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AN ALGORITHM AND PROCESS FLOW MODEL FOR THE EXTRACTION OF DIGITAL FORENSIC EVIDENCE IN ANDROID DEVICES

Abstract: *The advancement in technology especially the use of mobile devices has revolutionized the way of life in the 21st century. This ranges from the way people socialize to the modes of business that take place today. Consequently, mobile devices have become very vital part of life and thus contain substantial amounts of private data. Accordingly, in event of crime and/or security investigations, these gadgets carry with them crucial evidence that when adduced before any court of law can aid in resolving a number of undetermined cases and appeals. However, mobile digital forensics research is still faced with a number of challenges. One popular challenge is seeking a standard process model to make the digital forensic evidence extraction process accurate and consistent. Earlier process models proposed, present basic steps that can be categorized as: collection, Examination, Analysis and Reporting. This has sparked significant research and proposition of numerous process models to try and explain these steps further sophisticating the problem and creating more complexity and inconsistencies, for this reason, sporadic increase in the use of mobile devices and huge volumes of data they carry that can be adduced as potential evidence in the event of dispute or court proceedings has raised the need to develop standardized extraction process models and procedures for mobile devices running android operating system, in this paper we propose an algorithm and process flow model for the extraction of digital evidence in android devices that can be adapted to the latest release of android operating system especially given the ongoing rapid changing nature of mobile device. Using this algorithm and process flow model, a procedural experiment was done on the extraction of digital evidence from an android device. The results of this experiment highlights key steps that must be followed and carefully documented during evidence extraction from mobile devices in order to ensure consistency and reduction of the complexities in early proposed models.*

Key words: *Process, Flow, Model, Digital, Forensic, Evidence, Mobile, Devices, Android.*
Language: *English*
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1. Introduction

The proliferation of mobile devices and their use in day to activities raises the risk of such devices being used for criminal activities. Statistics indicate that 86.8% of mobile devices as at December 2018 were running on Android operating systems [1]. Android is an open source operating system designed for use on mobile devices and the basic composition of the operating system is the SDK (Software Development Kit) and applications which are a set of tools provided by Google that creates a development environment for developing Android compatible software[2]. The Android platform has unique characteristic features and different scenarios which a forensic analyst may come across, these unique characteristics raises issues of complexity and diversity of android based mobile devices which differ in terms of architecture, model and manufacturer design [3][4]. Therefore in the event of a need to extract forensic data from such devices, clear understanding of the architecture of the device plays a significant role in guiding the process model to be used and algorithm to follow [4]. A process model is a defined standard or method of getting things done by applying scientific methods [5]. While an algorithm is "*a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer*" [6]. Digital forensics is a term widely used to refer to the scientific method of identification, acquisition and analysis of digital evidence originating from digital devices, such as mobile phones, tablets, computers and wearable devices like smart watches[7]. Among the most urgent issues in digital forensics is the definition a process model that can make investigative and digital evidence process consistent and standardized. Several digital forensic process models have been defined with most of them focusing on necessary phases or groups of steps to be followed and sub-steps [5]. Therefore employing new methods and tools in the existing models for the extraction of digital evidence in android devices should improve efficiency in dealing with the problem of digital evidence extraction which is one of the challenges investigators face coupled with systematic documentation and reference procedures that should be provided [8], this has further raised challenges of performing data acquisition in a forensically sound manner from mobile devices, therefore to solve this problem this paper proposes an algorithm and process flow model for the extraction of digital evidence in mobile devices running on android.

Contribution of this Work

The contribution of this work can be summarized as follows:

- Discussed the current digital forensic process models,
- Reviewed literature on Digital forensic process models,
- Comparative analysis of existing models with the proposed model analyzing its benefits,
- Proposed an algorithm and process flow model for extraction digital evidence in Android devices

Review of Related work

Digital forensics is relatively a new research area but there has seen significant progressive work done ranging from the technology, tools and methodology, process models and frameworks used to extract, analyze, document and report. Those particularly related to this study are presented below:

Evolution of Digital Forensic Process Models

According to [5] a process model is the methodology used to conduct an investigation; a framework with a number of phases to guide an investigation. These process models were proposed and developed based on previous industrial experiences due to increase in cases such as cyber-attacks, civil and criminal cases [5], the variation in these cases called for different investigation and extraction trends due to lack of standard workflow during investigation[9]. However [10] define standard methodology in digital forensics process model as comprising of sequences of actions with sub actions necessary for the investigation that must be ideal to be applied to as many cases as possible. Various process models have been proposed in the literature to date. Generally, each framework attempts to refine the standard methodology for a specific use case and each of these process models take a broadly similar approach. The earliest research concentrated on defining the process of digital forensic investigation [11] More recently, process model research centers around solving more specific issues like focusing on particular steps (evidence collection, preservation or examination, analysis) [5]. Numerous procedures have been proposed for the collection of digital forensic evidence in mobile devices beginning with committees such as the Digital Forensic Research

Workshop Group (DFRWS) who proposed processes to be followed in extraction of digital evidence in computing and mobile devices since there were no standards forensic process in place to be followed by forensic investigators, several process models have been proposed and developed and these can be grouped in to three main categories; The first category were general models defining mainly process of digital forensic investigation detailing what should be done and steps to follow[12], the second category put emphasis on the investigative process itself on a case by case basis while the third category focused on defining problems associated with the methods and tools used in evidence extraction and how to solve them.

Building on the works of [13] who contend that digital forensic process model can be divided into several stages but majorly preservation, collection, examination and analysis, [14]examined a number of published models/framework for digital forensics whose basis is using the ideas from traditional (physical) forensic evidence collection strategy as practiced by law enforcement (e.g. FBI). In their examination, the authors argued that the proposed model can be termed as an enhancement of the DFRWS model since it is inspired from it, nine components emerged in their examination such as:

i. **Identification** – it recognizes an incident from indicators and determines its type. This component is important because it impacts other steps but it is not explicit within the field of forensic.
ii. **Preparation** – it involves the preparation of tools, techniques, search warrants and monitoring authorization and management support.
iii. **Approach strategy** – formulating procedures and approach to use in order to maximize the collection of untainted evidence while minimizing the impact to the victim.
iv. **Preservation** – it involves the isolation, securing and preserving the state of physical and digital evidence.
v. **Collection** – This is to record the physical scene and duplicate digital evidence using standardized and accepted procedures.
vi. **Examination** – An in-depth systematic search of evidence relating to the suspected crime. This focuses on identifying and locating potential evidence.
vii. **Analysis** – This determines importance and probative value to the case of the examined product
viii. **Presentation** - Summary and explanation of conclusion and Returning Evidence– Physical and digital property returned to proper owner.

The Efficient Generalized Forensics Framework for extraction and documentation of evidence from Android devices outlined by[8] put more emphasis on the consistency for a complete snapshot of Android devices through integrity verification using hashing algorithms. Generally speaking mobile devices forensics suffers from challenges in data acquisition and preservation as a result of many process models offered by different vendors[15]. The "*Systematic Digital Forensic Investigation Model*" proposed by [16], compared different process models and provided a mechanism upon which different frameworks can be implemented on the basis of technology, it is clear that this model is technology based and therefore does not address the `challenges of inconsistencies raised by various platforms. Further[17] presented "*Modeling the Forensics Process*" in which the authors proposed a model with major stages that would be helpful in separating the flow stream, according to them, these stages comprises of creation, release, transfer, arrive, accept, and process. In this model the authors introduce totally new phases in mobile devices forensic evidence extraction. Finally "*Models of Models: Digital Forensics and Domain-Specific Languages*" proposed by[18] focused on the domain specific languages as very important part of digital forensic evidence investigation and extraction, their concern was on the domain/or platform used.

Materials and Methods

Comprehensive literature review formed the basis for the comparison between the proposed model and existing models, highlighted the key features implemented by android operating system that affect evidence extraction. An experimental setup for extracting digital evidence was done using Samsung s6 running android 8.0, Htc m8, android 7.0, Software used involved, Access Data Forensic Toolkit, Elcomsoft Forensics Toolkit, Software Development Kit, SQLite Browser Tools. Initial set up involved installing these software on a windows 10 machine. The process flow model was developed using Microsoft Viso studio.

Results and Discussion

The discussion of this research is presented in two parts, the first taking a comparatively look at the existing models discussed with the proposed while the second part is presenting the process flow model and the algorithm used in the proposed model and using this algorithm and process model to perform basic evidence extraction in android. The researchers began by identifying key features implemented in android operating system that influence in one way another evidence extraction from mobile devices on android operating system.

Comparison with Existing Models

Critical look at seven recently developed models for investigation and extraction of digital evidence

reveals that it may not be easily possible to have a one-to-one mapping between the activities in the proposed model and other previous models. Though the processes may be similar, the terms and definition of the phases used in the proposed model differs from those in the existing models reviewed.

Table.1 comparison of the proposed model with the existing models.

Process/Phases in the Proposed model	NIST Guidelines[10]	HDFI model [19]	DEFSOP [20][12]	SDFIM[21]	MFP[17]	SFIM[22]	DFRWS[23]
Device status check	×	×	×	×	×	×	×
Preparation	×	✓	✓	✓	×	✓	✓
Identify evidence	✓	✓	×	✓	✓	✓	✓
Recover data	×	×	×	×	×	×	×
Forensic analysis	✓	×	✓	✓	✓	✓	✓
Verification	×	×	×	×	×	×	×
Documentation	✓	✓	×	×	×	✓	×

On the basis of steps or phases involved in the process models reviewed, it can be concluded the proposed model is most suitable because it summarizes most of the phases and steps proposed in earlier models and reveals the complexities in the models reviewed for example a look at:

NIST Guidelines shows that it has very limited steps; therefore they are not appropriate enough for performing digital evidence extraction thoroughly.

The Harmonized Digital Forensic investigation model presents preparation, identification and documentation stages which this proposed model also address however a critical consideration of device status check is ignored in this model, forensic analysis , recovery of data and verification which are key concerns in digital evidence extraction have also not been clearly addressed.

Though the Digital Evidence Forensic Standard Operating Procedure, The Systematic Digital Forensic Investigation model and Modeling the Forensic Process all present several phases or steps to be followed, it can be noted that there are several repetitions in these stages and all of them concentrate more on the investigation itself other than extraction which the proposed model addresses right from device seizure to evidence extraction.

The Smartphone Forensic investigation model is close to the proposed model except that it concentrated more on the investigation other than evidence extraction and critically lacks the device status check and data recovery phases as pointed out in the proposed model as one of the key critical issues in digital evidence extraction in android devices.

Proposed algorithm

```
Input ← SiezedDevice
    CheckDeviceStatus
    If siezedDevice is powered on
            If siezedDevice is unlocked
                    If siezedDevice is connectedToWifi network
                            TurnOff wifi connection
                    Else
                            If siezedDevice is connectedToCellular network
                                    Turn On Airplane Mode
                            Else
                                    Enable USB debugging through developer options
                                    Enable stay awake setting
                                    Increase screen time-out
                                    Gain root access
                                    DirectoriesAndDB ← {

    (/data/data/com.android.providers.telephony/Databases/, mmssms.db),

    (/data/data/com.android.browser/,browser2.db)

    (/data/data/com.android.providers.contacts/databases/,contacts2.db),
    ( /data/data/com.facebook.katana/,contacts2.db),
(/, (*.mp3 or *.wmv))
                                                                    }
                                    foreach((directory,dictionary) in DirectoriesAndDB)
                                            Browse To directory and dictionary
                                                    if evidence is found
                                                            Prepare Evidence
                                                            Identify Evidence
                                                            Recover the data
                                                            Forensic Analysis
                                                            Verification
                                                            Documentation
            Else
                    If siezedDevice.Android Version >= 6
                            Obtain Passcode
                    Else
                            ByPass Lock
    Else
            Power on siezedDevice
```

Table 2: Android Features and their level of implementation affect evidence extraction[24][25] [26]

No	Feature	Implementation
1.	On device encryption	implemented
2.	External storage encryption	implemented
3.	Privacy of synchronization	Partially implemented by third party apps
4.	Sync to cloud communication encryption	implemented
5.	Wireless anti- tracking	Not Implemented, need to use third party apps
6.	Remote device location tracking	implemented

7.	Remote device locking and or data wipe	implemented
8.	Zero knowledge encryption (access to customer cloud data by the Mobile Platform Owner)	No knowledge
9.	Secure Enclave Processors for firmware protection and supporting encryption	implemented
10.	Limiting Device Access	implemented

Based on the information presented on *table 2*, it is evident that any process model for the extraction of digital forensic evidence in android should consider architectural design of the platform so as to ensure consistency in evidence extraction and security issues that affect evidence extraction. The information on table*2* informed the model design presented in *Fig1*.

