmatrix}0.65 & 0.60 & 0.80 & 0.40\\ 0.90 & 0.86 & 0.77 & 0.60\end{pmatrix}$
T_P	$X=\begin{pmatrix}0.99 & 0.55 & 0.80 & 1.00\\ 0.70 & 1.00 & 0.65 & 0.90\end{pmatrix}$
T_W	$X=\begin{pmatrix}0.95 & 0.35 & 0.90 & 0.60\\ 0.50 & 1.00 & 0.00 & 0.85\end{pmatrix}$

Note that the problems of this class are characterized by a “plateau problem”. By varying the custom parameters of the method, one can obtain a set of solutions (if it exists) with a zero value of the objective function. Obviously, the solution of the optimization problem using the boundary product T_W can be obtained only with the value of the optimization criterion greater than zero.

The developed theoretical and methodological bases for solving the assignment inverse problem are unified, practically tested in the package of symbolic mathematics and can be applied to a wide range of problems associated with the synthesis of fuzzy expert, advising and diagnostic systems.

References

1. Osipov G.S. The study of correspondences in the task of fuzzy diagnostics // "Questions of modern science": kolkt. scientific monograph; [ed. HER. Enikeeva]. - Moscow: Internauka, 2018. - Vol. 29. p. 41-62. DOI: 10.18411 / InterNauka-2018-29. idSP: http://sp-identifier.ru/000001interNauka-2018-29

2. Osipov G.S. The problem of fuzzy diagnostics as an optimization problem // European Journal of Technical and Natural Sciences, Premier Publishing s.o. Vienna. 4. 2018, Pp. 29-32. DOI: 10.29013 / EJTNS-18-4-29-31

3. Osipov G. S., Vashakidze N. S., Filippova G. V. On the solution of inverse problems for fuzzy correspondences in the Wolfram Mathematica environment // Postulate. - 2018. - No. 1 (27). P. 42. DOI: 10.18411 / Postulat-2018-1. idSP: http://sp-identifier.ru/000001postulat-2018-1

逻辑风险拒绝方案的分析评估
ANALYTICAL ASSESSMENT OF LOGICAL SCHEMES FAILURE RISK

Hinova Antoaneta Ivanova
PhD of Electronics Engineering
Assistant in the Department of Mechanical Engineering, Computer Systems and Elecrical Engineering
Technical College - Lovech

摘要。 该方法用于设计电子电路。 检查在逻辑电路的转换过程中信号在电路的各个元件中的传播时间的影响。 提出了对这些时间延迟导致的故障的分析分析。 一个例子也用于通过改进光学元件基础来对抗故障。

关键词: 失效，保留，分析评估，建模

Summary. *The method is used in designing electronic circuits. The effect of the propagation time of the signal in the individual elements of the circuit in the transition processes in the logic circuits is examined. An analytical analysis of failure resulting from these time delays is proposed. An example is also used to combat failures by improving the optic element base.*

Key words: *failure, retention, analytical assessment, modeling*

The boolean algebra used to model the operation of digital circuits does not take into account the transition time (inertia) of the logical element. This is actually the transition time of transition from one state to another (e.g. 0 in 1). When the propagation time of the signal inside the element is small enough, the transition inhibition may not be read. But with increasing the frequency of change of input signals in real circuits, the effect of the propagation time of the signal inside its elements begins to be reflected [1]. Such delays may cause unstable operation of devices (i.e. in the signals, after unsuccessful passage through the nodes of the scheme, distortions, not known by the pattern of the scheme, called crashes or failures) appear. Contemporary processors keep secret methods to combat damage caused by delays in frequencies of the GHz range. An ordinary connecting wire with very close turns on the circuit board in this operating mode is now becoming an inductance. The classic risk analysis of crashes is the time diagrams. The output signals are represented by the laws of the boolean algebra. Working with charts may lead to an error in the

output signals and does not give information about possible crashes. For a more accurate analysis, it is possible to move from a graphical to an analytical mathematical method by introducing the parameter "time", by replacing logical operations with arithmetic. Fighting failures are also brought about by improving the element base.

In the bipolar power switches to reduce power consumption by devices operating in standby mode and powered by autonomous sources, the power supply to some units is interrupted (eg, only a timer is left). Frequency of crashes in case of necessity to bipolar voltage is increasing as a lot of difficulties arise. Low power relay in this case is not applicable due to the low switching current, but a more powerful relay reduces the efficiency of the whole scheme. The use of transistor keys complicates the management process of the negative side of the circuit increases the risk of failures.

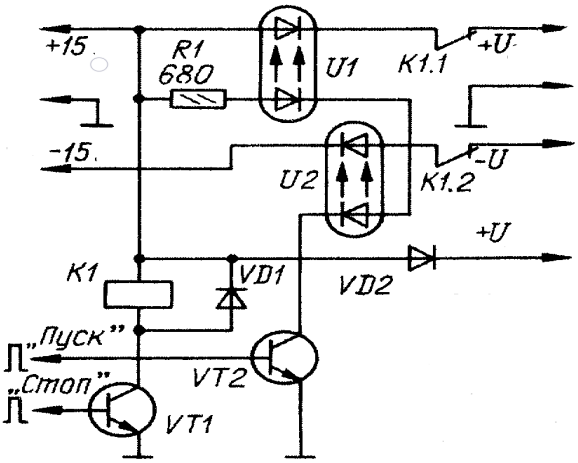


***Fig.1**. Reduce the risk of failures by optocouplers*

The failures are increased and in case of incorrect polarity of the power supply, the transistor switches do not protect the circuit in this case. By using thyristor optocouplers, connecting conductors are avoided and the risk of failure is largely eliminated. With the input signal the optics distributors are switched on and the voltage is applied to the load. The power is unlocked via a short-time signal at the Stop input. In this case, the current of the units of the apparatus, which operate continuously, flows through the D2 diode. Such a circuit solution reduces the risk of failure and saves the load at the wrong input polarity of the power supply. The resistor R1 is selected based on the maximum allowable current through the optocouplers' LED. The current through the distributors should not, on the one hand, exceed the maximum value and on the other hand be less than the detention current of Shockley diodes.

For the simplicity of the failure analysis of digital circuits, an asynchronous logic circuit can be considered, i. no external clock signal. The transition to analysis of boolean functions by arithmetic representation requires the input of the set M. It defines the operations negativity, conjunction, disjunction and derivatives of them (eg implication, exclusion or etc.) Let us express these logical operations by the arithmetic set M :

$$\begin{aligned} &\overline{x} = 1 - x, \\ &x \wedge y = x \cdot y, \\ &x \vee y = x + y - x \cdot y. \end{aligned} \tag{1}$$

We check according to Morgan's law:

$$x \wedge y = \overline{\overline{x} \vee \overline{y}} \tag{2}$$

We prove that:

$$\overline{\overline{x} \vee \overline{y}} = 1 - \overline{x} \vee \overline{y} = 1 - (1 - x + 1 - y - (1 - x) \cdot (1 - y)) = x \cdot y = x \wedge y. \tag{3}$$

The expression of the boolean function, which is a function of the inputs of the scheme, can now be simplified by the laws of arithmetic actions and rules. After simplification, it can go back to Boolean presentation. In this case, the minimization process can be automated by moving to symbolic calculations. Enter the algebra parameter time-τ. As is known, the single step function or Hevesidade function is defined as the plurality of the real numbers, returns a number belonging to the set M:

$$h(t) = \begin{cases} 1, & t \geq 0, \\ 0, & t < 0. \end{cases} \tag{4}$$

We denote current time with t. The function (4) is also called the exclusion function. Then each signal in the logic scheme, including a transition from one logical state to another, can be presented as an aliasing sum by the Heaviside function taken with a corresponding argument.

For h, the rule applies:

$$\prod_{i=1}^{n} h(t - \tau_i) = h\left(t - \max_{i=\overline{1,n}} \tau_i\right), \tag{5}$$

where the time of the signal change occurs

- time of the time when it causes a signal change. the signal. Rule (5) to (1) and (2) is added.

Once the analytical expression for the input signal of the logic circuit is known, the function of the output signal can be found.

Retaining the signal in the logical element is conveniently modeled as the difference between the argument of the Heaviside function and the retention time. This follows from the fact that the logical elements exist staying at transition from 0 to 1 i.e. to a high level and to a transition from 1 to 0, i. to a low level, is the same. Therefore, each logical element can be modeled as a sequential union of a unit, "a clear delay at each input, and an ideal logical element. With the ideal logical element, delay is equal to the duration of retention [2]. For example, the equation of the output signal of the connector at the input t is the type

$$y_c = f_1(t-\tau)\cdot f_2(t-\tau), \quad (6)$$

where f1 (t) and f2 (t) are functions describing the corresponding input signals.

Based on the above considerations, a fault search algorithm can be compiled. It is analogous to the time diagrams method. The advantage of the method is that it does not work with timing of the signals but with their analytical expressions. This gives rise to an analytical assessment of the temporary failure characteristics. The method is based on the following basic steps:

1. Let the studied scheme function in accordance with some logical expressions. Set as primary functions.

2. Function input signals representing transitions in the table of authenticity expressed by Heaviside function are provided by functions;

3. Follow the path of following the signals in the logic scheme to find expression for the output of the scheme by applying rules (1) and (3).

4. If there is a difference in Heaviside function in the resulting equation, there is a static refusal, and if Heaviside's function is present with a hold argument, the refusal is dynamic. An example of a logic scheme analysis is the study of the transition from combination 1111 to 1001 of the truth table shown in Figure 2.

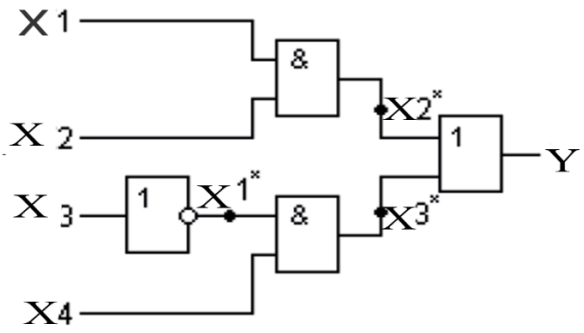


Figure 2 *Diagram of the logical function studied*
The function is being tested.

$$Y = X_1X_2 \vee \overline{X_3}X_4 \tag{7}$$

Let's present the state change at a time equal to 5 temporary units:

$$\begin{aligned} X_1 &= 1, \\ X_2(t) &= 1 - h(t-5), \\ X_3(t) &= 1 - h(t-5), \\ X_4 &= 1. \end{aligned} \tag{8}$$

It is assumed that all have equal detention equal to τ. Then

$X_1^*(t) = 1 - (1 - h(t-5-\tau)) = h(t-5-\tau),$

$X_2^*(t) = 1 \cdot (1 - h(t-5-\tau)) = 1 - h(t-5-\tau),$

$X_3^*(t) = X_1^*(t-\tau) \cdot 1 = h(t-5-2\tau),$

$Y(t) = X_2^*(t-\tau) + X_3^*(t-\tau) - X_2^*(t-\tau) \cdot X_3^*(t-\tau) = 1 - h(t-5-2\tau) +$
$+h(t-5-3\tau) - (1 - h(t-5-2\tau)) \cdot h(t-5-3\tau) = 1 - h(t-(5+2\tau)) +$
$+h(t-(5+2\tau)) \cdot h(t-(5+3\tau)) = 1 - h(t-(5+2\tau)) + h(t-(5+3\tau)).$

In the final result a static refusal occurs, the expression is a difference in the function of Heviside.

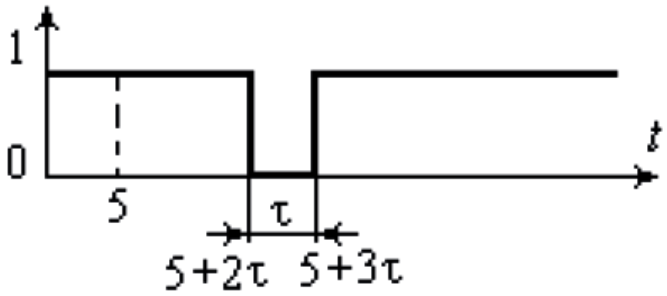


Fig. 3). *Y signal timing graph Y (t).*

CONCLUSION

The method allows for an analytical assessment of the temporary characteristics of the rejection by replacing logical operations with arithmetic. The switching of logical elements from one state to another is investigated with Heaviside function. This feature provides an opportunity for analytical analysis of the rejection characteristics of the logical elements in the schematics. The application of the methodology assists the accuracy of the reliability indicators of the design schemes.