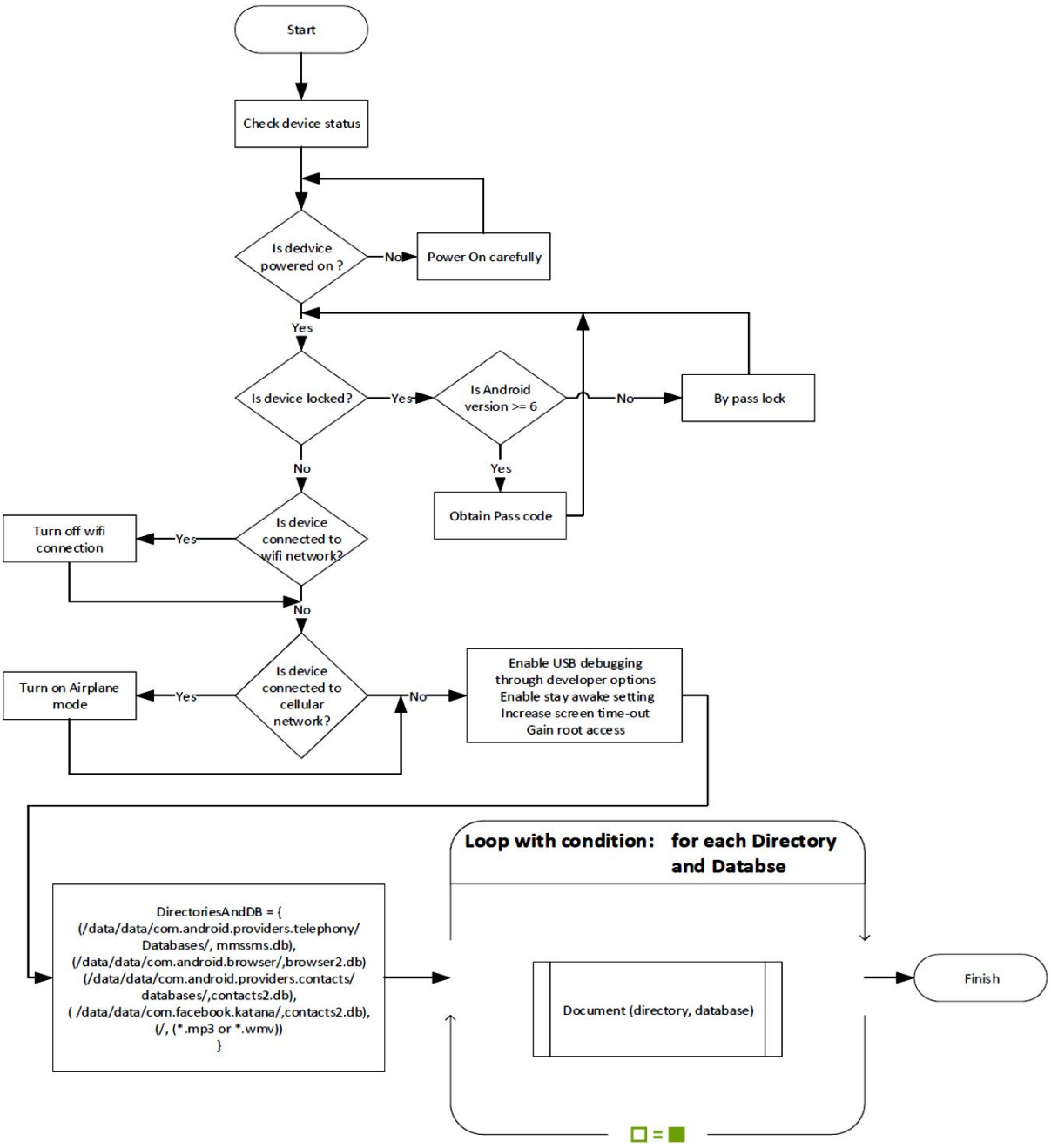

Figure 1: Process flow model

1. At the start, the device status is checked, that is; power status, Wi-Fi connection status and cellular network status. This is done to ensure that the device is powered on and not having any network connection. Thereafter, USB debugging is enabled through developer options, screen timeout is increased and root access is gained.
2. Then browse to different locations, and get SQLite databases which can be opened to get evidence, which is later documented using Document_(directory, dictionary). It follows similar steps while documenting every stage to ensure consistency.

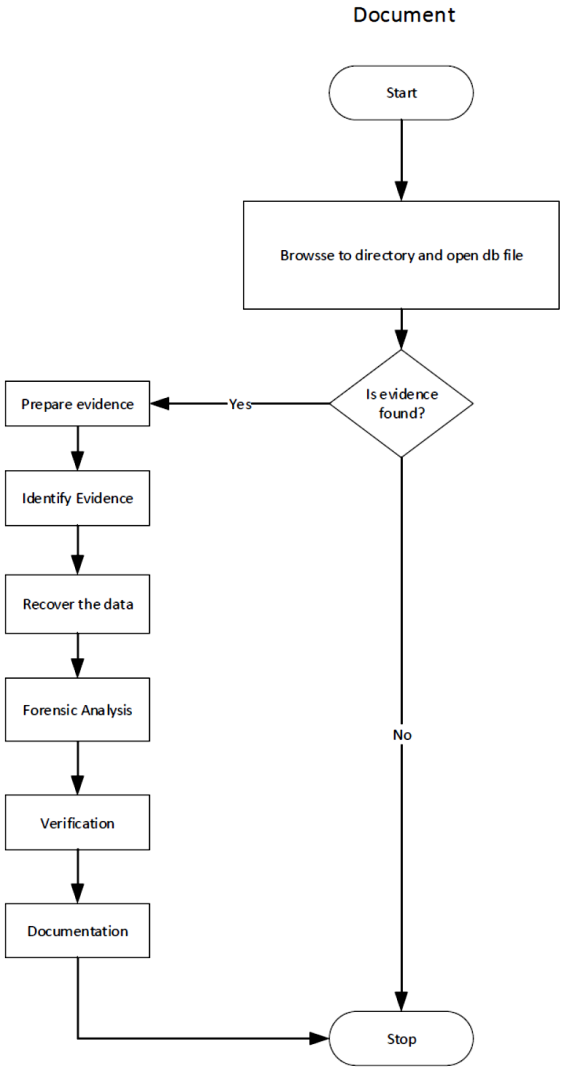

Figure 2: Extension of the process flow model with documentation of every phase

In this proposed model, once the device status is checked and necessary access procedures followed as per *Figure1*, every directory is browsed to ***open db file*** to check if evidence is found and at every step documentation is taken. In the context of this model, the meaning of these phases are further elaborated below:

Device status check

If the device's display is in a viewable state, the screen's contents should be photographed and, if necessary, recorded manually, capturing the time, service status, battery level, and other displayed icons. The main consideration is selecting a tool that reports the status of any PINs and recovers the data of interest.

If the mobile device is powered on, the information appearing on the display may aid in mobile device identification

Prepare evidence

This entails the preparation of tools, techniques, search warrants, and monitoring authorizations and management support. The preparation phase involves specific research the regarding the particular phone to be examined, the appropriate tools to be used during the examination and preparation of the examination machine to ensure that all of the necessary equipment, cables, software and drivers are in place for the examination. Once the make and model of the phone have been identified, the examiner can then research the specific phone to determine what available tools are capable of extracting the desired data from the phone.

- **Identify evidence**

In this model Identification of evidence is gathering information that the investigator require as potential evidence. Questions regarding where the information is located, what information is required and how it should be gathered are key to the investigator at this phase.

- **Recover data**

This phase deals with discovery of deleted, hidden, transfigured data or non-displayable data and is conducted on duplicate data got from imaging the memory.

- **Forensic analysis**

Forensic analysis phase helps in “drawing conclusions based on evidence found". It involves determination of the significance, reconstructing fragments of data and drawing conclusions based on evidence found.

- **Verification**

Verification in this model is the process of ascertaining and evaluating component to determine if a given result or product conform to pre-set conditions at the start of each life cycle and consequently in all activities and set criteria.

- **Documentation**

Documentation deals with the means and mechanisms of for describing the overall extraction process either by using graphics, texts or both. Documentation should be comprehensive enough to support decision making at all stages of legal and court proceedings.

EXPERIMENTATION

Before the experiment was conducted, a check was done to determine whether the device is still active (unlocked) and the settings of the device were changed to enable greater access to the device. For an active device the following tasks were done;

1. Enabling USB debugging to give greater access to the device through the adb connection since most methods for physical acquisition in android devices require USB debugging to be enabled

2. Enabling the Stay awake setting: If the Stay awake option is selected and the device is connected for charging, then the device never locks. Again, if the device locks, the acquisition can be halted.

3. Increasing screen timeout: This is the time for which the device will be effectively active once it is unlocked. The location to access this setting varies depending upon the model of the device. On a Samsung phone, you can access the same by navigating to Settings | Display | Screen Timeout.

4. Gaining root access since this helps in understanding the internal workings of the device in detail and comprehend many issues during evidence extraction. The process of rooting varies depending on the underlying device manufacturer. However, rooting any device usually involves exploiting a security bug in the device's firmware and software then *copying the su (superuser) binary to a location in the current process's path (/system/xbin/su) and granting it executable permissions with the chmod command.*

During physical acquisition the JTAG interface was used since it allows for complete extraction of memory and is supported by many mobile forensic tool vendors. While during logical extraction the Android Debugging Bridge (ADB) was used to pull data extraction since this tool works for Android 4.2.2 and has secure USB debugging and is supported by the command line SDK tool. Cosidering that data to be extracted on an android phone can be stored in shared preference under *shared_pref/data_directory*, internal storage, external storage under */sdcard directory*, but importantly the **SQLite database** where data is stored the */data/data/PackageName/ database* and can be extracted by executing SQLite commands on the respective files

Using adb, the data present in this partition was extracted for further analysis using the adb pull command. The adb pull command on the databases folder of the Dropbox app was executed as follows:

Figure 3: ADB Dropbox app for database folder

Similarly, on a rooted phone, the entire */data* folder was pulled in this manner, as shown in Fig.3 …, also the complete */data* directory on the Android device was copied to the local directory on the machine for analysis. The entire data directory was extracted in 97 seconds. This extraction time varies depending on the amount of data residing in */dat/ adb.exe pull /data c:\temp*

Whereas On a non-rooted device, a pull command on the */data* directory does not extract the files, as shown in Fig 4, since the shell user does not have permission to access those files

Figure 4. Pulling data on rooted device

The data was copied from a rooted phone through the preceding process so as to maintain its directory structure, thus allowing for browsing through the necessary files to gain access to the information. This was done through analysis and examination of critical information while taking keen note on the dates and time comparison and with careful documentation. Using SQLite Browser to view this information, database files such as .qlite, .sqlite3, .sqlitedb, .db and .db3 were browsed to view the contents and shown in Fig.5

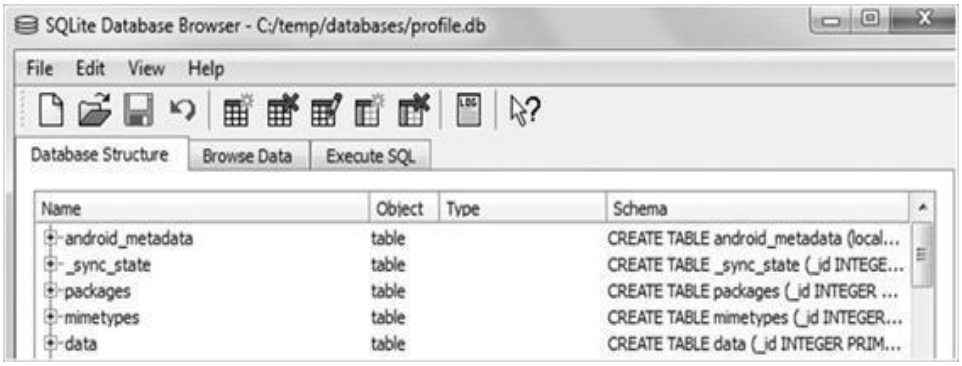

Figure: 5 SQLite Database Browser

Conclusion and Future work

A process flow model and an algorithm has been developed for the extraction of digital evidence in android devices with emphasis on technical and core concept of evidence extraction process. The proposed model is starts with checking of the device status and follows with all necessary security checks and android operating system version checks. An experiment was conducted the test this model and the results showed greater efficiency. It is shown through examples that the method can uniformly specify the forensic process

in various phases and provides a more exact description and process flow of how evidence can be extracted by browsing each directory and documenting each stage in the evidence extraction. Further research aims at experimenting this model with latest android operating system version to ensure consistency in results obtained.

References:

1. (2019). *Statista 2019, Mobile OS market share 2018 Statista*. Retrieved April 01, 2019, from https://www.statista.com/statistics/266136/global-market-share-held-by-smartphone-operating-systems/
2. Renner, T. (n.d.). *Mobile OS - Features, Concepts and Challenges for Enterprise Environments.*
3. Al-Hadadi, M., & AlShidhani, A. (2013). Smartphone Forensics Analysis: A Case Study. *Int. J. Comput. Electr. Eng., vol. 5, no. 6*, 576–580.
4. Rao, V., & A. S. (2016). Survey on Android Forensic Tools and Methodologies. *Int. J. Comput. Appl., vol. 154, no. 8*, 17–21.
5. Du, X., & Scanlon, M. (2016). *Evaluation of Digital Forensic Process Models with Respect to Digital Forensics as a Service*.
6. (2019). oxford dictionary online. *algorithm | Definition of algorithm in English by Oxford Dictionaries*. Retrieved April 01, 2019, from: https://en.oxforddictionaries.com/definition/algorithm
7. Daware, S., Dahake, S., & Thakare, V. M. (2012). Mobile forensics: Overview of digital forensic, computer forensics vs. mobile forensics and tools. *Int. J. Comput. Appl., vol. 2012*, 7–8.
8. Ahmed, R., Dharaskar, R., & Thakare, V. (2013). Digital evidence extraction and documentation from mobile devices. *Int. J. Adv. Res. Comput. Commun. Eng., vol. 2, no. 1*, 1019–1024.
9. Lawton, D., Stacey, R., & Dodd, G. (2014). *eDiscovery in digital forensic investigations*.
10. Ayers, R., Brothers, S., & Jansen, W. (2014). NIST Special Publication 800-101 Revision 1: Guidelines on Mobile Device Forensics. *NIST Spec. Publ., vol. 1, no. 1*, 85.
11. Kohn, M. D., Eloff, M. M., & Eloff, J. H. P. (2010). *Integrated digital forensic process model*. (pp.1–13).
12. Khadijah, S., Mohd, T., Adil, Z., & Talib, B. (2013). *Standard operating procedure of digital evidence collection.* Digital Forensics Department, CyberSecurity Malaysia.
13. K. R., & Amandeep, K. (2012). Digital Forensics. *Int. J. Comput. Appl., vol. 50, no. 5*, 5–9.
14. Jafari, F., & Satti, R. S. (2015). Comparative Analysis of Digital Forensic Models. *J. Adv. Comput. Networks, vol. 3, no. 1*, 82–86.
15. Anobah, M., Saleem, S., & Popov, O. (2014). Testing Framework for Mobile Device Forensics Tools DEVICE FORENSICS TOOLS. *J. Digit. Forensics, Secur. Law Artic., vol. 9, no. 2*.
16. Agarwal, M., & Gupta, M. (2011). Systematic digital forensic investigation model. *Int. J. Comput. Sci. Secur., vol. 5, no. 1*, 118–131.
17. Al-Fedaghi, S., & Al-Babtain, B. (2012). Modeling the forensics process. *Int. J. Secur. its Appl., vol. 6, no. 4*, 97–108.
18. Ray, D. A., & Bradford, P. G. (2007). *Models of Models: Digital Forensics and Domain-Specific Languages A Selection of Previous Work on Models of Digital Investigation*. no. May, p. 108.
19. Valjarevic, A., & Venter, H. S. (2012). *Harmonised digital forensic investigation process model.* 2012 Inf. Secur. South Africa - Proc. ISSA 2012 Conf.
20. Perumal, S., & Md Norwawi, N. (2011). *New improvement in digital forensic standard operating procedure (SOP)*.
21. Gupta, Y. K. (2016). *Systematic Digital Forensic Investigation Model*. no. January 2011.
22. Goel, A., Tyagi, A., & Agarwal, A. (2012). Smartphone Forensic Investigation Process Model. *J. Comput. Sci. ..., no. 6*, 322–341.
23. Pollitt, M. (n.d.). Digital forensic research conference. *A Framework for Digital Forensic Science*.
24. Shibly, A. (2016). Android Operating System: *Architecture, Security Challenges and Solutions*. no. March.
25. Pandiyan, D., & Paranjape, S. (n.d.). *Android architecture and binder*.
26. Bala, K. (2015). A Study on Smartphone based Operating System. *vol. 121, no. 1*, 17–22.

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SECTION 7. Mechanics and machine construction.

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STRESSES IN A STEEL RING AT CLAMPING IN A THREE-JAW CHUCK

Abstract: *The results of experimental researches of stress-strain state of a metallic ring with a wall thickness from 0.5 to 10 mm at a classical clamping scheme in a three-jaw self-centering lathe chuck are presented in the article. The dependence analysis of shear stress of the ring from the wall thickness and arising bending moment τ(S;M) was performed.*

Key words: *a ring, thickness, stress, moment, load.*

Language: *English*

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Introduction

Boring of thin-walled metallic rings is performed on universal or automated lathes at observance of the certain conditions of mechanical processing. Excessive clamping of a processed workpiece by jaws of a lathe chuck leads to a distortion of a geometric shape of the ring [1 – 9]. This distortion is expressed in a deflection of an outer diameter, and after boring and the inner diameter of the ring in places of clamping [6]. In turn, insufficient clamping force can

lead to snatching of the ring from the jaws of the lathe chuck under the action of cutting forces. Special machine retaining devices excluding elastic and plastic deformations of the workpieces are used at turning of a large number of the thin-walled rings. The presented clamping scheme is used at mechanical processing of the small number of the rings in an experimental (individual) production. Prediction of stress-strain state of the metallic ring at clamping in the three-jaw lathe chuck can be obtained by thickness changing of the processed workpiece and mathematical processing of the results of performed experiments.

Materials and methods

Stress-strain state of the metallic ring was determined in accordance with the loading scheme (the Fig. 1). The ring is clamped with some force in the lathe chuck at the outer cylindrical diameter by three self-centering jaws. There were performed 39 experiments in which thickness (*S*) of the ring from 0.5 to 10 mm was changed. A changing step of the ring thickness was adopted 0.25 mm.

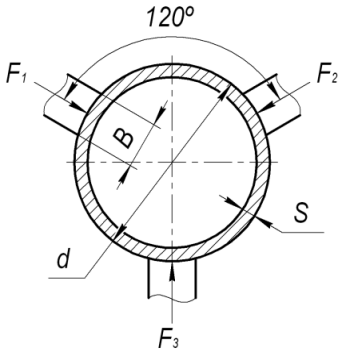


Figure 1 – The loading scheme of the metallic ring clamped by three jaws of the lathe chuck.

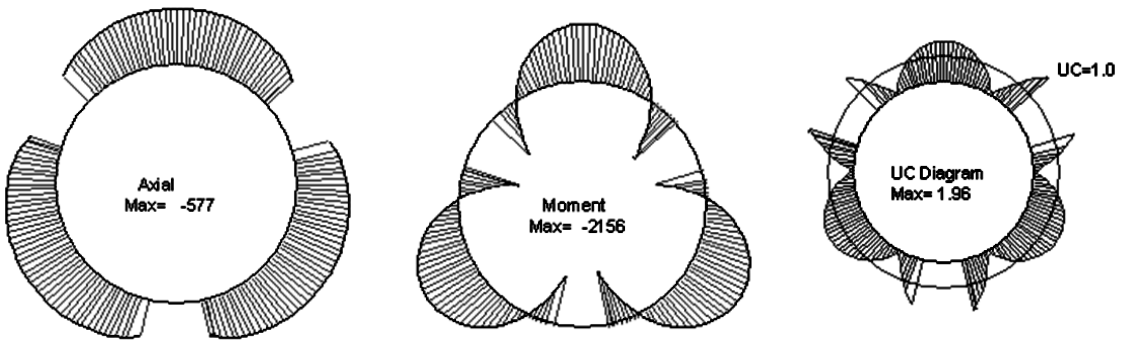
The other source parameters were taken constant for each performed experiment: the outer diameter of the ring *d* is 50 mm; external force on the ring F_1, F_2, F_3 is 1000 N; the width of the jaw of the lathe chuck *B* is 12 mm; yield stress of the metallic ring R_e is 355 N/mm^2; the allowable stress factor of the ring material is 0.6.

Results and discussion

The diagrams of stress-strain state of the ring material (the axial, moment and UC diagrams) when *S* = 3 mm are presented in the Fig. 2. On the diagrams it is seen that axial stresses in the ring material and bending moment have negative values. However, in material of the deformed ring there are arised stresses with the positive values. Thus, you can say that the clamped metallic ring is exposed simultaneously by tension and compression.

Herewith, maximum stresses occur in material volumes of the thin-walled ring which do not expose by external load. The coefficient of deformation of the metallic ring is: 73 when *S* = 0.5 mm; 2.8 when *S* = 2.5 mm; 0.7 when *S* = 5 mm; 0.3 when *S* = 7.5 mm and 0.1 when *S* = 10 mm.

The dependence of inertia moment (*J*) from the ring thickness is presented in the Fig. 3. Inertia moment of the ring is increased with increasing of thickness (at changing only the inner diameter). Increasing of inertia moment in 1000 times is occurred at tenfold increasing of the ring thickness (from the minimum to maximum value).



A) ***B)*** ***C)***

Figure 2 – The diagrams of stress-strain state of the metallic ring when *S* = 3 mm (*A* – the axial diagram, *B* – the moment diagram, *C* – the UC diagram).

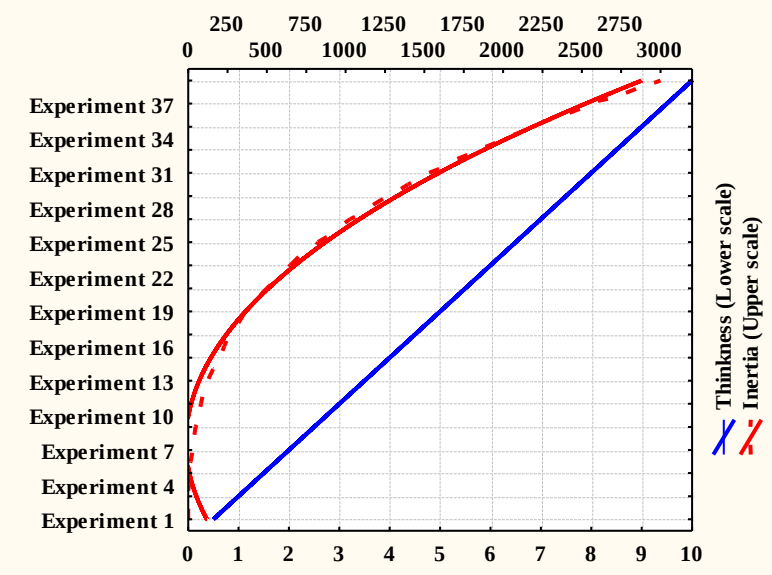


Figure 3 – The dependence of inertia moment from the ring thickness.

If the ring thickness does not change, then at constant external force, bending moment (M) will not change. By changing the ring thickness in the adopted range, the value of bending moment changes, and therefore, and shear stress (τ) of the ring material. How it is changing shear stress will show integration of the function $\tau(S;M) = -28.2651 - 0.1619M + 26.068S - 2.7608\times10^{-5}M^2 + 0.0096MS - 0.3613S^2$. Let us choose the integration range by the ring thickness based on the analysis of the dependence graph $J(S)$.

$$\int_3^{10} dS \int_{-2156}^{-1508} dM \left[\begin{array}{c} 26.068S - 2.7608\times10^{-5}M^2 + \\ + 0.0096MS - 0.3613S^2 - 28.2651 - \\ - 0.1619M \end{array} \right],$$

where -2156 N×m and -1508 N×m are the lower and upper limits of integration for bending moment, respectively.