References

[1] Zhilevska M., M. Zhilevski, Investigation of Reliability of Work for Class Milling Machines, Proceedings of the International Scientific Conference "Unitech - Gabrovo", 2017, ISSN 1313-230X.

[2] Hristov V., M. Zhilevski, Expansion of programming possibilities of programmable logical devices through Matlab, Yearbook of Technical University - Sofia, vol. 68, no. 2, 79-88, Sofia, 2018, ISSN 13110829.

[3] | Judd E. Power Supply, BFU, Bourgas, 2003

[4] Rubzov N. Mathematical Modeling, Science, M. 1999

[5] Mano M. Digital design, Wright sity. MO. USA

在住宅区技术检查中使用雷达图像的可能性
THE POSSIBILITY OF USING RADAR IMAGES IN THE TECHNICAL EXAMINATION OF RESIDENTIAL AREAS

Saitev Mikhail Revich
Master student
Moscow State University of Geodesy and Cartography
Moscow, Russia
Dedyukhova Polina Alekseevna
Postgraduate
Izhevsk State Technical University named after M.T. Kalashnikov,
Izhevsk, Russia

注解。改革俄罗斯联邦住房存量的问题需要详细研究可能的实施方案，以及全面的工具性解决方案。

国家住房部门发展的变化取决于国家和科学计划，以便一致地重建第一批质量系列的房屋，随后进行大规模维修，以满足现代质量标准。

根据2018年8月1日住房和公共服务改革基金会的统计，在过去十年中，有超过180万人居住的公寓楼（或超过3000万平方米的住房）被认可紧急情况。除了处于紧急状态的住宅建筑外，还有大量房屋的修复期已达25年。

目前，高层公寓楼的虚线建筑有一种趋势，在居民区内有一个整体框架，对土壤地块进行长期技术开发，在此过程中，技术过程的组织发生了根本性的变化。检查建筑物和结构。这方面加剧了现有住宅建筑的技术状况，地面上的额外压力，这导致出现新的物理恶化迹象并导致支撑结构的破坏。

不是对BCH 57-88（p）规定的现有建筑物和结构的技术条件进行仪器控制，而是根据对开发地点和设施的设施进行岩土工程监测，编制关于新建筑可能性的技术结论。靠近设计的建筑。确定岩土监测需求的主要因素是竖立结构的责任水平：КС-3（增加）和КС-2（正常）。

同时，长期运行现有建筑物和结构的工作没有每年两次强制检查，没有对支撑结构的确定缺陷进行持续的仪器监测，这些缺陷目前不是计划系统的基础。和恢复措施。

关键词：技术沉降，技术检测，填充，流变土壤变化，城市规划，稳定反射器法，雷达测量。

Annotation*. The issue of overhauling the housing stock of the Russian Federation requires a detailed study of possible implementation options, as well as a comprehensive instrumental solution.*

Changes in the development of the country's housing sector depend on state and scientifically based programs for the consistent reconstruction of houses of the first mass series with subsequent major repairs that meet modern quality standards.

Over the past decade, according to the Foundation for Assistance to the Reform of Housing and Communal Services on August 1, 2018, about 88,000 apartment buildings (or more than 30 million square meters of housing), inhabited by over 1.8 million people, were recognized as emergency. In addition to residential buildings in emergency condition, there is a huge number of homes with an expired repair period of 25 years.

Currently, there is a trend in the dotted construction of high-rise apartment buildings with a monolithic frame inside residential neighborhoods with a long-term technogenic exploitation of soil massifs, in connection with which a fundamental change occurs in the organization of the process of technical inspection of buildings and structures. This aspect exacerbates the technical condition of existing residential buildings, additional stress on the ground, which leads to the emergence of new signs of physical deterioration and leads to the destruction of supporting structures.

Instead of the instrumental control of the technical condition of existing buildings and structures regulated by the BCH 57-88 (p), a technical conclusion on the possibility of new construction is compiled on the basis of geotechnical monitoring of the development site and facilities located in close proximity to the designed building. The main factor determining the need for geotechnical monitoring is the levels of responsibility of the erected structure: KC-3 (increased) and KC-2 (normal).

At the same time, the operation of existing buildings and structures for a long time is carried out without mandatory inspections twice a year, without constant instrumental monitoring of the identified defects of the supporting structures, which are not currently the basis of the system of planned and restoration measures.

***Keywords**: technogenic subsidence, technical inspection, suffusion, rheological soil changes, urban planning, method of stable reflectors, radar survey.*

Prior to the beginning of the 90s of the last century, housing development was carried out by microdistricts with the complex organization of design and construction and installation works. Thus, within the residential areas of the residential zone there were large tracts of soil with disturbed filtration paths, low-rise buildings of kindergartens and schools, as well as reserve sites for the development of engineering and social infrastructure. By the end of the 80s of the last century, problems with subsidence of bases caused by the processes of suffusion under low-rise buildings of kindergartens and schools located inside the “sleeping” neighborhoods were observed in residential buildings of the 60s and 70s. The situation was aggravated by the erection of “dot building” in the immediate vicinity of high-rise residential buildings.

In order to resolve the issue of the technical possibility of compacting the building, the demolition of the existing renovation programs contributed to improving the quality of construction and reliability of the existing building, it is necessary to conduct a comprehensive survey using instrumental monitoring of changes in the physical and mechanical characteristics of the soil massif, but the entire microdistrict along the filtration path drains

The determination of the exact cause of the existing deformations and defects should be made on the basis of instrumental examination, taking into account the rheological changes of the base, that is, when compared with the mechanical characteristics of the bases at the time of build-up. Only in this case, the measures taken to eliminate the defects will be of a long-term quality. The process of improving the structure of housing, considered as an integrated system, can be represented in the form of work on the modernization of existing housing [3].

The purpose of this study is to study the possibility of using radar images to obtain reliable data, with a comprehensive technical survey. The result of the study are recommendations for conducting a technical survey, using the method of interferometry of stable reflectors to monitor the deformation of the earth's surface. In this case, there is an analytical study, that is, the study aims not only to describe the state of the object, but also to identify the causal relationships that underlie the phenomenon or process and allow us to determine its predictive state. [4].

The method of stable reflectors (Persistent scatterer, PS) is a method for calculating the displacements of point targets, which are permanent reflectors for a radar satellite. Allows you to measure the detailed displacements on the infrastructure [1].

Stable reflectors are points on the radar image that retain temporal coherence from snapshot to snapshot [1].

The objects that perform the functions of stable reflectors are the walls and roofs of residential buildings in the microdistrict, in which it is necessary to conduct a comprehensive technical survey.

One of the key aspects of the technical survey should be the analysis of the entire adjacent territory, which is advisable to perform at the stage of preliminary design when tying a new structure. This is necessary in order to establish the causes and patterns of the proliferation of defects, the development of which may exacerbate new construction.

This is due to the redistribution of deformations in the thickness of the ground, changes in the filtration of internal effluents, which not only can “strike” into the bearing thickness of the existing building, but also contribute to the formation of lenses and inclusions of subsiding soil at the base, primarily low-rise structures that are not capable of their own weighing sufficiently consolidate the base. A relatively small weight of its own weight in a small and medium-storey residential building of buildings does not allow squeezing out moisture in the zone of the stress-deforming section surrounding the foundations.

Each new building being erected, a dotted building, directly affects not only nearby existing objects, but also other structures adjacent to a building development microdistrict. However, the main deformations will occur in them not only during the construction of a new facility or during the period of running-in of the building after commissioning. The main changes in the soil mass will occur during the normal operation of the constructed object.

On April 3, 2014, the European Space Agency (ESA) launched the radar satellite Sentinel-1A into orbit. He became the first in the satellite constellation of the global monitoring of the environment and safety Copernicus. Sentinel-1A is developed by Thales Alenia Space. Radar equipment with synthesized aperture C-SAR (developed by Astrium), which provides all-weather, as well as round-the-clock delivery of satellite images, is installed on board [2].

Radar survey - a type of aerospace survey carried out by a radar - an active microwave sensor capable of emitting and receiving polarized radio waves reflected from the earth's surface in a certain wavelength (frequency) range. That is, the brightness radar images encoded the amount of reflected radiation, but not solar, as in the usual for us pictures in the visible range, and the radiation generated by the radar [5].

Table 1 discusses the advantages and disadvantages of radar imagery.

Table 1

Advantages and disadvantages of radar survey

№	Virtues	Disadvantages
1	Independence from urban density conditions	The complexity of the thematic interpretation of the data
2	Independence from light conditions	Influence of a relief and a tilt angle, the considered terrain
3	Independence from weather conditions	The difficulty in the selection of data corresponding to the terrain, without tolerance of discrepancies between the images
4	The opportunity to explore a large area of urban development	Noisy data
5	Cost effective execution and data collection	Possible errors
6	Saving human resources to perform the type of work under consideration	The need for additional work on the processing of data
7	The possibility of obtaining reliable aggregated data for the group of sites considered	Negative influence of the surface roughness

Approbation of the use of radar images is reflected in the research study of I.V. Onkov "Evaluation of the accuracy of building a digital elevation model using

radar interferometry using ALOS / PALSAR images" [6]. The study is devoted to the study of the accuracy of the data, and the possibility of determining the displacements of the earth's surface over large areas.

The territory selected for building the DEM is the city of Perm and its suburbs, 30 by 25 km in size and 750 square kilometers in size, of which about 10% are occupied by multi-storey urban buildings, 20% are suburban areas with rural-type buildings, 30% are agricultural land and 40% are woodlands. The overall elevation difference within the selected area is approximately 160 m. [6].

As a result of the study of the obtained data, the following conclusions were made:

1. The reliability and accuracy of the results directly depends on the reliability of information about the area in question, its topography and elevation transmission;

2. To improve accuracy, you can perform averaging of heights obtained in different pairs of images;

3. The difference in the nature of the terrain and reflective surfaces affects the appearance of errors and errors.

The study of the results of the study allows to approve the assumption about the possibility of using radar images in the technical examination of residential areas, as well as to track the change in the deformation of the earth's surface.

Thus, the use of radar images by the method of stable reflectors will allow to study the change of deformations of the earth's surface not for each house separately, but for the whole microdistrict, taking into account such factors as the construction of a point building near the considered microdistrict. This will save time on an analytical study of the problem of the occurrence of deformations, search for causes, and corresponding defects.

During the consideration of the issue, the following recommendations were formulated on the introduction of modern methods of tracking deformations in a comprehensive survey of residential neighborhoods, in order to get a general picture of changes in the level of the earth's surface:

1. Work on the technical survey should be carried out in a complex throughout the neighborhood, to obtain reliable information on changes in the level of the earth's surface;

2. The study of data, obtaining a method of stable reflections should be based on a field technical survey of each house separately;

3. The results of the integrated technical survey data should include additional study of the rheological changes of the soil, as well as additional laboratory study of the composition of the soil, the territory under consideration.

References

1. Mikov L.S. Application of the method of interferometry of stable reflectors for monitoring the deformation of the earth's surface // Processing of spatial data in the tasks of monitoring natural and anthropogenic processes: Collection of papers of the All-Russian Conference / Novosibirsk, Institute of Computational Technologies SB RAS - Novosibirsk, 2017. - P.131-133.

2. Myshlyakov S. G. Possibilities of Sentinel-1 radar images for solving problems of agriculture // Geomatics. - 2016. - №2. P.16-24.

3. "Comprehensive assessment and selection of design solutions in construction", NL Taranukha, P.N. Papunidze, monograph. - IzhSTU, Izhevsk, 2009. 204 p.

4. Asaul, A.N. Marketing management in construction . - SPb: Humanistic, 2007. - 248 p.

5. Radar data in geographic research and mapping. Access mode: http://www.geogr.msu.ru/cafedra/karta/materials/radiolocation/files/1razd/1.1.osnovy_osob.html#RL (appeal date 01/27/2019)

6. Onkov I.V. Assessment of the accuracy of building a DEM using radar interferometry using ALOS / PALSAR images // Geomatics. - 2012. - №3. p.35-41.

基于谷物原料的非酒精饮料商业报价结构的分析评估
ANALYTICAL ASSESSMENT OF THE STRUCTURE OF THE COMMERCIAL OFFER OF NON-ALCOHOLIC BEVERAGES BASED ON GRAIN RAW MATERIALS

Rainik Vitaly Sergeevich
Postgraduate
Sergeeva Irina Yurievna
Doctor of Technical Sciences, Head of the Department
Kemerovo State University
Kemerovo, Russia

注解。 对基于植物原料的非酒精饮料的商业报价结构的分析评价使得可以识别市场上存在的产品的优点和缺点，扩大范围的方向。 比较评价的对象是果冻，谷物饮料，植物奶。 考虑了集团，制造商（俄罗斯）的kissels贸易提案和发布形式。 分析谷物饮料的成分组成。 考虑了蔬菜奶市场的趋势。 长期的消费趋势和谷物饮料市场的动态表明了巨大的潜力。

关键词：软饮料，谷物饮料，植物奶，果冻，市场

Annotation*. Analytical evaluation of the structure of the commercial offer of non-alcoholic beverages based on vegetable raw materials makes it possible to identify the advantages and disadvantages of the products present in the market, the directions for expanding the range. The objects of comparative evaluation were jelly, cereal drinks, vegetable milk. Considered the trade proposal of kissels by group, manufacturer (Russia) and the form of release. The ingredient composition of cereal drinks is analyzed. Trends in the vegetable milk market are considered. Long-term consumer trends and the dynamics of the grain beverage market indicate great potential.*

Keywords: *soft drinks, cereal drinks, vegetable milk, jellies, market*

The initial stage of any research is devoted to designating the relevance of a product creation technology based on monitoring the current state of this area using open access sources.

Analytical evaluation of the structure of the commercial offer of non-alcoholic beverages based on vegetable raw materials makes it possible to identify the advantages and disadvantages of the products present in the market, the directions

for expanding the range. As a result, an evidentiary component of the perspective of a new high-quality product appears, with elevated nutritional value and the absence of deficiencies in the identified analogous products.

The objects of comparative evaluation were jelly, cereal drinks, as well as the currently popular drink under the brand "non-milk" - vegetable milk.

The kissel sales offer is subdivided into the following groups: dry quick-squeezed kissels, dry bulk kissels requiring boiling, dry briquetted kissels, bottled kissels ready to eat. The quantitative ratio of various groups of jelly present on the market is presented in Figure 1.

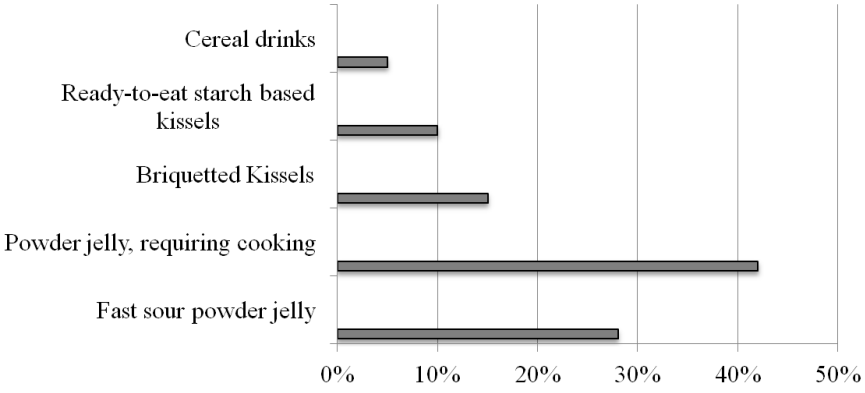


Figure 1 - *The quantitative ratio of the various groups of jelly and cereal beverages present on the market (for example, the trading rooms of Kemerovo, Δ ± 5.0%)*

The procedure for bringing to the culinary readiness of the drink is a determining component in the percentage distribution of the kissel groups. So, dry powdered jellies are the simplest in this respect. What can not be said for the briquetted product - it must first be crushed in order to avoid clumping of the finished drink.

The package volume of jelly in the form of powder and briquette is designed by the manufacturer for 3-4 servings, which is convenient for family use. While mono-portioned quick-bake kissels are characterized by the simplest cooking scheme in a mug and are convenient for a light snack on the road or in the office.

It should be noted that recently the production of finished bottled kissels has become popular. Such a drink is ready to use and thus attractive to the buyer, since, unlike dry semi-finished products, it does not require preparation costs. Characteristics of the range of jelly on such indicators as the manufacturer (Russia) and the form of release is presented in Figure 2 (for example, large trading halls in Kemerovo).

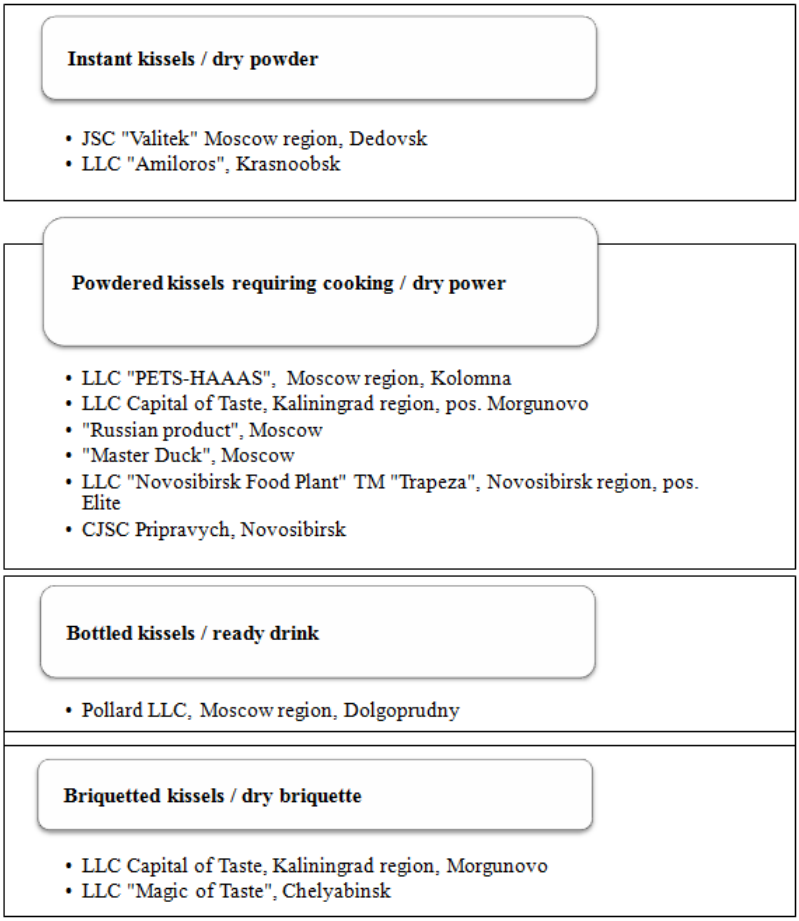


Figure 2 - *Characteristics of the assortment of jelly (by manufacturer (Russia) and release form)*

When analyzing the chemical composition of jelly offered on the market, general trends were identified. The main ingredient is starch. The formulation is represented by sugar, citric acid and flavoring additives. Dried juices, extracts of natural juices, natural and identical natural flavors, natural and identical to natural dyes - are the components that are involved in the formation of the flavor profile of the product.

To this end, manufacturers use flavors that match the traditional fruit and berry raw materials. The offered assortment is presented by jelly with the taste of apple,

raspberry, apricot, pear, strawberry, black and red currant, cranberry, cherry, lingonberry, peach. An exotic set of flavors such as pineapple, passion fruit, mango, etc., is not represented.

On the labels of some jelly in the "nutritional value" section contains information on the presence of vitamins. However, with respect to dry jelly, when bringing it to culinary readiness with the help of temperature processing, the final fortification of the drink is doubtful. The elimination of this drawback allows the release of bottled jelly.

The composition of cereal drinks of domestic producers includes cereal base (oatmeal, oat bran), flavor additives and probiotic cultures of microorganisms.

The composition of foreign drinks is similar. The basis is water and oatmeal in the amount of 10.0 - 11.5%. In the formulation there is also vegetable oil and sea salt.

The main disadvantage of cereal drinks is the high cost - an average of 200-250 rubles. per unit of packaging in 1 liter.

The vegetable milk product segment on the Russian market is a relatively new, rapidly developing vector due to the current movement of vegetarianism and proper nutrition. Such drinks are also valued among people suffering from lactose intolerance, and the category of consumers who, for one reason or another, refused to dairy products. Currently, the share of vegetable milk among traditional cow's milk is about 1%. At the same time, the structure of the vegetable milk market in Russia for 2017 shows that oat milk accounts for 15% of the share of this segment [1]. Actively conducted studies of the functional and technological properties of oats and its products [2]. Therefore, at present there is a steady tendency to strengthen the vector of using oats and its products in the food industry.

The countries of Europe for a long time were suppliers of vegetable milk to Russia. On the modern domestic market there appeared analogues of this drink. The most common foreign product that can be found in almost all large trading floors is the vegetable milk from the Belgian company Alpro. At the same time, the popular and advanced Russian brand is the oat vegetable milk of the brand “Nemoloko”, produced by the company “Sady Pridonya”. The price category of imported drinks is 230-290 rubles per liter, Russian counterparts are often 1.5 - 2 times cheaper.

The National Food Group “Sady Pridonya” is currently not the only Russian producer of oat milk. On the market are other manufacturers who are not so advanced in the retail network, and provide their products on the Internet. These are mainly online health food stores. The same product can be purchased on the websites of the manufacturers themselves.

Among such manufacturers are Soyuzpischeprom LLC, Alev agribusiness holding, Biofoodlab snack and bar company, Volkomolko LLC.

Among the manufacturers and their brands of vegetable milk products, an analysis of formulations was made. It has been established that some manufacturers do not use any technological additives, except salt. An insignificant part of the producers add juices to the recipes of their drinks, the majority enrich the product with vitamin-mineral premixes.

Long-term consumer trends and the dynamics of the development of the vegetable milk market indicate a great potential [1].

References.

1. Business research: vegetable milk in Russia is gaining popularity. - Access mode: https://marketpublishers.ru/

2. Oat and its products. - Access Mode: http://vniiz.org/science/

UDC: 536.755

工程计算中的耗散函数
DISSIPATIVE FUNCTION IN ENGINEERING CALCULATIONS

Habibova Natalia Zamilovna
Ph.D, Associate Professor of the Department
of processes and devices of chemical technology
Russian University of Chemical Technology
named after D.I. Mendeleev, Moscow
Moskvichev Stanislav Sergeevich
Assistant of the Department of Physical Chemistry
Russian University of Chemical Technology
named after D.I. Mendeleev, Moscow

注解。 本文讨论了计算耗散函数的方法，作为过程不可逆性的定量测量。 重点是基于理论模型设置任务并概述解决它们的方法。 给出了计算圆柱形反应器壁中导热过程的局部和整体耗散的数值例子。

关键词：不可逆性原理，耗散函数，局部熵产生，热通量密度。

Annotation. *The article discusses the method of calculating the dissipative function as a quantitative measure of the irreversibility of processes. The focus is on setting the tasks and outlining the methods for solving them, based on a theoretical model. A numerical example is given of the calculation of the local and integral dissipation of the process of thermal conductivity in the wall of a cylindrical reactor.*

Keywords*: principle of irreversibility, dissipative function, local entropy production, heat flux density.*

Thermodynamics of irreversible processes as an independent field of knowledge began to develop relatively recently. An essential contribution to its scientific substantiation and further consistent application was the phenomenological theory and the method of dissipative functions developed on its basis.

A special place in this doctrine is occupied by the works of Gibbs, who created the foundations of thermo-dynamic equilibrium in inhomogeneous systems, which stimulated the study and quantitative description of the patterns of energy and matter transfer.

Meanwhile, in the presentation of issues relating to the practical application of thermodynamic regularities and kinetic relationships near the equilibrium in the courses of physical chemistry, technical thermodynamics, theoretical foundations of energy and resource saving in chemical technology is still an element of descriptiveness. Many significant achievements in the development of engineering calculation methods remain not generalized, but are the achievements of a small number of specialists working in this field. The authors of the article aim to draw attention to this existing gap and give an example of a systematic presentation of the method for calculating energy dissipation on a specific example. In this case, it is advisable to focus on the practical, engineering aspects of the problem. It is proposed to consider the general questions of the theory concerning thermodynamic regularities and kinetic relationships in the processes of energy and substance transfer in the volume that is necessary to justify the computational methods set forth in the article.

A common characteristic of the occurrence of irreversible processes in continuous systems is the local production of entropy J_S^V whose value is associated with the dissipative function $\dot{\Psi}^V$ as follows (1):

$$\dot{\Psi}^V = T \cdot J_S^V, \quad (1)$$

where $\dot{\Psi}^V$ – dissipative function of the elementary volume of the system, W/m^3; T – absolute temperature for a heterogeneous (heterogeneous) system, K.