Let us integrate by the ring thickness

$$\int_3^{10} \left[\begin{array}{c} 26.068S - 2.7608\times10^{-5}M^2 + 0.0096MS - \\ - 0.3613S^2 - 28.2651 - 0.1619M \end{array} \right] dS$$

1. $\frac{26.068S^2}{2}\Big|_3^{10} = 1303.4 - 117.306 = 1186.094$
2. $2.7608\times10^{-5}M^2S\Big|_3^{10} = 27.608\times10^{-5}M^2 - 8.2824\times10^{-5}M^2 = 19.3256\times10^{-5}M^2$
3. $\frac{0.0096MS^2}{2}\Big|_3^{10} = 0.48M - 0.0432M = 0.4368M$
4. $\frac{0.3613S^3}{3}\Big|_3^{10} = 120.4333 - 3.2517 = 117.1816$
5. $28.2651S\Big|_3^{10} = 282.651 - 84.7953 = 197.8557$
6. $0.1619MS\Big|_3^{10} = 1.619M - 0.4857M = 1.1333M$
7. $1186.094 - 19.3256\times10^{-5}M^2 + 0.4368M - 117.1816 - 197.8557 - 1.1333M = 871.0567 - 19.3256\times10^{-5}M^2 - 0.6965M$

Let us convert mm to m and integrate by bending moment

$$\int_{-2156}^{-1508} \left[0.871 - 19.3256\times10^{-8}M^2 - 0.0007M \right] dM$$

1. $0.871M\Big|_{-2156}^{-1508} = -1313.468 - (-1877.876) = 564.408$
2. $\frac{19.3256\times10^{-8}M^3}{3}\Big|_{-2156}^{-1508} = -220.91 - (-645.592) = 424.682$
3. $\frac{0.0007M^2}{2}\Big|_{-2156}^{-1508} = 795.92 - 1626.9176 = -830.9976$
4. $564.408 - 424.682 - (-830.9976) = 970.7236 N/m^2$

The calculation result shows that tension deformations of the ring material are prevailed over compression deformations. Therefore, inevitably there is occurred a deviation from circularity of the ring after machining.

Conclusion

Based on the performed experiments and the mathematical calculations by determination of stress-strain state of the metallic ring at load can be drawn the following conclusions:

1. If the ring thickness more than 3 mm that inertia moment does not change significantly, what says about large stresses in material.

2. Optimal forces (boundaries of integration) were selected by means of the mathematical

calculations in which minimum elastic and plastic deformations of the ring were defined.

References:

1. Litvin, A. V. (2014). Technological systems lathe and its effects on processing nonrigid parts. *Bulletin of Sevastopol national technical University, 151*, 81-86.
2. Frolov, A. A., & Vasilyev, A. S. (2016). *The research of strain state of billets of the type rings when installed on the machines of the turning group.* All-Russian scientific and technical conference of students «Student research spring of 2016: Mechanical Engineering Technology», (pp.1-21).
3. Kopetsky, A. A., Nosenko, V. A., & Tyshkevich, V. N. (2013). Research of elastic deformations of bearings rings at fixing in jaw chuck. *Izvestija TulGU, №5*, 159-166.
4. Morgunov, A. P., & Chkhetiani, E. Yu. (2012). The technological base of machining precision of the thin-walled plane engine details. *The Journal Omsk Scientific Bulletin, №1 (107)*, 130-132.
5. Morgunov, A. P., & Chkhetiani, E. Yu. (2012). The influence of technological system rigid factor to the machining precision of thin-walled variable-section flange. *The Journal Omsk Scientific Bulletin, №2 (110)*, 70-72.
6. Eremeykin, P. A., & Zhargalova, A. D. (2017). Automation of assignment of rational thin-walled parts turning mode. *Engineering Journal: Science & Innovation, 2*, 1-15.
7. Gavryushin, S. S., Zhargalova, A. D., Lazarenko, G. P., & Semisalov, V. I. (2015). The Method of Determining the Conditions for Machining Thin-Walled Parts. *Proceedings of Higher Educational Institutions. Machine Building, № 11*, 53-60.
8. Lastovskii, P. N. (2010). *Ensuring the accuracy of specified requirements with regard to Automatic turning thin-walled parts*. Cand. tehn. sci. diss., OmGTU publ., (p.226).
9. Chumakov, I. V. (2015). Turning non-solid flanges on the CNC machine tool. *Technique and technology of modern productions*, 150-154.
10. *GOST 2.308-2011*. Unified system of design documentation. Representation of limits of forms and surface lay-out on drawings.

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SECTION 20. Medicine.

QR – Issue QR – Article

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GLUCOCORTICOSTEROIDS AND DEVELOPMENT OF DIABETES MELLITUS (literature review)

Abstract: *This article presents a review of the literature on the study of the development of diabetes mellitus when using glucocorticosteroids in the treatment of various diseases. Along with this, there have been studied some mechanisms of the development of an increase in the level of glucose in patients taking steroid drugs for the treatment of certain diseases.*

Key words: *glucocorticosteroids, hyperglycemia, diabetes mellitus, corticosteroids.*

Language: *Russian*

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ГЛЮКОКОРТИКОСТЕРОИДЫ И РАЗВИТИЕ САХАРНОГО ДИАБЕТА (литературный обзор)

Аннотация: *В данной статье представлен обзор литературы по изучению развития сахарного диабета при использовании глюкокортикостероидов в лечении различных заболеваний. Наряду с этим, изучены некоторые механизмы развития повышения уровня глюкозы у пациентов принимающих стероидные препараты для лечения тех или иных заболеваний.*

Ключевые слова: *глюкокортикостероиды, гипергликемия, сахарный диабет, кортикостероиды.*

Введение.

Стероиды - это лекарства, которые широко используются для лечения многих заболеваний. Хотя, глюкокортикоиды часто назначаются как противовоспалительные и иммунодепрессивные препараты, они имеют несколько побочных эффектов, и гипергликемия представляет собой одну из наиболее распространенных. Стероиды являются основной причиной гипергликемии, вызванной лекарственными препаратами. Они не только усугубляют гипергликемию у пациентов с сахарным диабетом (СД), но также вызывают СД у здоровых пациентов, причем частота может достигать до 46%. Кроме того, в некоторых случаях они могут вызывать острые осложнения, такие как гиперосмолярное состояние и диабетический кетоацидоз, и даже летальный исход, особенно у пациентов с уже существующим СД [1]. Эффекты глюкокортикоидов на метаболизм глюкозы включают подавление транспортера глюкозы в мышцах, который увеличивает количество инсулина, необходимого для поглощения глюкозы клетками, увеличение выработки глюкозы в печени, ингибирование связывания инсулина рецептором и снижение секреции инсулина в островковых клетках. Следовательно, введение глюкокортикоидов может усугубить предиабет или недиагностированный диабет и может трансформировать умеренный диабет в клинически тяжелое заболевание, что может привести к гипергликемической гиперосмолярной коме. Однако некоторые симптомы гипергликемии, такие как жажда, сухость во рту, слабость, потеря веса и полиурия также часто встречаются у пациентов [2]. Таким образом, гипергликемия выявленная у пациента требует дифференциальной диагностики, так как причиной повышение уровня глюкозы могут быть

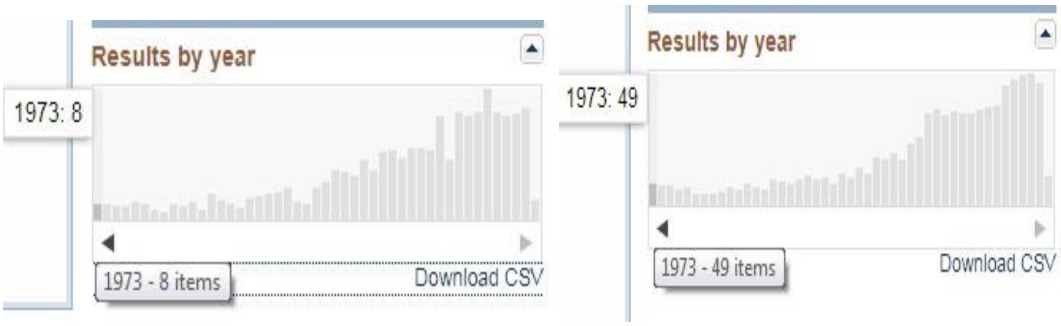
лекарственные препараты применяемые для лечения определенных заболеваний.

Цель исследования.

Целью исследования явилась изучение данных литературы по развитию сахарного диабета после приема глюкокортикостероидов, а также оценить основной механизм ответственный за повышение уровня глюкозы при лечении стероидными препаратами.

Методы исследования.

В данной статье проведен обзор литературы по ключевым словам «стероид-индуцированная гипергликемия», «глюкокортикостероиды и гипергликемия», «глюкокортикостероиды и диабет» в базах данных PubMed и ScienceDirect. При вводе ключевых слов наблюдается увеличение публикации с 1973 по 2018 гг, что показано в рисунке 1.



а) **б)**

Рисунок 1. Количество научных статьей в базе PubMed при вводе ключевых слов: а) «глюкокортикостероиды и гипергликемия», б) «глюкокортикостероиды и диабет».

Результаты литературного обзора.

Глюкокортикоидные гормоны секретируются корой надпочечников под контролем гипоталамо-гипофизарно-надпочечниковой системы. Глюкокортикостероиды - это гормоны стресса, которые облегчают реакцию защиты организма путем увеличения производство глюкозы в печени, липолиза жировой ткани и протеолиза, а также поддержание адекватного артериального давления. В клинике синтетические кортикостероиды широко используются в лечении многочисленных заболеваний в связи с их мощным противовоспалительным и иммуносупрессивным действием. В 1908 году впервые было установлено, что «вещества» секретируемые надпочечниками вовлечены в метаболизм глюкозы, а последующие исследования на животных с адреналэктомией, выявили развитие гипогликемии [3].

С момента появления глюкокортикоидной терапии аутоиммунных заболеваний в 1940-х годах их широкое применение привело к одновременному ограничению использования и обнаружению многих побочных метаболических эффектов [4]. Пациенты получают стероидную терапию при лечении множества состояний, от легочных до ревматологических и дерматологических заболеваний. Известно, что стероиды вызывают гипергликемию, которая возникает в период, пока пациент принимает стероиды. Если пациент не страдающий СД находится на пятидневном курсе стероидами, мониторинг уровня глюкозы в крови обычно не выполняется. Однако, если пациенту требуются стероиды в течение длительного периода времени, обычно порядка нескольких недель или месяцев, целесообразно контролировать уровень глюкозы в крови [5]. Так, Hoes J.N. и соавторы выявили, что у пациентов длительно принимающих кортикостероиды наблюдается пониженная чувствительность к инсулину и функция β-клеток по сравнению с контрольной группой [6].

По данным литературы распространенность СД вследствие перорального приема глюкокортикоидов колеблется от 2% до 50%. Имеются несколько факторов риска развития стероид-индуцированного СД (СИСД). Большая длительность, высокая доза и тип непрерывной терапии глюкокортикоидами, пожилой возраст, индекс массы тела, гестационный СД, семейный анамнез диабета и уровень гликолизированного гемоглобина являются факторами риска развития СИСД. При этом, предиабет также является предполагаемым фактором риска. Важно идентифицировать пациентов, подвергающихся

лечению стероидами, которым грозит СИСД, так как диабет может остаться незамеченным у пациентов с нормальным уровнем глюкозы [7,8,9].

Пациенты из группы риска должны быть обследованы на наличие гипергликемии в течение первых 1-2 дней стероидной терапии, когда развивается большинство случаев СИСД. Стероиды вызывают в основном постпрандиальную гипергликемию, поэтому показатели глюкозы в крови после приема пищи более чувствительны, чем тесты на глюкозу натощак. СИСД лучше всего диагностируется пероральным тестом на толерантность к глюкозе [5].

Механизмы, лежащие в основе этих так называемых диабетогенных эффекты глюкокортикоидов в отношении метаболизма глюкозы, липидов и белков были изучены в 1960-1970-х годах и были в основном связаны с глюкокортикоид-индуцированной резистентностью к инсулину на уровне печени, скелетных мышц и жировой ткани [3]. Существует ряд механизмов, объясняющих повышение уровня глюкозы в крови вследствие терапии стероидами. Глюкокортикоиды усиливают глюконеогенез в печени и вызывают повышение резистентности к инсулину. Они также вызывают распад белков и липидов, тем самым обеспечивая субстратом процесс глюконеогенеза. После введения глюкокортикоидов наблюдается подавление периферического поглощения глюкозы скелетными мышцами. Это объясняет причину, по которой глюкокортикоиды вызывают начальную постпрандиальную гипергликемию [3,10,11].

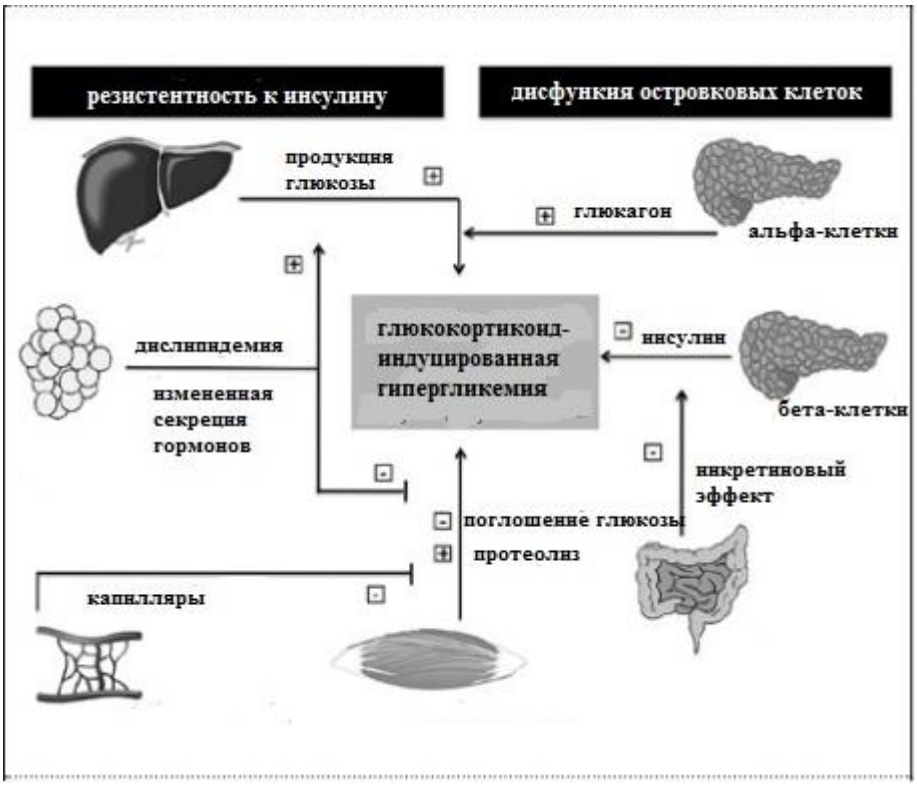


Рисунок 2. Механизм развития глюкокортикоид-индуцированной гипергликемии [3].

Dănescu A.S. и соавторы считают, что влияние стероидов на метаболизм глюкозы является результатом нескольких путей, в том числе, дисфункции бета-клеток, снижение аффинности связывания инсулина или уменьшение числа рецепторов, ингибирование каскадов постинсулиновых рецепторов [12,13].

Кроме того, по мнению Rafacho A. и соавторов, кортикостероиды могут стимулировать абдоминальное ожирение, повышать содержание в плазме жирных кислот и триглицеридов. В ответ на это, в попытке поддержать нормогликемию, β-клетки поджелудочной железы претерпевают несколько морфофункциональных адаптаций, которые приводят к гиперинсулинемии. Неспособность β-клеток компенсировать эту ситуацию способствует нарушению гомеостаза глюкозы, что может приводит к гипергликемии. Лечение кортикостероидами не только изменяет функцию β-клеток поджелудочной железы, но также влияет

на их действие, которое может привести к гиперглюкагонемии, что также способствует нарушению гомеостаза глюкозы и гипергликемии [14].

Проблемы в лечении стероид-индуцированного диабета связаны с широкими колебаниями постпрандиальной гипергликемии и отсутствием четко определенных протоколов лечения. Основой лечения является инсулинотерапия, совмещенная с диетотерапией. Инсулин является лечением выбора в большинстве случаев СИСД. Поскольку, при приеме кортикостероидов снижают дозу препаратов, эндокринная функция организма пациентов обычно возвращается к исходному уровню и потребность в инсулине снижается. Долгосрочное использование низких доз глюкокортикоидов было связано с повышенной сердечно-сосудистой смертностью, возможно, из-за микрососудистых осложнений гипергликемии. Поэтому своевременная идентификация СИСД имеет решающее значение, при котором, факторы риска сердечно-сосудистых заболеваний могут быть оптимизированы и достигнут адекватный гликемический контроль [4,15].

Лечение СИСД фокусируется на двух основных направлениях. В начальный период глюкокортикоиды оказывают преобладающее влияние на уровень глюкозы в крови после приема пищи, исходя из этого первый механизм лечения направлен на борьбу с СИСД - это увеличение болюсного инсулина до приема пищи для того, чтобы предотвратить постпрандиальную гипергликемию. Использование этого базально-болюсного подхода лечения СИСД хорошо известно и есть доказательства того, что он является очень эффективным. Альтернативный подход заключается в том, что инсулин вводится одновременно с глюкокортикоидами, тогда можно уменьшить гипергликемический эффект глюкокортикоидов [8].

Вывод.

Таким образом, кортикостероиды могут быть причиной гипергликемии и сахарного диабета у пациентов принимающих данные препараты для лечения тех или иных заболеваний. Риск гипергликемии и СД возрастает у пациентов находящихся на длительном лечении стероидными препаратами, что требует мониторинга гликемического профиля для предупреждения возникновения осложнений диабета.

References:

1. Tamez-Pérez, H. E., Quintanilla-Flores, D. L., Rodríguez-Gutiérrez, R., González-González, J. G., & Tamez-Peña, A. L. (2015). Steroid hyperglycemia: Prevalence, early detection and therapeutic recommendations: A narrative review. *World J Diabetes, 6(8)*, 1073–1081.
2. Jeong, Y., et al. (2016). A Pilot Study Evaluating Steroid-Induced Diabetes after Antiemetic Dexamethasone Therapy in Chemotherapy-Treated Cancer Patients. *Cancer Res Treat, 48(4)*, 1429-1437.
3. Van Raalte, D. H., & Diamant, M. (2014). Steroid diabetes: from mechanism to treatment? *Neth J Med, 72(2)*, 62-72.
4. Hwang, J. L., & Weiss, R. E. (2014). Steroid-induced diabetes: a clinical and molecular approach to understanding and treatment. *Diabetes Metab Res Rev, 30(2)*, 96–102.
5. Byrd, V., & Nemeth, A. (2018). Steroid-induced Diabetes Complicating Treatment of Epidermolysis Bullosa Acquisita: A Preventable Treatment Complication Stresses the Importance of Primary Care Follow-up. *Cureus, 10(11)*, e3608.
6. Hoes, J. N., et al. (2011). Glucose tolerance, insulin sensitivity and β-cell function in patients with rheumatoid arthritis treated with or without low-to-medium dose glucocorticoids. *Ann Rheum Dis, 70(11)*, 1887-1894.
7. Gonzalez-Gonzalez, J. G., et al. (2013). Hyperglycemia related to high-dose glucocorticoid use in noncritically ill patients. *Diabetol Metab Syndr, 5*, 18.
8. Clore, J. N., & Thurby-Hay, L. (2009). Glucocorticoid-induced hyperglycemia. *Endocr Pract, 15(5)*, 469-474.
9. Kim, S. Y., et al. (2011). Incidence and risk factors of steroid-induced diabetes in patients with respiratory disease. *J Korean Med Sci, 26(2)*, 264-267.
10. Lakhani, O. J., Kumar, S., Tripathi, S., Desai, M., & Seth, C. (2017). Comparison of Two Protocols in the Management of Glucocorticoid induced Hyperglycemiaamong Hospitalized

Patients. *Indian J Endocrinol Metab, 21(6)*, 836-844.

11. Iwamoto, T., Kagawa, Y., Naito, Y., Kuzuhara, S., & Kojima, M. (2004). Steroid-induced diabetes mellitus and related risk factors in patients with neurologic diseases. *Pharmacotherapy, 24(4)*, 508-514.
12. Dănescu, A. S., et al. (2018). Immunological markers as predictors of developing steroid-induced diabetes mellitus in pemphigus vulgaris patients: An observational study. *Medicine (Baltimore), 97(17)*, e0463.
13. Ruzzin, J., Wagman, A. S., & Jensen, J. (2005). Glucocorticoid-induced insulin resistance in skeletal muscles: defects in insulin signalling and the effects of a selective glycogen synthase kinase-3 inhibitor. *Diabetologia, 48(10)*: 2119-2130.
14. Rafacho, A., Ortsäter, H., Nadal, A., & Quesada, I. (2014). Glucocorticoid treatment and endocrine pancreas function: implications for glucose homeostasis, insulin resistance and diabetes. *J Endocrinol, 223(3)*, 49-62.
15. Hoogwerf, B., & Danese, R. D. (1999). Drug selection and the management of corticosteroid-related diabetes mellitus. *Rheum Dis Clin North Am, 25(3)*, 489-505.

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EFFECT OF THE LONG-TERM GUM ARABIC SOLUTIONS PRESERVATION ON HISTOLOGICAL STRUCTURE OF BIOLOGICAL TISSUES

Abstract: *In our previous study by Satte et al., in 2017, gum Arabic solutions were used in the preservation of biological tissues, and the produced samples were maintained their macroscopic features for the long-term. The current study was planned to compare the microscopic structure of biological tissue preserved in gum Arabic solutions with those of unpreserved tissue as a negative control and tissue preserved in silicone-S10 as a positive control. The study was conducted on 5 µm thick tissue sections obtained from 39 specimens of adult sheep, divided into eleven experimental groups and two control groups (positive & negative); each group contained three specimens: kidney, heart, and brain. The experimental groups were preserved in eleven different concentrations of gum Arabic solutions, the positive control group was preserved in silicone-S10, and the negative control group was unpreserved tissue (fresh). From each group, five tissue sections of 5 µm thick were cut from kidney, heart, and brain and were prepared for subsequent hematoxylin and eosin staining for histological examination under a light microscope. The gum Arabic solutions preserved tissue sections revealed the histological architecture similar to that of the unpreserved and that observed in silicone-S10 preserved tissues. The present study concludes that; tissues preserved in gum Arabic solutions can be used in teaching histology for medical students.*

Key words: *histology, gum Arabic, preservation, biological tissues.*

Language: *English*

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1. Introduction

Each year new medical students make their entry in the medical and veterinary colleges. The difficulty of obtaining fresh organs and tissues to study anatomy has encouraged the used of preserved one. There are several methods for preservation of biological tissues, which has helped a lot in the study of anatomy for medical and veterinary students and researchers. In ancient times, gum Arabic and some local materials such as natron and herbs were used traditionally by Egyptian to preserve cadavers [1]. Century's later, formalin solutions have been used for fixation of tissues, but formalin has health hazards such as watery eyes; burning sensations in the eyes, nose, and throat; coughing; wheezing; nausea; and skin irritation for students and staff during practical section [2]. Recently, plastination was introduced as a modern and safe technique for preservation of cadavers by Von Hagens in 1979. During the plastination process, the tissues were fixed in formalin (5 to 20%), dehydrated in acetone, impregnated in curable silicone-S10 or epoxy resin and cured by silicone-S6. The silicones used in the plastination procedure are relatively expensive, not available and patented [4, 8, 18].

Excellent histological tissue sections similar to that of unpreserved histological sections were obtained from silicone-S10 plastinated specimens, however, simple compactness of cells was observed in sections prepared from silicone-S10 plastinated specimens [7, 8,].

The pure gum Arabic solution consists of natural polymers with weak physical properties such as viscosity and elasticity [10, 11]. Glycerin is used as the plasticizer agent to improve the absorption and viscosity of gum Arabic solution. Gum Arabic solution component are the gum Arabic powder, glycerin, and distilled water, and these materials are available and safe [10, 12]. Gum Arabic solutions were tested as an effective and safe material for the biological tissues preservation process, and the produced specimens were maintaining their original macroscopic features for the long term [14].

2. Material and methods

2.1 Preservation procedure

A total of 18 fresh organs (6 hearts, 6 kidneys, and 6 brains) of adult sheep were collected from an abattoir in Najran city, Saudi Arabia, and animal ethics were considered. The organs were transferred in an icebox to the dissection room at medical college, anatomy department, Najran University. First, the organs washed under running tap water to clean blood clots. Each organ was cut sagittally into two halves so that the total number of specimens became 36. The specimens were divided into 12 groups, with each group containing 3 specimens (half kidney, heart, and brain). Each group of specimens was kept in plastic containers with tight lids and then fixed in 10% formalin (02144. CHEMANOL. KSA) for 3 days [14, 15].

After fixation, the specimens were dehydrated in three changes of pure acetone (7566/12. APCO. KSA) for 10 days at room temperature. The acetone is replaced by the tissues fluid and dissolved the excess fat. The concentration of acetone of the successive changes was measured by using a hydrometer (Fisher brand, USA, 9598115900). When the final acetone concentration remained at 99 % or above the specimens were considered dehydrated [16, 17].