Differential equations of mass balance, energy, entropy and kinetic relations of local velocities of heat transfer processes, components of matter and momentum near equilibrium, as well as the Gibbs equation allow us to obtain an analytical expression for the dissipative function in a generalized form (2):

$$\dot{\Psi}^V = \sum_{i=1}^{n} J_i \cdot X_i, \quad (2)$$

where J_i is the local speed of the process, X_i is the driving force.

From equation (2) it follows that the dissipative function $\dot{\Psi}^V$ equal to the sum of the products of local velocities of processes J_i by their own driving forces X_i, presented in a form that allows to obtain the dimension of dissipation (W/m^3). In the equilibrium system, there is a uniform distribution of intense parameters and, as a result, the absence of relaxation processes and the forces identical to these processes, which keep the system in equilibrium, i.e. $J_i = 0$ and $X_i = 0$.

Generally local velocity near equilibrium can be represented as a linear relation (3):

$$J_i = \sum_{k=1}^{n} L_{ik} \cdot X_k, \quad (3)$$

where J_i – local speed of the i-th process, which in general depends on all driving forces X_k, L_{ik} – phenomenological coefficients of proportionality, which may be functions of the state of the object, but do not depend on the driving forces X_k.

For non-conjugate processes, the speed depends only on its own driving force X_i (4):

$$J_i = L_{ii} \cdot X_i, \tag{4}$$

where L_{ii} – phenomenological coefficients of proportionality, which are related to the thermal conductivity coefficients λ, the diffusion coefficient D_j of the *j*-th component, the viscosity of the medium μ, the rate constants of the forward and reverse reactions $\vec{k}$ and $\overleftarrow{k}$. The calculated ratios for the dissipative function in the processes of heat transfer, the component of a substance, impulse, chemical transformations near equilibrium can be represented as the following expression (5):

$$\dot{\Psi}^V = \vec{q} \cdot \left(-\frac{\vec{\nabla}T}{T}\right) + \sum_{j=1}^{m} \overrightarrow{J_j^{\text{дф}}} \cdot \left(-\vec{\nabla}\mu\right)_{T,p} + \sum_{r=1}^{f} J_{jr}^V \cdot A_r + \left(-\sigma \cdot \vec{\nabla}\right) \cdot \vec{\vartheta} \tag{5}$$

So the driving force for heat exchange is $X = -\frac{\vec{\nabla}T}{T}$; for mass transfer - $X_j = \left(-\vec{\nabla}\mu\right)_{T,p}$, where μ_j – chemical potential of the j-th component of the system; for chemical transformations – $X_r = A_r$, where A_r – chemical affinity, characterizing the degree of completeness of a chemical reaction. In accordance with equation (3), we have (6):

$$A_r = -\sum_{k=1}^{n} \nu_{kr} \cdot \mu_k, \tag{6}$$

where ν_{kr}– the stoichiometric coefficients of substance k in the considered reaction r, μ_k – chemical potential of all components.

For viscous flow processes, the local dissipative function (the Rayleigh function) is equal to the product of the momentum flux σ_{ij} in the plane of the velocity profile of the moving medium and the cause — the velocity deformation. Taking into account the tensor nature of the pulse, we obtain (7):

$$\dot{\Psi}^V = -\left(\sigma \cdot \vec{\nabla}\right) \cdot \vec{\vartheta} = \sum_{i=1}^{n=3} \sum_{j=1}^{m=3} \sigma_{ij} \left[-\frac{1}{2}\left(\frac{\partial \vartheta_i}{\partial x_j} + \frac{\partial \vartheta_j}{\partial x_i}\right)\right], \tag{7}$$

where $X_{ij} = -\frac{1}{2}\left(\frac{\partial \vartheta_i}{\partial x_j} + \frac{\partial \vartheta_j}{\partial x_i}\right)$.

The dissipation value Ψ for the thermodynamic system as a whole can be determined by the distribution of the local dissipative function Ψ^V across the whole volume V (8):

$$\dot{\Psi} = \int_0^V \dot{\Psi}^V dV = \int_0^V T \cdot J_S^V dV = \bar{T}_{\text{т/д}} \cdot {}_{in}\dot{S}, \tag{8}$$

where $\bar{T}_{\text{т/д}}$ – average thermodynamic temperature, K; ${}_{in}\dot{S}$ – entropy increment rate in the entire system under consideration due to internal irreversible processes, W/K.

To obtain an analytical ratio and determine the numerical value of dissipation, two calculation methods are used. The first method is based on the integration of a local dissipative function over the entire volume of the system under consider-

ation. The second method consists in using the integral balance equations of mass, energy, entropy, exergy for a fixed control volume of a nonequilibrium thermodynamic system. The advantage of the first method lies in its clarity and ability to reveal the internal logic of the derivation of the basic laws of the process. Let us analyze this approach on a specific example of dissipation of internal energy in the process of thermal conductivity: obtain an analytical and numerical solution for the value of local and integral energy dissipation in the wall of a tubular reactor, if the value of the heat flux density on the outer surface of the pipe is known q'= - 60 kW/m^2, the temperature of this surface is $T_{CT} = T_{HAP} = 873$ K, outer $d_{\text{H}} = 0.1$ m and inner $d_{\text{BH}} = 0.08$ m diameters, pipe length $L = 40$ m, wall thermal conductivity $\lambda = 23.8$ W/(m·K).

In the technique of heat transfer at a constant heat flux density, walls are encountered in many cases: during electrical heating, radiation heating, heating in nuclear reactors and in countercurrent heat exchangers, when the mass consumed heat capacities (product of mass flow to heat capacity) of heat transfer media are the same. there is another boundary condition - a constant temperature of the external surface of the pipe along the entire length of the reactor. Such a boundary condition is also often found in practice, for example, in such heat exchangers as evaporators, condensers, and in all heat exchangers, when the mass consumption heat capacity of one heat carrier is much larger than that of another [2, p. 135].

Note that the relations for the dissipative function (2) given in the article are the simplest linear combination of the terms of each individual gradient (temperature, concentration, velocity), although it is known that various forms of energy transfer are interrelated. In the problem under consideration, there is only a temperature gradient, and, according to the Fourier law, the heat flux density is determined by equation (9):

$$\vec{q} = -\lambda \cdot \vec{\nabla} T, \tag{9}$$

where the temperature gradient in a one-dimensional (radial) problem is defined simply as:

$$\vec{\nabla} T = \vec{l_r} \cdot \frac{\partial T}{\partial r}$$

We draw the temperature distribution along the pipe radius for the selected boundary conditions (Fig. 1).

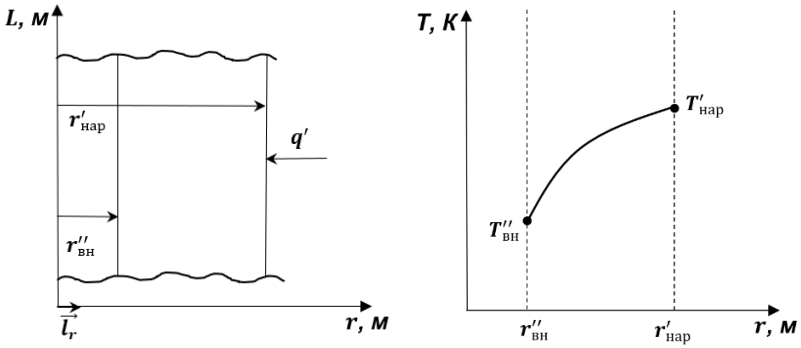


Fig. 1. *Temperature distribution along the pipe radius provided that q', T'_{HAP} and λ are constant*

The local dissipative function according to equation (9) is equal to:

$$\dot{\Psi}^V = \vec{q} \cdot \left(-\frac{\vec{\nabla}T}{T}\right) = \frac{\lambda}{T}\left(\vec{\nabla}T\right)^2 \geq 0 \tag{10}$$

For a one-dimensional problem with a boundary condition of the second kind, the temperature distribution in a cylindrical tube of radii r has the form (11):

$$T(r) = T'_{нар} - \frac{q' \cdot r'_{нар}}{\lambda} ln \frac{r}{r'_{нар}}, \tag{11}$$

where is the condition $q' = -\lambda\left(\frac{\partial T}{\partial r}\right)_{r=r'_{нар}} = const,$ runs regardless of the mode of flow of the medium along the entire surface of the wall of length l.

Differentiating and solving equation (11) with respect to $\frac{\partial T}{\partial r}$, we get (12):

$$\frac{\partial T}{\partial r} = -\frac{q' \cdot r'_{нар}}{\lambda} \cdot \frac{1}{r} \tag{12}$$

Substituting the expression $\frac{\partial T}{\partial r}$ into equation 10, we get (13):

$$\dot{\Psi}^V = \frac{\lambda}{T}\left[-\frac{q' \cdot r'_{нар}}{\lambda} \cdot \frac{1}{r}\right]^2 \left(\vec{l_r}\right)^2, \tag{13}$$

where the square of the unit radiant vector is 1 $\left(\vec{l_r}\right)^2 = 1$:

$$\dot{\Psi}^V = \frac{\lambda}{T}\left[-\frac{q' \cdot r'_{нар}}{\lambda} \cdot \frac{1}{r}\right]^2 = \frac{\left[-q' \cdot r'_{нар}\right]^2}{T \cdot \lambda \cdot r^2}$$

We see that the expression data for the direct determination of the numerical value of the local dissipative function on the outer and inner walls of the reactor tube is very convenient. Perform these calculations:

$$r = r'_{\text{нар}} = 0{,}05 \text{ м} \qquad T = T'_{\text{нар}} = 873 \text{ К}$$

$$\dot{\Psi}^V = \frac{\left[-q' \cdot r'_{\text{нар}}\right]^2}{T'_{\text{нар}} \cdot \lambda \cdot {r'_{\text{нар}}}^2} = \frac{(q')^2}{T'_{\text{нар}} \cdot \lambda} = \frac{(-60 \cdot 10^3)^2}{873 \cdot 23{,}8} = 173{,}27 \ \frac{kW}{m^3}$$

$$r = r'_{\text{вн}} = 0{,}04 \text{ м} \qquad T = T''_{\text{вн}}$$

$$T''_{\text{вн}} = T'_{\text{нар}} - \frac{q' \cdot r'_{\text{нар}}}{\lambda} ln \frac{r''_{\text{вн}}}{r'_{\text{нар}}} = 873 - \frac{-60 \cdot 10^3 \cdot 0{,}05}{23{,}8} ln \frac{0{,}04}{0{,}05} = 844{,}88 \text{ К}$$

$$\dot{\Psi}^V = \frac{(q')^2}{T'_{\text{нар}} \cdot \lambda} \cdot \left(\frac{r'_{\text{нар}}}{r''_{\text{вн}}}\right)^2 = \frac{(-60 \cdot 10^3)^2}{844{,}88 \cdot 23{,}8} \cdot \left(\frac{0{,}05}{0{,}04}\right)^2 = 279{,}72 \ \frac{kW}{m^3}$$

To determine the integral value of dissipation in the pipe wall long $l = 1\,m$ provided $T'_{\text{нар}} = 873$ К, $q' = -60 \ \frac{\text{kW}}{\text{m}^2}$ and $\lambda = 23{,}8 \ \frac{\text{W}}{\text{m·К}}$ we get:

$$\dot{\Psi}_l = \int_0^V \dot{\Psi}^V dV = \int_{r'_{\text{нар}}}^{r''_{\text{вн}}} \frac{\left[-q' \cdot r'_{\text{нар}}\right]^2}{T \cdot \lambda \cdot r^2} 2\pi r \cdot l \cdot dr$$

$$\dot{\Psi}_l = \frac{\left[-q' \cdot r'_{\text{нар}}\right]^2}{\lambda} 2\pi l \int_{r'_{\text{нар}}}^{r''_{\text{вн}}} \frac{dr}{T \cdot r}$$

To determine the integral $\int_{r'_{\text{нар}}}^{r''_{\text{вн}}} \frac{dr}{T \cdot r}$ it is necessary to replace the variable from (12):

$$\frac{dr}{r} = -\frac{\lambda}{q' \cdot r'_{\text{нар}}} dT$$

Then:

$$\dot{\Psi}_l = \frac{\left[-q' \cdot r'_{\text{нар}}\right]^2}{\lambda} 2\pi l \int_{T'_{\text{нар}}}^{T''_{\text{вн}}} \left(-\frac{\lambda}{T \cdot q' \cdot r'_{\text{нар}}}\right) dT$$

Dissipation per 1 meter of pipe:

$$\dot{\Psi}_l = -q' 2\pi r'_{\text{нар}} l \cdot ln \frac{T'_{\text{нар}}}{T''_{\text{вн}}} = -(-60 \cdot 10^3 \cdot 2 \cdot 3{,}14 \cdot 1 \cdot 0{,}05) \cdot ln \frac{873}{844{,}88} = 617{,}84 \ \frac{\text{W}}{\text{m}}$$

The dissipation along the entire length of the reactor tube is:

$$\dot{\Psi} = L \cdot \dot{\Psi}_l = 617{,}84 \cdot 40 = 24713{,}6\ W \approx 25\ kW$$

In the example proposed in the article, the authors strive to reveal the internal logic of the main thermodynamic conclusions and kinetic relations, illustrating the wide possibilities of practical application of the dissipative function method. A powerful tool for research is mathematics, armed with supercomputers. At present, information technologies have been developed to such an extent that the experiment's share of the classic role of verifying the theoretical model remains for the experiment. Engineering analysis will ensure a successful solution of the task, only if not only the values of the quantities sought are determined, but also the degree of their reliability and the possibility of practical implementation.

References

1. Bikkin, H.M., Lyapilin, I.I. Nonequilibrium thermodynamics and physical kinetics. - Ekaterinburg: Ural Branch of RAS, 2009. - 500 p.

2. Case V.M. Convective heat and mass transfer. - Moscow: Energy, 1972. - 448 p.

3. Parmon V.N. Thermodynamics of non-equilibrium processes for chemists. - Dolgoprudny: Publishing House "Intellect", 2015. - 474 p.

4. Prigogine I., Condepudi D. Modern thermodynamics. From heat engines to dissipative structures. Per. from English Yu.A. Danilova and V.V. White. - Moscow: Mir, 2009. - 461 p.

5. Haase R. Thermodynamics of irreversible processes. - Moscow: Mir. - 1967. - 544 p.

6. N. Habibova Analysis of non-equilibrium processes of compression of non-ideal gas [Text]: examples and objectives / comp. N. Z. Habibova. - Moscow: RHTU. Publ. Center, 2007. - 51 p.: il. - Bibliogr: p. 51.

7. Khabibova, N. Z., Method of Dissipative Functions, as the Main Principle of Quantitative Evaluation of the Degree of Irreversibility of the Energy and Substance Conversion Processes, Chemical Technology and Biotechnology of New Materials and Products. Collection of theses of reports of the IX International Conference of the D.I. Mendeleev Russian Chemical Society. - 2018. - RHTU them. D.I. Mendeleev, 2018 Moscow, 2018. - p. 56-58.

在随机环境中返回应用程序的重试队列
RETRIAL QUEUE WITH RETURN OF APPLICATIONS IN RANDOM ENVIRONMENT

Vavilov Viacheslav Anatolevich
PhD in Physics and Mathematics
Associate Professor of the Department of Software Engineering
National Research Tomsk State University

抽象。 在本文中，我们考虑重试队列，其中传入的新呼叫根据泊松过程到达设备。 如果设备处于空闲状态，则来电占用设备或者在设备忙碌时加入轨道。在轨道上，呼叫重试占用设备，其行为与新呼入呼叫相同。 服务应用程序永久离开系统或以随机时间间隔返回以进行重新服务。系统在随机环境中运行。 随机外部因素会影响应用程序的服务时间。 随机环境的数学模型是马尔可夫链。 对于该系统，我们获得了装置状态的概率分布，渐近平均特征，与平均值的偏差。

关键词：重试队列，排队系统，轨道，随机环境，扩散近似，渐近分析，马尔可夫链，变量参数，来电，去电，应用泊松流。

Abstract. *In this paper, we consider a retrial queue, where incoming fresh calls arrive at the device according to a Poisson process. An incoming call either occupies the device if it is idle or joins an orbit if the device is busy. From the orbit, a call retries to occupy the device and behaves the same as a fresh incoming call. Served application leaves the system permanently or return for re-servicing at a random time interval The system operates in a random environment. Random external factors affect the service time of applications. The mathematical model of a random environment is a Markov chain. For this system we obtained probability distribution of the states of the device, asymptotic mean characteristics, deviations from the mean.*

Keywords: *retrial queue, queuing system, orbit, random environment, diffusion approximation, asymptotic analysis, Markov chain, variable parameters, incoming calls, outgoing calls, Poisson flow of applications.*

Introduction. In this paper, we study retrial queue that are models of a wide class of real service systems such as banks, employment centers, and others. In these systems, the serviced customer may leave the system permanently or return for re-servicing at a random time interval. For example, a bank customer may re-

apply for a new loan. Also customer of the employment center can apply again for a new job. At present, the effectiveness of the functioning of such systems is very important, that's why there is a lot of research on retrial queues [1, 2]. In addition, the functioning of the systems under consideration depends on random factors that directly affect the success and time of service. Generally, such factors are called a random environment. Information on the functioning of retrial queue operating in random environment is of great practical interest.

Purdue P. the first introduced the concept of a queuing system in a random environment [3]. The first work about characteristics of queuing system in a random environment was an article by Yechiali U. and Naor P. [4]. There are Markov chain-based queuing system at a two-state investigated. This result was soon generalized in the papers of Yechiali U. [5], where the Markov chain with an arbitrary finite number of states was used as the controlling process.

The Markov chain with continuous time can be considered as a mathematical model of a random environment. This approach is used also in [6-8]. At the same time, there are generalizations of the Markov chain in the form of a semi-Markov process, for example in [9].

The problem of developing new and modifying available research methods for retrial queue, including those operating in a random environment, is quite relevant. In the proposed work, the main method of research is the method of asymptotic analysis [10], which makes it possible to find the main probabilistic characteristics in the asymptotic conditions.

1. Mathematical model. Consider a retrial queue with an incoming flow of Poisson with the parameter λ. An application received for a free device begins to be serviced with exponentially distributed service time with parameter μ. Upon completion of a successful service, the application leaves the system permanently with probability *r* or goes to orbit with probability 1 - *r*. Applications are re-submitted to the device after an accidental delay. The delay time has an exponential distribution with the parameter γ. The number of applications in orbit denote *i*. Also denote the state of the device: $k = 0$, if it is free, $k = 1$, if it is busy servicing the application. The system operates in a random environment. The mathematical model of a random environment is a Markov chain *s(t)* with states $s = 1, 2,..., S$ and continuous time. At the same time, infinitesimal characteristics are specified as $q_{s_1 s_2}$. Random environment affects the functioning of the system,

such as $\mu = \mu(s)$, $\gamma = \gamma(s)$, $\lambda = \lambda(s)$.

A random process $\{k(t), i(t), s(t)\}$ is a continuous time Markov chain.

Let be $P(k(t) = k, i(t) = i, s(t) = s) = P_k(i, s, t)$.

Condition must be met $\sum_{k=0}^{1} \sum_{i=0}^{\infty} \sum_{s=1}^{S} P_k(i, s, t) = 1$.

The probability distribution $P_k(i,s,t)$ satisfies the Kolmogorov's system:

$$\frac{\partial P_0(i,s,t)}{\partial t}+(\lambda(s)+i\gamma(s))P_0(i,s,t)=(1-r)\mu(s)P_1(i-1,s,t)+$$

$$+r\mu(s)P_1(i,s,t)+\sum_{s_1=1}^{S}q_{s_1s}P_0(i,s_1,t),$$

$$\frac{\partial P_1(i,s,t)}{\partial t}+(\lambda(s)+\mu(s))P_1(i,s,t)=\lambda(s)P_0(i,s,t)+$$

$$+(i+1)\gamma(s)P_0(i+1,s,t)+\lambda(s)P_1(i-1,s,t)+\sum_{s_1=1}^{S}q_{s_1s}P_1(i,s_1,t).$$

Denote $\gamma(s)=\gamma\sigma(s)$, will get

$$\frac{\partial P_0(i,s,t)}{\partial t}+(\lambda(s)+i\gamma\sigma(s))P_0(i,s,t)=(1-r)\mu(s)P_1(i-1,s,t)+$$

$$+r\mu(s)P_1(i,s,t)+\sum_{s_1=1}^{S}q_{s_1s}P_0(i,s_1,t),$$

$$\frac{\partial P_1(i,s,t)}{\partial t}+(\lambda(s)+\mu(s))P_1(i,s,t)=\lambda(s)P_0(i,s,t)+$$

$$+(i+1)\gamma\sigma(s)P_0(i+1,s,t)+\lambda(s)P_1(i-1,s,t)+\sum_{s_1=1}^{S}q_{s_1s}P_1(i,s_1,t).$$

This system is investigated by the method of asymptotic analysis [10] provided $\gamma\to 0$.

Let be $\gamma=\varepsilon^2$, $\varepsilon^2 t=\tau$, $\varepsilon^2 i=x+\varepsilon y$, $\frac{1}{\varepsilon}P_k(i,s,t)=H_k(y,s,\tau,\varepsilon)$.

Get the system

$$\varepsilon^2\frac{\partial H_0(y,s,\tau,\varepsilon)}{\partial\tau}-\varepsilon x'(\tau)\frac{\partial H_0(y,s,\tau,\varepsilon)}{\partial y}+$$

$$+(\lambda(s)+\sigma(s)(x+\varepsilon y))H_0(y,s,\tau,\varepsilon)=(1-r)\mu(s)H_1(y-\varepsilon,s,\tau,\varepsilon)+$$

$$+r\mu(s)H_1(y,s,\tau,\varepsilon)+\sum_{s_1=1}^{S}q_{s_1s}H_0(y,s_1,\tau,\varepsilon),$$

$$\varepsilon^2\frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial\tau}-\varepsilon x'(\tau)\frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial y}+(\lambda(s)+\mu(s))H_1(y,s,\tau,\varepsilon)=$$

$$=\lambda(s)H_0(y,s,\tau,\varepsilon)+\sigma(s)(x+\varepsilon(y+\varepsilon))H_0(y+\varepsilon,\tau,\varepsilon)+$$

$$+\lambda(s)H_1(y-\varepsilon,s,\tau,\varepsilon)+\sum_{s_1=1}^{S}q_{s_1s}H_1(y,s_1,\tau,\varepsilon). \quad (1)$$

Further research is carried out with this system.

2. Asymptotic mean characteristics. Asymptotic mean characteristics are the probability distribution $R_k(x)$ of device states and function $x = x(\tau)$. The limiting process $x(\tau) = \lim_{\varepsilon \to 0}\left(\varepsilon^2 i(\tau/\varepsilon^2)\right)$ is the asymptotic average of the normalized number of applications in the system. We will prove that it is a deterministic function. In system (1) we make the limit

$$\lim_{\varepsilon \to 0} H_k(y,s,\tau,\varepsilon) = H_k(y,s,\tau),$$

get the system

$$(\lambda(s)+\sigma(s)x)H_0(y,s,\tau) = \mu(s)H_1(y,s,\tau) + \sum_{s_1=1}^{S} q_{s_1 s} H_0(y,s_1,\tau),$$

$$\mu(s)H_1(y,s,\tau) = (\lambda(s)+\sigma(s)x)H_0(y,s,\tau) + \sum_{s_1=1}^{S} q_{s_1 s} H_1(y,s_1,\tau). \qquad (2)$$

The solution $H_k(y,s,\tau)$ of system (2) will be sought in the following form

$$H_k(y,s,\tau) = Q_k(x,s)H(y,\tau). \qquad (3)$$

Function $H(y,\tau)$ is a probability density of process values. Function $Q_k(x,s)$ is two-dimensional probability distribution of instrument states *k* and states *s* of a random environment. Determined by the system

$$(\lambda(s)+\sigma(s)x)Q_0(x,s) = \mu(s)Q_1(x,s) + \sum_{s_1=1}^{S} q_{s_1 s} Q_0(x,s_1),$$

$$\mu(s)Q_1(x,s) = (\lambda(s)+\sigma(s)x)Q_0(x,s) + \sum_{s_1=1}^{S} q_{s_1 s} Q_1(x,s_1) \qquad (4)$$

and condition

$$\sum_{k=0}^{1}\sum_{s=1}^{S} Q_k(x,s) = 1. \qquad (5)$$

Denote

$$\sum_{k=0}^{1} Q_k(x,s) = r(s), \qquad \sum_{s=1}^{S} Q_k(x,s) = R_k(x). \qquad (6)$$

Function $R_k(x)$ is a probability distribution of device states. Function $r(s)$ is a probability distribution of a random environment states.