Eleven gum Arabic solutions of different concentrations were prepared from pure gum Arabic powder (Acacia Senegal, Natural Gum, Sudan, 6-14600-000191), distilled water and pure glycerin (Chiangrai Agro-Industry Co. Ltd., Thailand 99.5% USP Grade). Two liters of each solution were kept in plastic containers of 3 liters capacity. The silicone-S10 (NC27261Silicones, Inc.211 Woodbine Street, High Point, NC 27260 USA) was mixed with catalyst-S3 (NC336-886-5018.) at 100:1ratio and was used as a control (Table 1) [5].

After fixation and dehydration, the first eleven groups of specimens were submerged in gum Arabic solutions, while group 12 specimens were submerged in the silicone-S10/S3 mixture as shown in table 1. The specimens were left in the different solutions for two days to equilibrate with solutions before force impregnation process. The submerged specimens for each group were covered by a stainless grid to avoid the samples floating [5, 14].

Forced impregnation was used for the replacement of acetone in the specimens with the gum Arabic solutions (for experimental groups) and a curable polymer (for the control group). The submerged groups of specimens were transferred to the vacuum chamber (Mopec, USA, 800-362-8491) connected to a vacuum pump (Mopec, USA, HP200D11001) for forced impregnation at room temperature. The vacuum caused the acetone to vaporize from the specimens creating spaces in the cell for the gum Arabic solutions and polymers to diffuse. The vacuum pressure was gradually decreased to 6 mmHg. The vacuum was maintained for 4 days (5 hours daily) for the experimental groups and one week for the positive control group. Impregnation was considered completed when there were no air bubbles coming out from the specimens [15].

After forced impregnation, the specimens were removed from the impregnation solution, and excess gum Arabic solution and polymers were allowed to drain. The specimens in each group were then arranged on a stainless steel plate. The control group was transferred to close curing gas chamber at room temperature and cured with catalyst S6 (two times daily, 10minutes) until the specimens were hardened up for three days.[17] The experimental specimens were allowed to harden by atmospheric air at room temperature for one week [14].

2.2 The histological procedure

From each group of experimental (preserved in gum Arabic) and silicone-S10 plastinated (as a positive control), a total of 3 small pieces of about 1 cm^3 size were cut from kidney, heart wall, and brain after being stored for six months in the cabinet at room temperature. Subsequently, pieces of 1 cm^3 size were cut from fresh (as a negative control) of each heart, kidney, and brain of adult sheep after the slaughter at an abattoir and fixed immediately after collection in 10% formalin (02144.CHEMANOL. KSA) for two days [6].

Specimens obtained from preserved gum Arabic tissues were submerged in three changes (70%, 80%, 90% and 100% ethanol) of alcohol for 12 hours per immersion to dissolved the impregnated gum Arabic solutions. Whilst, the collected specimens obtained from silicone-S10 plastinated tissues were submerged in alcohol (100% ethanol) for 48hours to dissolve the impregnated silicone. The fresh samples were dehydrated in 70%, 90%, 100% ethanol (32221. SIGMA-ALDRICH. Germany) for 12, 2 and 2 hours respectively.

after the tissues dissolved (for experimental and positive control samples) and dehydrated (for negative control sample), specimens were cleared in xylene (74132. APCO. KSA) for 30 minutes and embedded in molten paraffin wax (REF502004. McCormick. USA) for two hours in an embedding centre (Feica, Germany, 038837689). The embedded specimens were blocked and cut into thin sections of 5 µm thickness by using a microtome (Carl Zeiss, Germany, 3333000173). The tissue sections were transferred to water path heated at 50 ^{0}C for 2-3 minutes and then mounted on glass slides. The slides were placed on a heating plate (the UK, 1892447) at 70 ^{0}C for15 to 20 minutes to adhere the tissue section to the glass slide [19, 22].

Five tissue sections mounted on glass slides were selected from each specimen and stained in hematoxylin (MOH784010004. SOMAT.KSA) and Eosin (17372-87-1. LOBA Chemie. Mumbai. India) [8].

The stained sections were examined under a light microscope (Carl Zeiss, Germany, 3333000173) and photomicrography images were taken for comparison.

3. Results:

The histological sections obtained from kidneys, hearts, and brains preserved in gum Arabic solutions showed good histological structures, and they are similar to that obtained from the same organs plastinated in silicone-S10 (positive control) and that obtained from unpreserved sections (negative control).

Histological sections obtained from gum Arabic solution preserved kidneys revealed clear renal corpuscles structure with obvious Bowman's capsule with its parietal layer of simple squamous epithelium followed by Bowman space, and the inner visceral layer made up of podocytes cells wrap around the capillaries of the renal glomeruli. The glomerular cells nuclei such as that of mesangial cells, and the glomerular capillaries endothelial cells that contact with blood are obvious. Also, renal tubules lining epithelia were visible, the proximal convoluted tubules lined with simple cuboidal cells with brush borders and the tubules lumens appeared narrow while the distal convoluted tubules are lined with simple cuboidal epithelium without brush border and appeared wide lumens. However, urinary spaces are slightly wider in negative control kidney sections compare to that in tissue sections obtained from kidney preserved in gum Arabic solution and that plastinated in silicone-S10 (Figures 1, 2, 3).

The heart tissue sections obtained from preserved gum Arabic solutions showed good stained cardiac muscle fibers connected by intercalated discs (densely staining regions at the end of muscle fibers) and with centrally located nuclei and similar to that of the unpreserved (negative control) heart sections (Figures 4, 5). The histological architectures of silicone-S10 plastinated heart sections showed deep compactness of cardiac muscles cells compared with that of the negative control and experimental groups (Figure 6).

Gum Arabic preserved brain tissue sections revealed well-stained neurons with clear outlines: the neuron cell bodies appeared with central nuclei and projected processes. Moreover, neuroglial cells nuclei were observed scattered among neurons. The histological architecture of gum Arabic preserved brain sections are similar to that obtained from unpreserved and plastinated silicone-S10 brains sections (Figures 7, 8, 9).

4. Discussions:

In this study, tissue sections obtained from gum Arabic preserved specimens showed very good microscopic details and can be used for histological studies; however, gum Arabic is cheap and safe natural products compared to silicone S10 which is

relatively expensive synthetics materials with some health hazards [2, 17].

In previous studies, histological sections obtained from kidneys plastinated in silicone-S10 and stained with hematoxylin and eosin revealed clear and fine histological architectures as reported by researchers [7]. Therefore, these findings are similar to the tissue sections obtained from kidneys preserved by gum Arabic solution technique.

In current study tissue sections obtained from heart preserved in gum Arabic solution presented very good histological details, which is more clear than that obtained from silicone S10 plastinated heart sections, which agreed with the poor stained heart tissue sections reported in the previous study [9].

A previous study showed that the plastinated brain sections can be used for histological studies [23]. This agrees with our findings of tissue sections obtained from a brain preserved in gum Arabic solutions, which showed the histological details such as neurons structures, supporting cells nuclei, and neurons boundaries, which are similar to that obtained from the negative control group.

The obvious wider of urinary space in negative control kidney sections compare to that of gum Arabic kidneys sections may be attributed to negative vacuum pressure used during organ impregnation in gum Arabic solutions and in silicone-S10, this agreed with reporters findings in tissue sections prepared from organs plastinated in silicone-S10 [7, 8].

Conclusion:

The outcome of the present study confirmed that gum Arabic solutions are an excellent medium for preservation of histological details of biological tissues, and is suitable for preservation of biological tissues for microscopic study for medical students.

Table 1. Impregnation solutions.

Solution No	Gum g/L	Glycerin %	Water %	Specimens group No
1	100	75	25	**G1**
2	100	80	20	**G2**
3	100	85	15	**G3**
4	100	60	40	**G4**
5	100	40	60	**G5**
6	100	30	70	**G6**
7	80	85	15	**G7**
8	90	85	15	**G8**
9	110	85	15	**G9**
10	50	80	20	**G10**
11	227	10	90	**G11**
12	Mix of Silicone-S10 and catalystS3 at ratio 100:1			**G12 (positive control)**

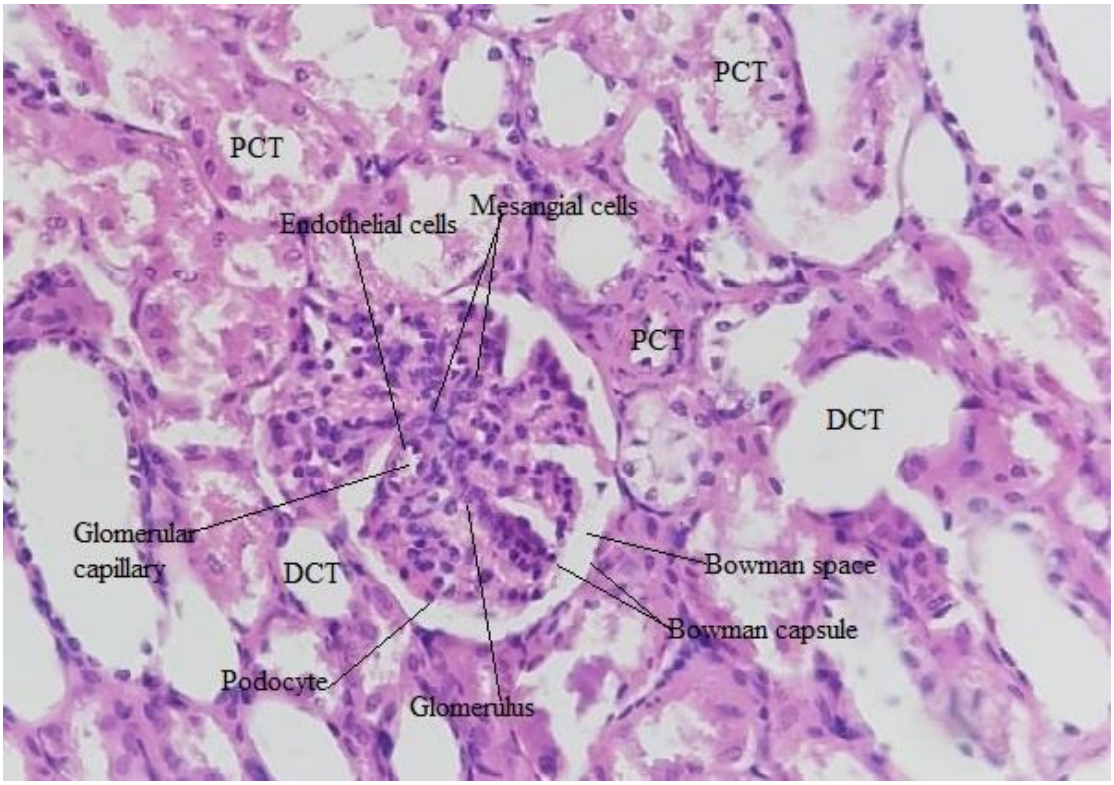

Figure 1: Histological features of unpreserved (fresh) kidney section. Photomicrograph, x40. Proximal convoluted tubules (PCT), distal convoluted tubules (DCT).