The following conditions must be met

$$\sum_{s=1}^{S} r(s) = 1, \qquad \sum_{k=0}^{1} R_k(x) = 1. \qquad (7)$$

Sum up the equations of the system (4) by *s*, take into account (6), denote

$$\sum_{s=1}^{S}\lambda(s)Q_k(x,s)=\varphi_k R_k(x),\ k=\overline{0,1},$$

$$\sum_{s=1}^{S}\sigma(s)Q_0(x,s)=\Xi R_0(x),\qquad \sum_{s=1}^{S}\mu(s)Q_1(x,s)=\psi R_1(x), \tag{8}$$

in this case, the system (4) takes the form

$$(\varphi_0+x\Xi)R_0(x)=\psi R_1(x), \tag{9}$$

System (9) and condition (7) gives the solution

$$R_0(x)=\frac{\psi}{\varphi_0+\psi+x\Xi},\qquad R_1(x)=\frac{\varphi_0+x\Xi}{\varphi_0+\psi+x\Xi}. \tag{10}$$

In system (1), expand the functions $H_k(y\pm\varepsilon,s,\tau,\varepsilon)$ in a series in increments of the argument y to within $o(\varepsilon)$, will get

$$-\varepsilon x'(\tau)\frac{\partial H_0(y,s,\tau,\varepsilon)}{\partial y}+(\lambda(s)+\sigma(s)(x+\varepsilon y))H_0(y,s,\tau,\varepsilon)=$$

$$=\mu(s)H_1(y,s,\tau,\varepsilon)-(1-r)\mu(s)\varepsilon\frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial y}+\sum_{s_1=1}^{S}H_0(y,s_1,\tau,\varepsilon)q_{s_1s}+o(\varepsilon),$$

$$-\varepsilon x'(\tau)\frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial y}+\mu(s)H_1(y,s,\tau,\varepsilon)=\lambda(s)H_0(y,s,\tau,\varepsilon)+\sigma(s)(x+\varepsilon y)H_0(y,s,\tau,\varepsilon)+$$

$$+\varepsilon x\sigma(s)\frac{\partial H_0(y,s,\tau,\varepsilon)}{\partial y}-\lambda(s)\varepsilon\frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial y}+\sum_{s_1=1}^{S}H_1(y,s_1,\tau,\varepsilon)q_{s_1s}+o(\varepsilon). \tag{11}$$

Sum the equations of the system (13) by k and s, take into account that $\sum_{s_2=1}^{S}q_{s_1s_2}=0$, will get

$$-\varepsilon x'(\tau)\frac{\partial}{\partial y}\left\{\sum_{k=0}^{1}\sum_{s=1}^{S}H_k(y,s,\tau,\varepsilon)\right\}=\varepsilon\frac{\partial}{\partial y}\left\{-(1-r)\mu(s)\sum_{s=1}^{S}H_1(y,s,\tau,\varepsilon)+\right.$$

$$\left.+x\sigma(s)\sum_{s=1}^{S}H_0(y,s,\tau,\varepsilon)-\lambda(s)\sum_{s=1}^{S}H_1(y,s,\tau,\varepsilon)\right\}+o(\varepsilon).$$

Divide into ε both sides of the obtained equation, perform the limit transition, take into account (3), obtain

$$-x'(\tau)\sum_{k=0}^{1}\sum_{s=1}^{S}Q_k(x,s)\frac{\partial H(y,\tau)}{\partial y}=\left\{-(1-r)\sum_{s=1}^{S}\mu(s)Q_0(x,s)-\right.$$

$$\left.-\sum_{s=1}^{S}\lambda(s)Q_1(x,s)+x\sum_{s=1}^{S}\sigma(s)Q_0(x,s)\right\}\frac{\partial H(y,\tau)}{\partial y}.$$

Take into account (5) and (6), will get

$$\{x'(\tau)+x\Xi R_0(x)-((1-r)\psi+\varphi_1)R_1(x)\}\frac{\partial H(y,\tau)}{\partial y}=0\cdot$$

The function $x=x(\tau)$ is a solution of an ordinary differential equation

$$x'(\tau)=-x\Xi R_0(x)+((1-r)\psi+\varphi_1)R_1(x)\,. \qquad (12)$$

3. The deviations of number applications in the system. Consider also the process $y(\tau)=\lim_{\varepsilon\to 0}\left(\left(\varepsilon^2 i(\tau/\varepsilon^2)-x(\tau)\right)/\varepsilon\right)$. This process characterizes the deviation of the number of applications in the system. Prove that it is a diffusion autoregression process. Denote the right side of the differential equation (12) as $A(x)$:

$$A(x)=-x\Xi R_0(x)+((1-r)\psi+\varphi_1)R_1(x)\,. \qquad (13)$$

Will seek a solution $H_k(y,s,\tau,\varepsilon)$ of system (11) in the form

$$H_k(y,s,\tau,\varepsilon)=Q_k(x,s)H(y,\tau)+\varepsilon h_k(y,s,\tau)+o(\varepsilon). \qquad (14)$$

Find the kind of functions $h_k(y,s,\tau)$. Write the system (11) in the form

$$-(\lambda+\sigma(s)x)H_0(y,s,\tau,\varepsilon)-\sigma(s)y\varepsilon H_0(y,s,\tau,\varepsilon)+$$

$$+(1-r)\mu(s)H_1(y,s,\tau,\varepsilon)+r\mu(s)H_1(y,s,\tau,\varepsilon)+\sum_{s_1=1}^{S}H_0(y,s_1,\tau,\varepsilon)q_{s_1s}=$$

$$=-\varepsilon\frac{\partial}{\partial y}\{x'(\tau)H_0(y,s,\tau,\varepsilon)-(1-r)\mu(s)H_1(y,s,\tau,\varepsilon)\}+o(\varepsilon),$$

$$-\mu_1(s)H_1(y,s,\tau,\varepsilon)+(\lambda(s)+x\sigma(s))H_0(y,s,\tau,\varepsilon)+$$

$$+\sigma(s)y\varepsilon H_0(y,s,\tau,\varepsilon)+\sum_{s_1=1}^{S}H_1(y,s_1,\tau,\varepsilon)q_{s_1s}=$$

$$=-\varepsilon\frac{\partial}{\partial y}\{(x'(\tau)-\lambda(s))H_1(y,s,\tau,\varepsilon)+\sigma(s)xH_0(y,s,\tau,\varepsilon)\}+o(\varepsilon)\,.$$

Let substitute the decomposition (14) into this system, take into account (4) and write the resulting system, reducing by ε all the equations, in the following form

$$-(\lambda(s)+\sigma(s)x)h_0(y,s,\tau)+\mu(s)h_1(y,s,\tau)+\sum_{s_1=1}^{S}h_0(y,s_1,\tau)q_{s_1s}=$$

$$=\sigma(s)Q_0(x,s)yH(y,\tau)-\left(x'(\tau)Q_0(x,s)-(1-r)\mu(s)Q_1(x,s)\right)\frac{\partial H(y,\tau)}{\partial y},$$

$$-\mu(s)h_1(y,s,\tau)+(\lambda(s)+\sigma(s)x)h_0(y,s,\tau)+\sum_{s_1=1}^{S}h_1(y,s_1,\tau)q_{s_1s}=$$

$$=-Q_0(x,s)yH(y,\tau)-\left((x'(\tau)-\lambda(s))Q_1(x,s)+x\sigma(s)Q_0(x,s)\right)\frac{\partial H(y,\tau)}{\partial y}. \quad (15)$$

Will seek the solution of system (18) in the following form

$$h_k(y,s,\tau)=h_k^{(1)}(x,s)\frac{\partial H(y,\tau)}{\partial y}+h_k^{(2)}(x,s)yH(y,\tau). \quad (16)$$

Substitute (16) into (15) and present the system in the form of two systems

$$-(\lambda(s)+\sigma(s)x)h_0^{(1)}(x,s)+\mu(s)h_1^{(1)}(x,s)+\sum_{s_1=1}^{S}h_0^{(1)}(x,s_1)q_{s_1s}=$$

$$=-x'(\tau)Q_0(x,s)+(1-r)\mu(s)Q_1(x,s),$$

$$-\mu(s)h_1^{(1)}(x,s)+(\lambda(s)+\sigma(s)x)h_0^{(1)}(x,s)+\sum_{s_1=1}^{S}h_1^{(1)}(x,s_1)q_{s_1s}=$$

$$=-(x'(\tau)-\lambda(s))Q_1(x,s)-\sigma(s)xQ_0(x,s) \quad (17)$$

and

$$-(\lambda(s)+\sigma(s)x)h_0^{(2)}(x,s)+\mu(s)h_1^{(2)}(x,s)+\sum_{s_1=1}^{S}h_0^{(2)}(x,s_1)q_{s_1s}=\sigma(s)Q_0(x,s),$$

$$-\mu(s)h_1^{(2)}(x,s)+(\lambda(s)+\sigma(s)x)h_0^{(2)}(x,s)+\sum_{s_1=1}^{S}h_1^{(2)}(x,s_1)q_{s_1s}=-\sigma(s)Q_0(x,s). \quad (18)$$

Differentiate the system (4) by x. Consequently, the solution $h_k^{(2)}(x,s)$ of (18) has the form

$$h_k^{(2)}(x,s)=\frac{\partial Q_k(x,s)}{\partial x}. \quad (19)$$

With (19) and (16) decomposition (14) will take the form

$$H_k(y,s,\tau,\varepsilon)=Q_k(x,s)H(y,\tau)+\varepsilon h_k^{(1)}(x,s)\frac{\partial H(y,\tau)}{\partial y}+\varepsilon yH(y,\tau)\frac{\partial Q_k(x,s)}{\partial x}+o(\varepsilon). \quad (20)$$

Find the type of function $H(y,\tau)$. Expand the functions of the right-hand side of system (1) in a row in increment of the argument y up to $o(\varepsilon^2)$, will get

$$\varepsilon^2 \frac{\partial H_0(y,s,\tau,\varepsilon)}{\partial \tau} - \varepsilon x'(\tau) \frac{\partial H_0(y,s,\tau,\varepsilon)}{\partial y} +$$

$$+ (\lambda(s) + \sigma(s)(x+\varepsilon y)) H_0(y,s,\tau,\varepsilon) = \mu(s) H_1(y,s,\tau,\varepsilon) -$$

$$- \varepsilon(1-r)\mu(s) \frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial y} + (1-r)\mu(s) \frac{\varepsilon^2}{2} \frac{\partial^2 H_1(y,s,\tau,\varepsilon)}{\partial y^2} + \sum_{s_1=1}^{S} H_0(y,s_1,\tau,\varepsilon) q_{s_1 s} + o(\varepsilon^2),$$

$$\varepsilon^2 \frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial \tau} - \varepsilon x'(\tau) \frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial y} + \mu(s) H_1(y,s,\tau,\varepsilon) =$$

$$= (\lambda(s) + \sigma(s)(x+\varepsilon y)) H_0(y,s,\tau,\varepsilon) + \varepsilon \frac{\partial}{\partial y} \{\sigma(s)(x+\varepsilon y) H_0(y,s,\tau,\varepsilon)\} +$$

$$+ \sigma(s) x \frac{\varepsilon^2}{2} \frac{\partial^2 H_0(y,s,\tau,\varepsilon)}{\partial y^2} - \lambda(s)\varepsilon \frac{\partial H_1(y,s,\tau,\varepsilon)}{\partial y} +$$

$$+ \lambda(s) \frac{\varepsilon^2}{2} \frac{\partial^2 H_1(y,s,\tau,\varepsilon)}{\partial y^2} + \sum_{s_1=1}^{S} H_1(y,s_1,\tau,\varepsilon) q_{s_1 s} + o(\varepsilon^2). \qquad (21)$$

Sum the equations of system (21) by k, substitute into the resulting system the expansion of functions $H_k(y,s,\tau,\varepsilon)$ in the form (20), take into account the notation (6), will get

$$\varepsilon^2 r(s) \frac{\partial H(y,\tau)}{\partial \tau} - \varepsilon x'(\tau) r(s) \frac{\partial H(y,\tau)}{\partial y} -$$

$$- \varepsilon^2 x'(\tau) \frac{\partial}{\partial x} \left\{ \sum_{k=0}^{1} Q_k(x,s) \right\} \frac{\partial \{y H(y,\tau)\}}{\partial y} - \varepsilon^2 x'(\tau) \sum_{k=0}^{1} h_k^{(1)}(x,s) \frac{\partial^2 H(y,\tau)}{\partial y^2} =$$

$$= -\varepsilon \left(-\sigma(s) x Q_0(x,s) + ((1-r)\mu(s) + \lambda(s)) Q_1(x,s) \right) \frac{\partial H(y,\tau)}{\partial y} -$$

$$- \varepsilon^2 \left(-\sigma(s) Q_0(x,s) - \sigma(s) x \frac{\partial Q_0(x,s)}{\partial x} + ((1-r)\mu(s) + \lambda(s)) \frac{\partial Q_1(x,s)}{\partial x} \right) \frac{\partial \{y H(y,\tau)\}}{\partial y} +$$

$$+ \frac{\varepsilon^2}{2} \{\sigma(s) x Q_0(x,s) + ((1-r)\mu(s) + \lambda(s)) Q_1(x,s) +$$

$$+ 2\left[-\sigma(s) x h_0^{(1)}(x,s) + ((1-r)\mu(s) + \lambda(s)) h_1^{(1)}(x,s) \right] \} \frac{\partial^2 H(y,\tau)}{\partial y^2} +$$

$$+ \sum_{k=0}^{1} \sum_{s_1=1}^{S} H_k(y,s_1,\tau,\varepsilon) q_{s_1 s} + o(\varepsilon^2). \qquad (22)$$

Sum the equation (22) by s, use the condition (7), the designation (6), also denote

$$\sum_{s=1}^{S} h_k^{(1)}(x,s) = h_k^{(1)}(x), \quad \sum_{k=0}^{2} h_k^{(1)}(x) = h^{(1)}(x), \quad \sum_{s=1}^{S} \sigma(s) h_0^{(1)}(x,s) = \eta_3 h_0^{(1)}(x),$$

$$\sum_{s=1}^{S} \mu(s) h_1^{(1)}(x,s) = \eta_2 h_1^{(1)}(x), \quad \sum_{s=1}^{S} \lambda(s) h_1^{(1)}(x,s) = \eta_1 h_1^{(1)}(x), \qquad (23)$$

take into account (12), divide both sides of the equation by ε^2, will have

$$\frac{\partial H(y,\tau)}{\partial \tau} = -\left(-\Xi R_0(x) - x\Xi \frac{\partial R_0(x)}{\partial x} + ((1-r)\psi + \varphi_1) \frac{\partial R_1(x)}{\partial x} \right) \frac{\partial \{ yH(y,\tau) \}}{\partial y} +$$

$$+ \frac{1}{2} \{ x\Xi R_0(x) + ((1-r)\psi + \varphi_1) R_1(x) + 2 \left[-x\eta_3 h_0^{(1)}(x) + ((1-r)\eta_2 + \eta_1) h_1^{(1)}(x) + \right.$$

$$\left. + \left(-x\Xi R_0(x) + ((1-r)\psi + \varphi_1) R_1(x) \right) h^{(1)}(x) \right] \} \frac{\partial^2 H(y,\tau)}{\partial y^2}. \qquad (24)$$

Got Fokker's and Planck's equation for the probability density $H(y,\tau)$. The drift coefficient of equation (24) is a derivative of the right side of the differential equation (12)

$$A_x'(x) = -\Xi R_0(x) - x\Xi \frac{\partial R_0(x)}{\partial x} + ((1-r)\psi + \varphi_1) \frac{\partial R_1(x)}{\partial x}. \qquad (25)$$

We take into account (23) and denote the diffusion coefficient as follows

$$B^2(x) = x\Xi R_0(x) + ((1-r)\psi + \varphi_1) R_1(x) + 2 \left(-x\eta_3 h_0^{(1)}(x) + ((1-r)\eta_2 + \eta_1) h_1^{(1)}(x) + \right.$$

$$\left. + (-x\Xi R_0(x) + ((1-r)\psi + \varphi_1) R_1(x)) h^{(1)}(x) \right). \qquad (26)$$

The probability $H(y,\tau)$ distribution density of a certain diffusion process $y(\tau)$. This process satisfies the stochastic differential equation

$$dy(\tau) = A_x'(x) y(\tau) d\tau + B(x) dw(\tau), \qquad (27)$$

where $w(\tau)$ is a standard Wiener's process, therefore, the process $y(\tau)$ is an auto regression process.

Conclusions. Thus, for the presented model of the retrial queue with Return of Applications in a random environment found the asymptotic mean of the normalized number of applications in the system in the form (12), the probability distribution of the device states (10), the deviation from the mean, which are determined by the stochastic equation (27). The results can be used in servicing systems, such as banks, employment centers, and others in order to increase efficiency.

References

1. Artalejo J. R., Gomez-Corral A. Retrial Queueing Systems: A Computational Approach. – Berlin: Springer, Heidelberg, 2008. – 318 p.

2. Falin G. I., Templeton J. G. C. Retrial Queues. – London: Chapman and Hall, 1997. – 328 p.

3. Purdue P. The M/M/1 Queue in a Markovian Environment // Operations Research, 1974, Vol. 22. – P. 562-569.

4. Yechiali U., Naor P. Queuing Problems with Heterogeneous Arrivals and Services // Operations Research, 1971, Vol. 19. – P. 722-734.

5. Yechiali U. A Queuing-type Birth-and-death Process Defined on a Continuous-time Markov Chain // Operations Research, 1973, Vol. 21. – P. 604-609.

6. Dudin A. N., Nazarov A. A. The MMAP/M/R/0 Queueing System with Reservation of Servers Operating in a Random Environment // Problems of Information Transmission, 2015, T. 51, V. 3. – P. 289-298.

7. Kim C. S., Dudin A., Klimenok V., Khramova V. Erlang Loss Queueing System with Batch Arrivals Operating in a Random Environment // Comput. Oper. Res., 2009, V. 36, # 3. – P. 674–697.

8. Kim C. S., Klimenok V., Mushko V., Dudin A. The BMAP/PH/N Retrial Queueing System Operating in Markovian Random Environment // Comput. Oper. Res. 2010, V. 37, # 7. – P. 1228-1237.

9. D'Auria B. M/M/∞ Queues in semi-Markovian Random Environment // Queueing Syst., 2008, V. 58. – P. 221-237.

10. Nazarov A. A., Moiseeva S. P. Methods of Asymptotic Analysis in Queueing Theory (In Russian). – Tomsk: NTL Publishing House, 2006. – 112 p.

为行业运作建模提供信息支持
INFORMATION SUPPORT FOR MODELING THE FUNCTIONING OF INDUSTRIES

Akinshin Anatoly Anatolievich
Head of Laboratory, Central Economics and Mathematics Institute
Dybenko Alexey Nikolaevich
Senior Researcher, Central Economics and Mathematics Institute
Polak Yuri Evgenievich
Candidate of Economic Sciences, Leading Researcher
Central Economics and Mathematics Institute. Moscow, Russia

注解。 在处理个别组织和整个经济部门活动过程中产生的大量信息时，需要新的方法和解决方案。 在开发旨在有效转换国防工业的信息和分析系统时，有必要在这些方法中考虑一种侧重于复杂情况的定性分析的认知方法。 本文还讨论了分析大量数据的其他现代方法。 因此，随着对大量信息的高速处理的要求，其高复杂性和多样性，使用“大数据”技术和方法是合适的。 文本挖掘方法用于处理来自各种来源的非结构化信息，语义文本分析和信息检索。

关键词：信息系统，概念建模，认知方法，大数据，文本挖掘

Annotation. *When processing vast amounts of information arising in the process of the activities of individual organizations and entire sectors of the economy, new approaches and solutions are needed. In developing an information and analytical system designed for effective conversion of the national defense industry, it is necessary to consider among these methods a cognitive approach focused on qualitative analysis of complex situations. The paper also discusses other modern methods of analyzing large amounts of data. So, with the requirement of high speed processing of large amounts of information, its high complexity and diversity, it is appropriate to use 'Big Data' technologies and methods. Text mining methodology is used to process unstructured information from various sources, semantic text analysis, and information retrieval.*

Keywords*: information systems, conceptual modeling, cognitive approach, big data, text mining*

The processes of functioning of the national economy as a whole, and its in-

dividual components are described by the corresponding information systems, databases and knowledge bases. The key element in their creation is conceptual modeling, which allows building models of the most general level on the basis of fundamental and applied knowledge. One of the most important problems in the development of a general modeling procedure is the search for new, most rational methods and technologies that ensure the effective use of accumulated knowledge presented in the form of relevant information resources.

There are necessary prerequisites for the implementation of an effective scientific and industrial policy in our country. These are the availability of advanced science, a developed education system, an industrial base, human potential, financial and material resources, etc. However, in the conditions of the transition period and the long crisis of the real sector of the economy, new challenges emerge in the management of large research and production complexes and the implementation of high-tech projects. In particular, the scientific, technical and production potential of the defense industry is adversely affected by low power supply, deterioration of basic production assets, low capacity utilization, disintegration of existing cooperative ties, reduction in the number and quality of personnel, rising energy prices, etc.

Researchers are faced with the task of giving a comprehensive assessment of the current state and role of defense industry in the economic development of the country; identifying structural problems and external threats to its effective development. To this end, at the first stage, it is necessary to create information, analytical and software tools to systematize the available open data on military products. In particular:

- to develop a model of the knowledge base, which allows collecting, storing and processing data on the products of the defense industry complex;
- prepare a methodology for collecting, organizing and analyzing data on products of the military-industrial complex;
- develop software tools that allow for data collection and analysis, and their subsequent presentation.

To solve some of these problems, the method of cognitive modeling will be used. The basic principles of the cognitive approach in the decision-making process were first formulated by R. Axelrod [5], at the same time the initial version of the mathematical apparatus for modeling was proposed. The methodological basis for creating conceptual models in the study of dynamic systems in economics was laid by J. Forrester [1,2]. Cognitive methodology has also been successfully applied by domestic researchers.

The choice of this method as one of the most important for this study is due to a number of important points. The proposed approach is focused on the qualitative analysis of complex situations, interpreted as weakly structured systems, charac-

terized by a lack of accurate quantitative information about the processes occurring in them, as well as including various ‘qualitative’ variables. The number of variables in such situations can be measured in dozens, and all of them are woven into a web of causes and effects. It is extremely difficult to see and grasp the logic of the development of events in such a multifactor field. At the same time it is necessary to make decisions continuously on the choice of certain measures contributing to the development of situation in the right direction. The main advantage of the proposed methodological apparatus is the possibility of systematically qualitative account the remote consequences of decisions made and identifying side effects that may prevent the implementation of seemingly obvious solutions and which are difficult to evaluate intuitively with a large number of factors and a variety of interaction between them.

Processing of huge amounts of information arising in the process of activities of individual organizations and entire sectors of the economy, in particular, the defense industry, requires new approaches and solutions. Here it is appropriate to use the technologies and methods of Big Data. This term, unlike many others, has a specific date of appearance - September 3, 2008, when the paper [3] had appeared in *Nature*. C.Lynch then proposed for the new paradigm the special name Big Data, to reflect the transition of quantity into quality.

This problem existed long before its reflection in the mass media: more than 60 years ago it had arisen in space research, in problems of nuclear physics. Big data appears

- in the presence of large volume, which is problematic for processing facilities;

- at the demand of a high processing speed, which the processing facilities cannot provide;

- with high complexity and diversity that doesn’t allow to use traditional processing tools.

The processed data can be used both for analysis and for forecasting, while the areas of application of Big Data solutions are so wide that they penetrate deeper into everyday life. Continuous data growth has now affected wide areas of activity and will increase exponentially. Therefore, it is not possible to organize the process associated with their receipt, management and processing for the required time with traditional tools.

Working with Big Data is not cheap, but the costs will be meaningless if there is no clear understanding of what should be as a result. In addition, for their analysis, you need a specialist who can customize the machine model and regularly reconfigure it.

Programs focused on processing large amounts of data deal with data files in tera- and petabytes. In practice, this data comes in a variety of formats and is often

shared among several storage sources. Processing of such data sets usually occurs in a phased analytical pipeline mode, which includes the stages of data conversion and integration.

Giant information volumes in combination with high speed require the appropriate computers, so almost all major manufacturers offer specialized software and hardware: SAP HANA, Oracle Exadata Database Machine, Teradata Extreme Performance Appliance, NetApp E-Series Storage Technology, IBM Netezza Data Appliance, EMC Greenplum , HP Converged Infrastructure.

The analysis of large volumes of data requires the involvement of technologies and means of implementing high-performance computing. Artificial intelligence methods are applied, including machine learning, information extraction, and data mining. The main problems are the complexity and physical volume of the information collection. It should be noted that the actual data processing also includes the construction of the algorithm and the time for its description and debugging. Unique data collections require the development of unique algorithms, which dramatically increases the total processing time.