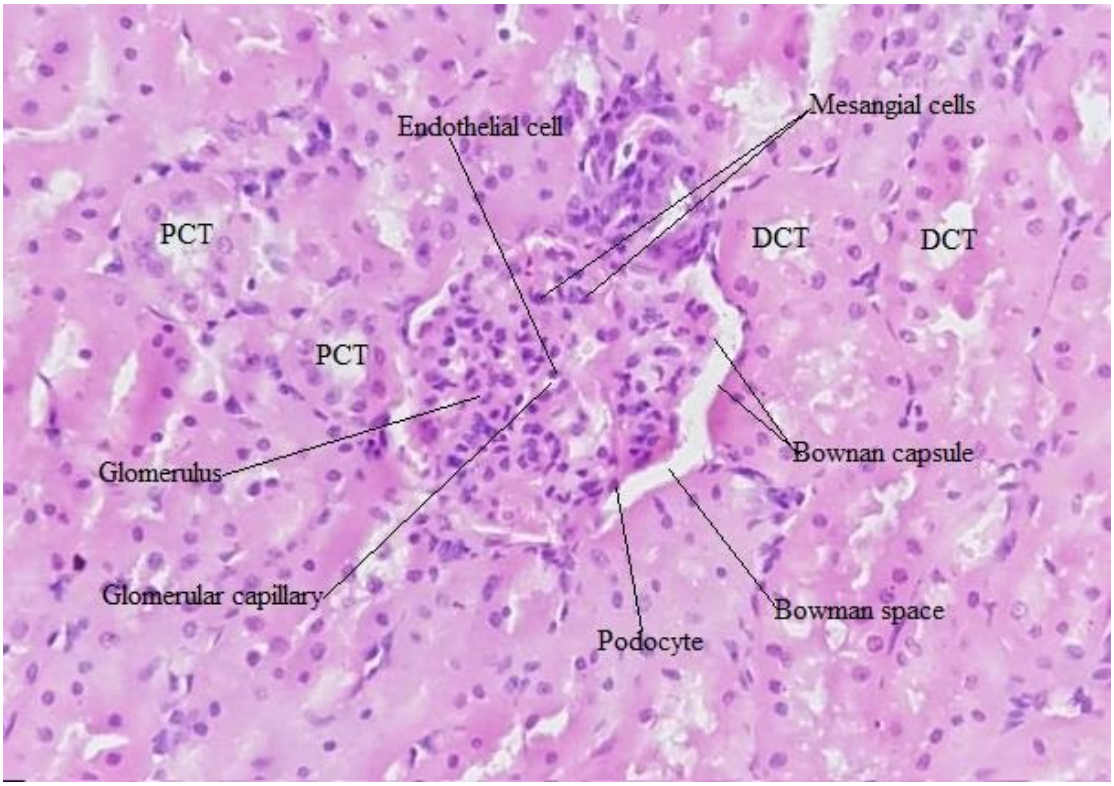

Figure 2: Histological features of gum Arabic solution preserved kidney section. Photomicrograph, x40. Proximal convoluted tubules (PCT), distal convoluted tubules (DCT).

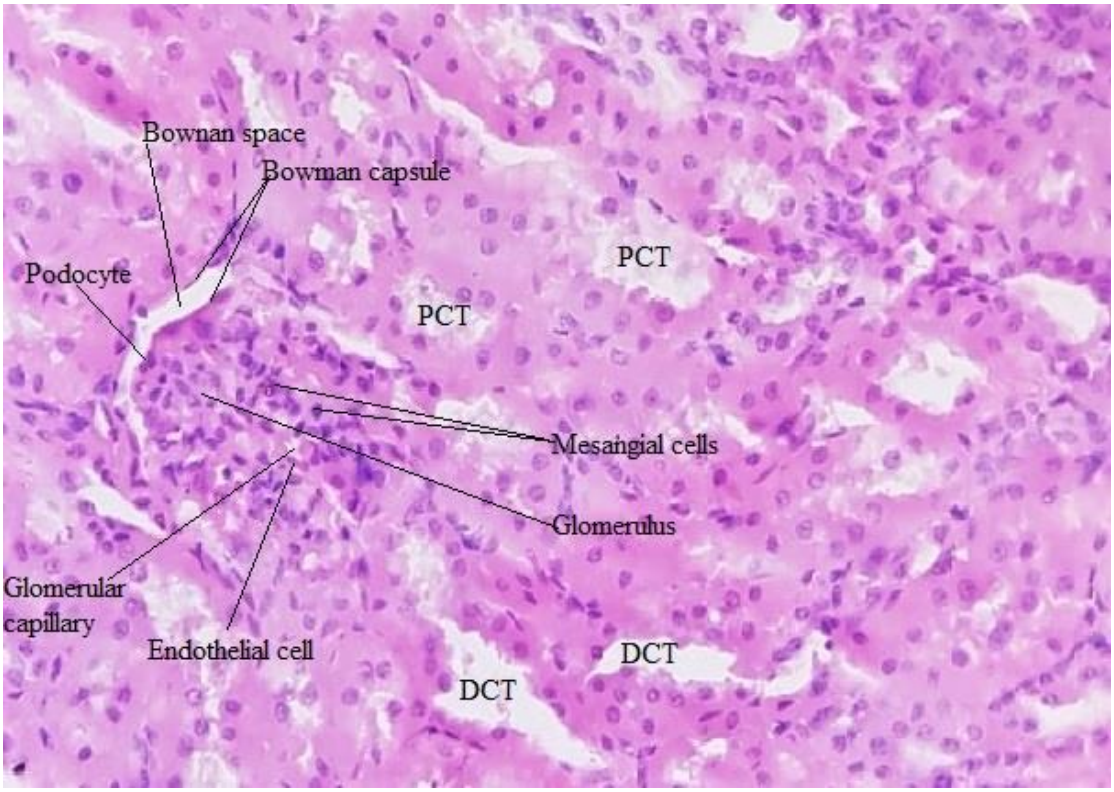

Figure 3: Histological features of silicone-S10 preserved kidney section. Photomicrograph, x40. Proximal convoluted tubules (PCT), distal convoluted tubules (DCT).

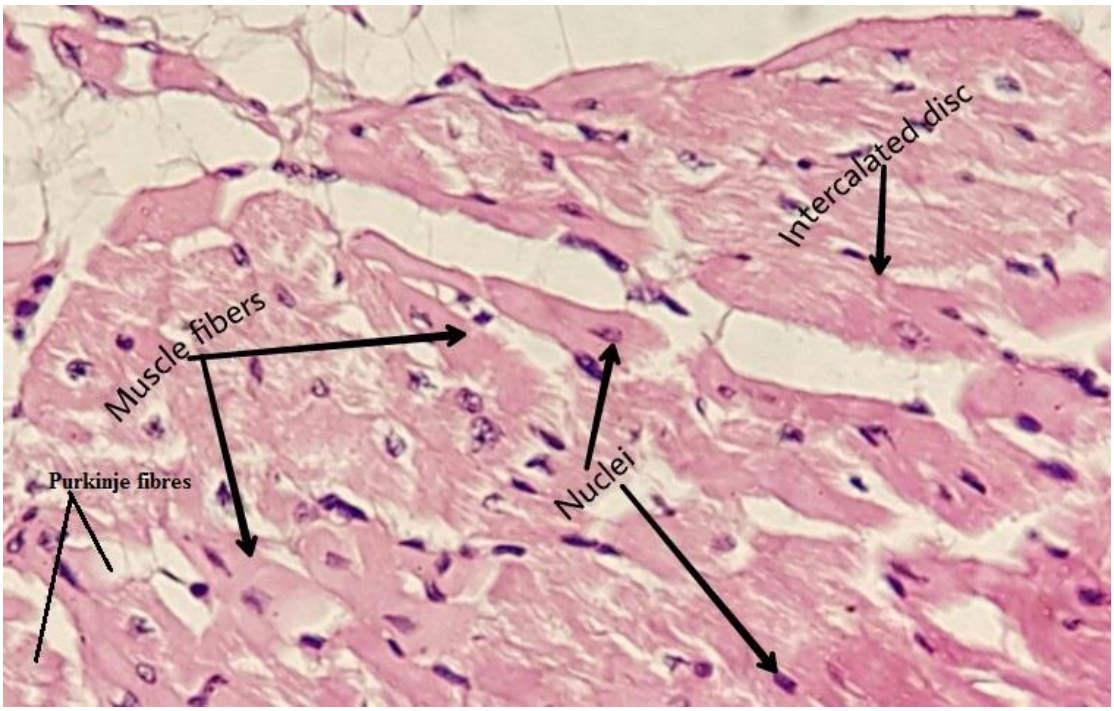

Figure 4: Histological features of unpreserved (fresh) heart section. Photomicrography, x40.

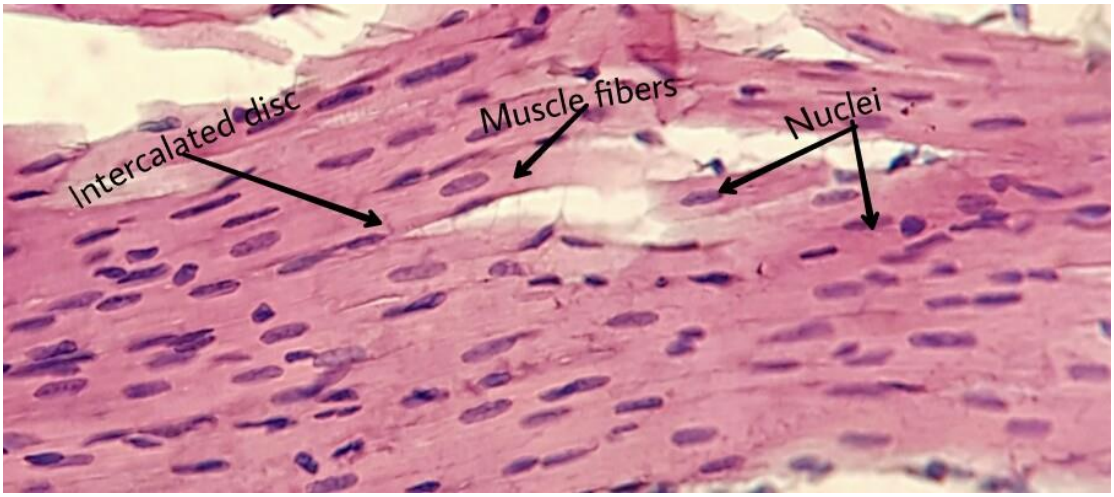

Figure 5: Histological features of gum Arabic solution preserved heart section. Photomicrography, x40

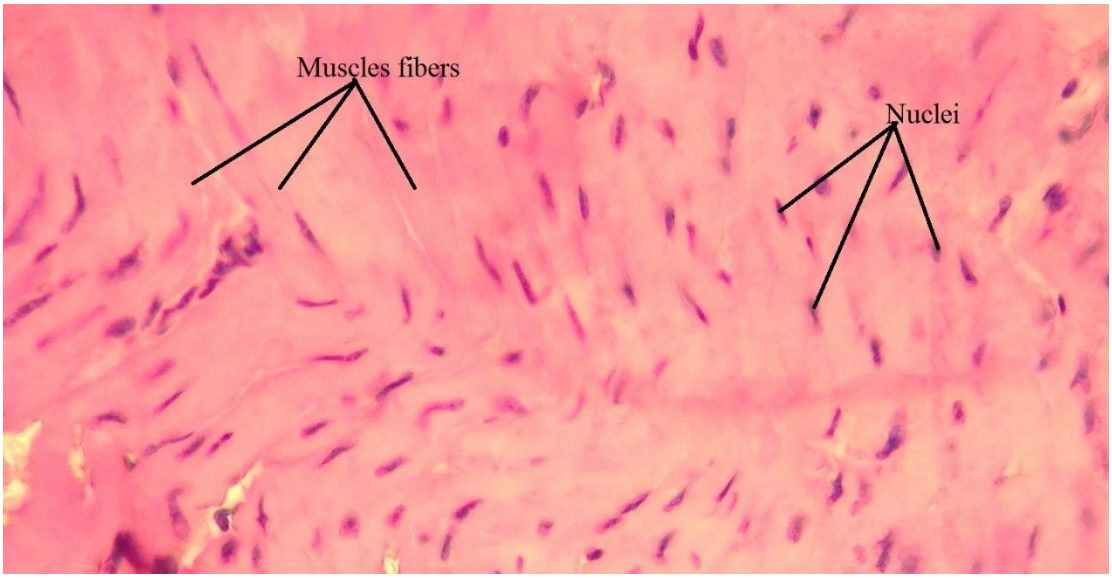

Figure 6: Histological features of silicone-S10 preserved heart section. Photomicrography, x40.