It is often necessary to solve numerous problems arising when working with unstructured information from various sources of social networks, blogs, forums, news sites, etc. Text analytic methods (morphological, syntactic, semantic) provide the ability to control this stream and extract the maximum possible benefit from it.

Extracting information from unstructured text allows performing text data mining. Text mining covers new methods for performing semantic text analysis, information retrieval and control. A synonym for text mining is KDT (knowledge discovering in text). Like most cognitive technologies, text mining is an algorithmic identification of relationships and correlations in existing textual data. Data mining is a process of non-trivial extraction from data of previously unknown and potentially useful information [4]. An important task of the text mining technology is extraction from the text its characteristic elements, which can be used as document metadata, keywords, annotations.

Among standard text mining applications are such mechanisms of ‘classical’ data mining as automatic text classification with the ability to automatically filter certain terms; algorithms and methods of clustering, factor analysis; automatic search in documents for given words or phrases.

Data mining methods can be applied to data collected from experiments in many scientific fields (astronomy, physics, medical imaging, bioinformatics). In the tasks of systematization of data on military products, analysis of the military-industrial potential, this method has not been previously used.

The reported study was funded by RFBR according to the research project № 18-00-00177 (18-00-00172)

References

1. Forrester J. W. (1968) Industrial dynamics – after the first decade. // Management Science, 14(7): 398-415.

2. Forrester J. W. (1969) Urban Dynamics. Pegasus Communications: Waltham, MA.

3. Lynch, C. (2008). How do your data grow? // Nature, 455(7209), 28–29. doi:10.1038/455028a

4. Olmer Petr. Knowledge discovery: data and text mining // Inverted CERN School of Computing: CERN, Geneva. 2006. P.47-55.

5. Structure of Decision. The cognitive Maps of Political Elites / Ed. by R. Axelrod. N.Y.: Princeton University Press, 1976. Pages: 422

研究粘合剂添加剂对合成异戊二烯橡胶硫化橡胶性能的影响

INVESTIGATION OF THE EFFECT OF ADHESIVE ADDITIVES ON THE PROPERTIES OF VULCANIZED RUBBERS BASED ON SYNTHETIC ISOPRENE RUBBER

Zakirova Larisa Yuryevna
PhD, Associate Professor of the Department of Chemistry and Processing Technology of Elastomers Kazan National Research Technological University
Shishkina Nellie Narimanovna
PhD, Associate Professor of the Technology of synthetic rubber Department
Efimova Alfia Rafailevna
PhD, Associate Professor Department of Physics Kazan National Research Technological University,

注解。 开发用于将橡胶粘附到钢丝帘线上的粘合促进剂的研究。 作为粘合促进剂，使用通过2,4-甲苯二异氰酸酯和苯胺反应得到的封端异氰酸酯，2,4-二苯基氨基甲酰基甲苯和2-异氰酸基-4苯基氨基甲酰基甲苯。

通过红外光谱，元素分析鉴定合成的添加剂，然后将它们用作基于合成异戊二烯橡胶的橡胶复合改性剂，以增加橡胶与钢丝帘线的粘合性。 在老化后观察到具有测试添加剂的混合物的粘合强度增加。

关键词：粘合剂添加剂，Manobond-680C，2,4-二苯基氨基甲酰基甲苯，2-异氰酸根合-4苯基氨基甲酰胺甲苯。

Annotation. *Conducted research in the development of adhesion promoters for attaching rubber to steel steel cord. As an adhesion promoter, a blocked isocyanate, 2,4-diphenylcarbamidotoluene and 2-isocyanato-4 phenylcarbamidotoluene, obtained by the reaction of 2,4-toluene diisocyanate and aniline was used.*

The synthesized additives were identified by IR spectroscopy, elemental analysis, then they were used as rubber compound modifiers based on synthetic isoprene rubber to increase the adhesion of rubber to steel cord. An increase in adhesion strength was observed for mixtures with test additives after aging.

Keywords: *adhesive additive, Manobond-680C, 2,4-diphenylcarbamidotoluene, 2-isocyanato-4 phenylcarbamidotoluene.*

Introduction

In the production of automobile tires, the main method of attaching rubber to metal is the vulcanization of rubber with brass-plated steel cord. Approximately half of the tire manufacturers to ensure the necessary bond strength between rubber and metal uses systems with a high content of sulfur and cobalt.

One of the ways to increase the bond strength of rubber-metal cord is the use of adhesive additives that can react with both the oxidized metal surface and rubber [1-4]. Epoxy resins, isocyanates, phenol-formaldehyde resins and acrylate resins can be used as adhesives.

Isocyanates are known to be used as adhesion promoters [5], but they are not convenient for practical use (air hydrolysis, toxicity, etc.). Therefore, in the work undertaken the use of blocked isocyanates as adhesive additives.

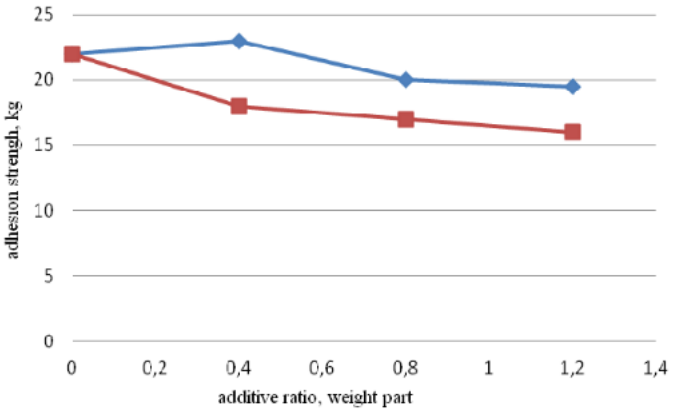
Research methods

Synthesis of 2,4-diphenylcarbamidotoluene (2,4-DCTT) and 2-isocyanato-4 phenylcarbamidotoluene (2-ITPT) was carried out according to the method of P. Hönig [6] in the absence of solvent, the molar ratio of 2,4-toluene diisocyanate: aniline was 1: 2 and 1: 1 respectively. The calculated amount of aniline was loaded into a round bottom flask and 2,4-toluene diisocyanate was slowly added dropwise through a separatory funnel. To reduce heat (exothermic reaction), a round bottom flask was placed in a cooling bath. After completion of the reaction, the product, which was a white powder, was recrystallized in toluene. Further, the product was characterized by IR spectroscopy, DTA and DSC. The melting point of 2,4-DFCT and 2-IFCT was 178 and 265 ° C, respectively [7].

Curing with steel cord was carried out for 30 minutes at a temperature of 150ºC. For the obtained samples, the bond strength between rubber and a single metal cord thread was determined (H-method, GOST 14863-69).

Results and its discussion

The goal of this work was to create a modifying additive and use it as part of a rubber composition based on SKI-3 as a promoter of adhesion of rubber to steel cord. Were obtained 7 samples of rubber based on SKI-3, which differ only in the composition of the additive that improves adhesion. Sample 1 is presented with a standard adhesion promoter based on cobalt salts - Manobond-680C, samples 2, 3, 4 - with synthesized 2,4-DKTT, samples 5, 6, 7 with synthesized 2-ICTP. The content of additives varied in the range of 0.4 - 1.2 wt.h. The test results for the obtained rubbers are shown in fig. 1.



■ –2-isocyanato-4phenylcarbamidotoluene; ♦ –2, 4-diphenylcarbamidotoluene

Fig. 1. *The change in the adhesion of the rubber mixture on the basis of SKI-3 to the steel cord, depending on the amount of the added additive*

From figure 1 we see that the best values of adhesion had a mixture with the content of additives of 0.4 wt.h. Automobile tires during operation are heated to 100 ºC, and the weak point of the rubber-metal cord is poor preservation of the initial level of adhesion. Therefore, tests were conducted rubber with a content of 0.4 wt.h. for accelerated aging, the results of the test after thermal aging are presented in fig. 2

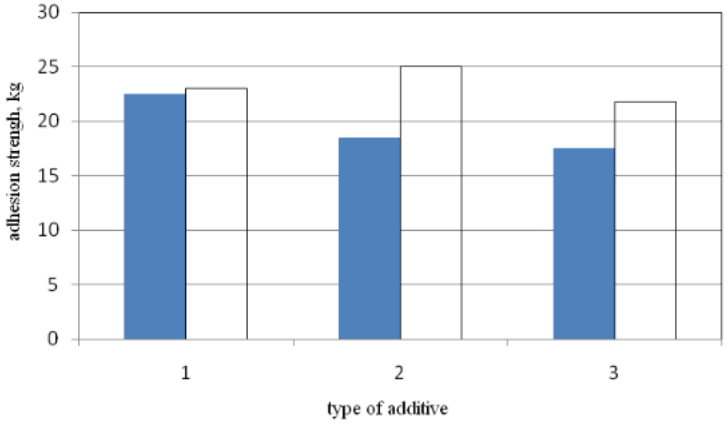
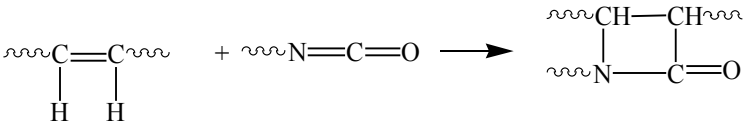


Fig. 2. *Dependence of adhesion strength on the type of additive (blue columns before aging, white - after aging):*
1 - with Manobond-680C,
2 - with 2,4-DFT, 3 - with 2-IFPT

Figure 2 shows that after heat aging, the adhesive strength of rubber in the presence of 2, 4-DFT and 2-ISCT increases by 25%, in the presence of Manobond it remains at the same level, probably the additives play the role of a stabilizer.

The results indicate that blocked isocyanates can increase the adhesion of polymers to the steel cord. Isocyanates are known to react with the carbon-carbon double bond of a rubber macromolecule to form lactams according to the reaction below, which can enhance the interaction of the metal-rubber system [8]:



Conclusions.

Thus, synthesized 2,4-diphenylcarbamidotoluene and 2-isocyanato-4-phenylcarbamidotoluene, can improve the adhesion characteristics of rubber based on SKI-3. When introduced into the rubber compound based on SKI-3, the adhesion value was at the level of standard cobalt-containing systems. Tested for thermal aging. After warm aging, an increase in adhesive strength was observed for mixtures with 2,4-diphenylcarbamidotoluene and 2-isocyanato-4-phenylcarbamidotoluene.

References

1 Van Ooij, W.J. Mechanism and theories of rubber adhesion to steel tire cords - an overview. Rubber Chemistry and Technology, (1984), 57 (3), pp. 421-456., doi: 10.5254/1.3536016

2 Hotaka, T., Ishikawa Y., Mori K. Effect of compound ingredients on adhesion between rubber and brass-plated steel cord, Rubber Chemistry and Technology , Volume 78, Issue 2, May-June 2005, Pages 175-187 DOI: 10.5254/1.3547876

3 Shi, X., Ma M., Lian C., Zhu D., Investigation of the effects of adhesion promoters on the adhesion properties of rubber/steel cord by a new testing technique, Journal of Applied Polymer Science, Volume 131, Issue 3, 5 February 2014, Article number 39460

4 Chen, Y., Schlarb J.L. Steel cord-rubber adhesion with SEM/EDX,

Tire Science and Technology, Volume 46, Issue 1, January-March 2018, Pages 27-37

5 Nikiforova N.A., Sheryshev M.A. // Successes of chemistry. 2011. T.XXV. Number 3. P.24-28.

6 H.J. Hennig, S. Stammheim, O. Bayer. US patent №3379749, 23.04.1968.

7 R. N. Aznabaev, N. N.Shishkina, L. U. Zakirova, M. E. Zakirov. Synthesis of 2,4 difenilkarbami-dotoluene and its use for modifying the rubber. Butlerov Communications. 2016. T.48. №12. C.133-137. ROI: jbc-01/16-48-12-133.

8 General organic chemistry. Ed. D. Barton and W. D Willis. V.3. Nitrogen-containing compounds. - Moscow: Chemistry. 1982

科学出版物

上合组织国家的科学研究：协同和一体化

国际科学大会的材料

（2019年2月11-12日，中国北京）

编辑A.A.Siliverstova
校正A.I.尼古拉耶夫

2019年2月16日印刷版。格式60×84/ 16。
USL。沸点：98.7。 订单253.流通450份。

在编辑和出版中心印制
无限出版社


中央民族大学