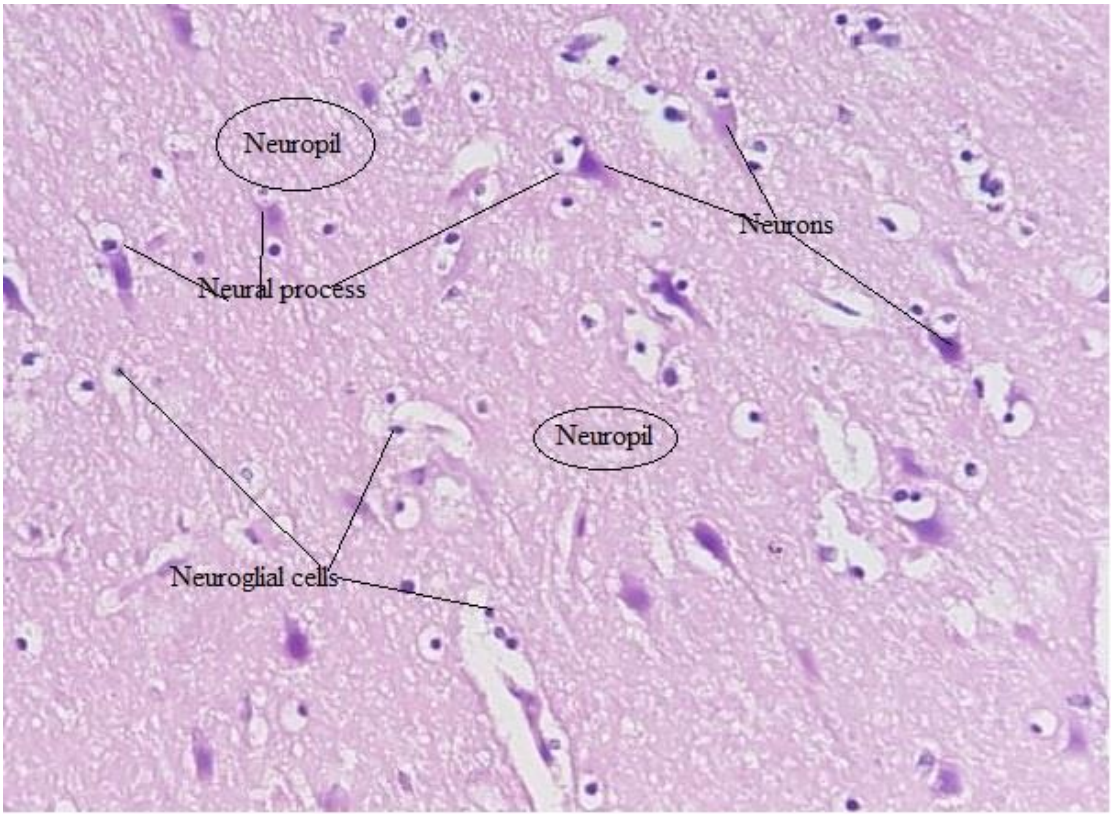

Figure 7: Histological features of unpreserved (fresh) brain section. Photomicrography, x40.

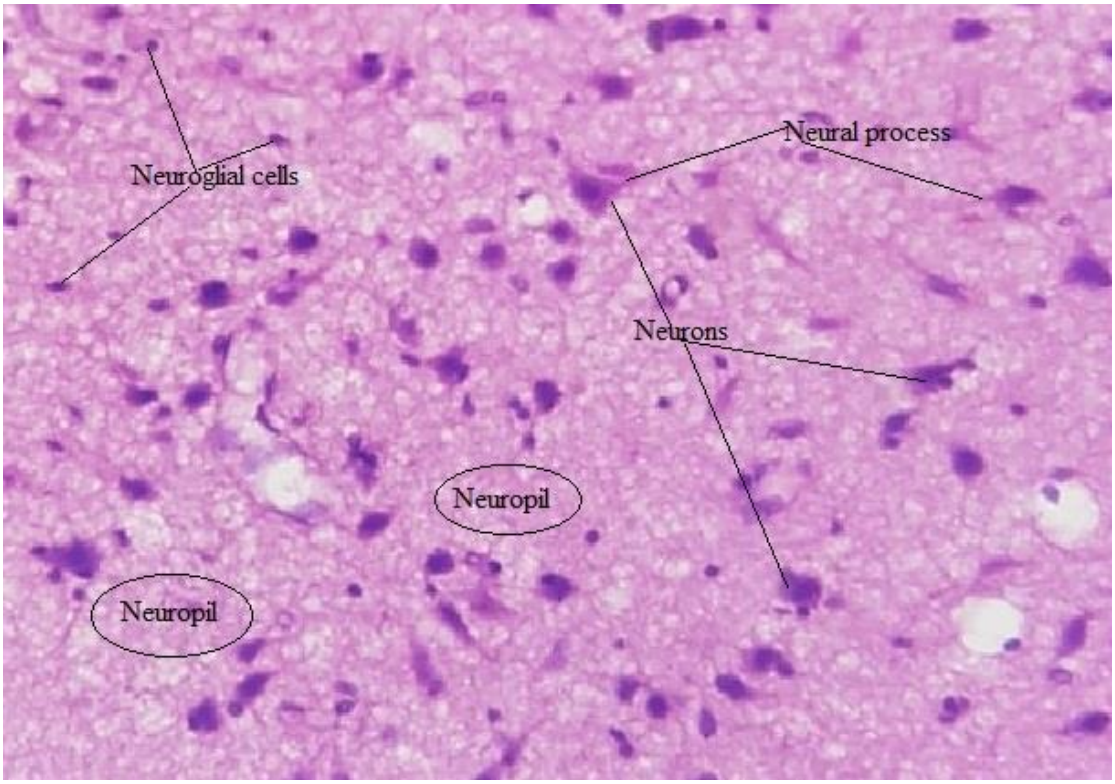

Figure 8: Histological features of gum Arabic solution preserved brain section. Photomicrography, x40.

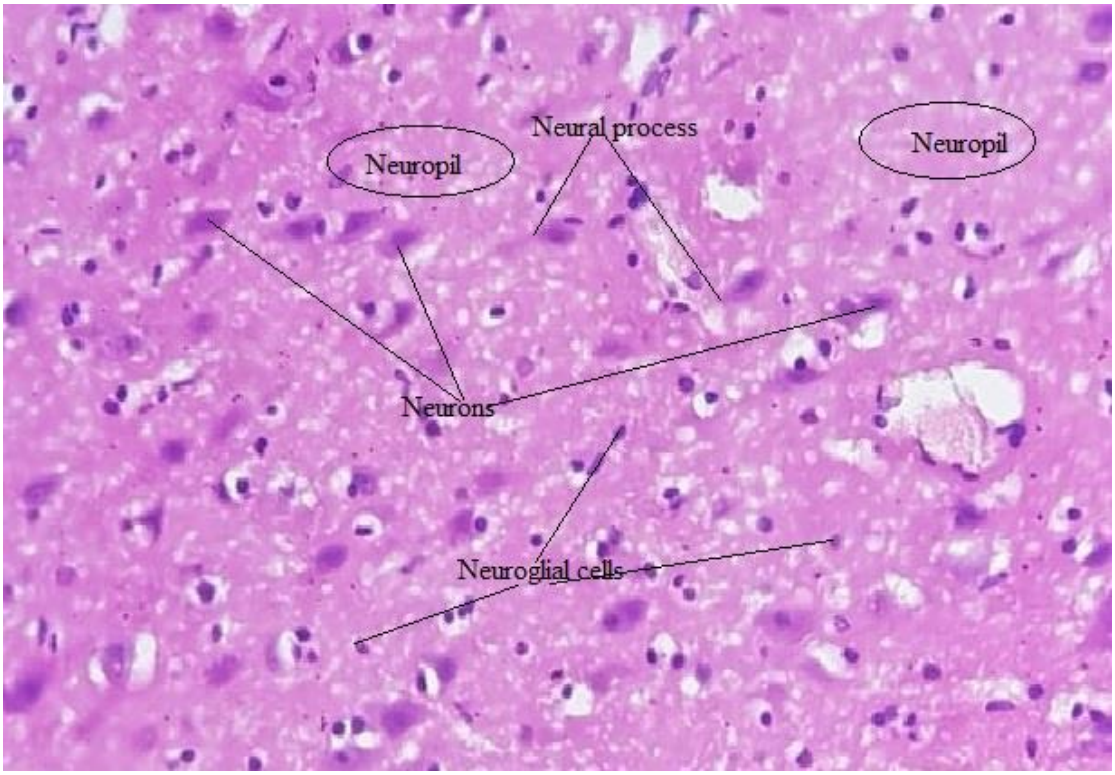

Figure 9: Histological features of silicone-S10 preserved brain section. Photomicrography, x40.

References:

1. Abdel-Maksoud, G., & El-Amin, A. (2011). A review of the materials during mummification processes in ancient Egypt. *MAA 11:* 129-150.
2. Abdullahi, M., Zagga, A. D., Iseh, K. R., Amutta, S. B., & Aliyu, D. (2014). Nasal response from Formaldehyde exposure used as cadaver preservative among pre-clinical medical students in a Nigerian medical college. *Int J Otorhinolaryngol Head Neck Surg 3*:173-178.
3. Von Hagens, G. (1979). Impregnation of soft biological specimens with thermosetting resins and elastomers. *Anat Rec 194*: 247-256.
4. Von Hagens, G., Tiedemann, K., & Kriz, W. (1987). The current potential of plastination. *Ana Embryol 175:* 411-421.
5. Suganthy, J., & Francis, D. V. (2012). Plastination using standard S10 technique-our experience in Christian medical college, Vellore. *J Ana Soc India, 61:* 44-47.
6. Mansy, A. E., El-Azab, N. E., & El-Mahalaway, A. M. (2017). Histological and immunohistochemical study of the potential healing effects of glucosamine and platelets rich plasma on experimentally induced oral mucositis in adult male rats. *J Histol Histopathol 4*: 1-8.
7. Manjunatha, K., Prasad, R. V., Jamuna, K. V., D'souza, P. E., Suguna, R., & Ramkrishna, V. (2014). Comparison of Histological Architecture of Paraffin-Embedded and Indigenously Plastinated Tissues. *Indian J vet anat 26:* 132-133.
8. Grondin, G. 1., Grondin, G. G., & Talbot, B. G. (1994). A study of criteria permitting the use of plastinated specimens for light and electron microscopy. *Biotech Histochem 69*: 219-234.
9. Patil, S. K., Jamuna, K. V., Badami, S., & Ramkrishna, V. (2016). Comparison of histology of cardiac muscle using different infiltrating media. *Indian J Nat Prod Resour 6*: 976-997.
10. Duaqan, E., & Abdullah, A. (2013). Utilization of gum arabic for industries and human health. *Am J Appl Sci 10*:1270-1279.
11. Alkarib, S. Y., Mohamedelhassan, D. E., & Abubakr, O. N. (2015). Evaluation of gum arabic solution as a film coating former for immediate

release oral tablet formulation. *J Pharm Pharm Sci 5*: 32-41.

12. Alkarib, S. Y., Khaleel, A. A., & Nurein, M. A, (2016). Gum Arabic Acacia for Manufacturing of Hard & Soft Empty Capsules in Sudan. *World J Pharm Pharm Sci 5*: 219-327.
13. Wyasu, G., & Okereke, N. Z. J. (2012). Improving the film-forming ability of gum arabic. *J Nat Prod. Plant Resour 2:* 314-317.
14. Satte, M. S., Ali, T. O., & Mohamed, A.Y. (2017). The use of Vacuum Forced Impregnation of Gum Arabic Solution in Biological Tissues for Long-term Preservation. *J Int Soc Plastination 29*: 19-25.
15. Srisuwatanasagul, K., Srisuwatanasagul, S., Adirekthaworn, A., & Darawiroj, D. (2010). A comparative study between using acetone and absolute alcohol for dehydration in plastination procedure. *Thai J Vet Med 40*: 437-440.
16. Elnady, F. A. (2016). The Elnady Technique. An Innovative, New Method for Tissue Preservation. *Altex 33:* 237-242.
17. Dejong, K., & Henry, R. W. (2007). Silicone plastination of biological tissue: cold temperature technique Biodur™ S10/S15 Technique and products. *J Int Soc Plastination 22*: 2-14.
18. Suriyaprapadilok, L., & Withyachumnarnkul, B. (1997). Plastination of Stained Sections of the Human Brain: Comparison between Different Staining Methods. *J Int Soc Plastination 12:* 27-32.
19. Tianzhong, Z., Jingren, L., & Kerming, Z. (1998). Plastination at Room Temperature. *J Int Soc Plastination 13*: 21-25.
20. Berry, R., Church, C., Gericke, M. T., Jeffery, E., Colman, L., & Rodeheffer, M. S. (2014). Methods in Enzymology (MIE): Methods of Adipose Tissue Biology. *Methods Enzymol 537*: 47-73.
21. Grounds, M. (2010). Quantification of histopathology in Haemotoxylin and Eosin stained muscle sections. *Treat-NMD 1*: 3-10.
22. Ramos, M. L., et al. (2018). Comparison of Different De-plastination Methodologies for Preparing Histological Sections of Material Plastinated with Biodur® S10 / S3. *J Int Soc Plastination 30:* 10-15.
23. Manjunatha, K. (2013). Evaluation of Indigenous Plastination Technique –vs- Available Plastination Techniques in the Preservation of Anatomical Specimens. Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar 1-87.

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RISK FACTORS OF DEVELOPMENT OF THE CARDIOVASCULAR DISEASES AND DIABETES MELLITUS TYPE 2 ON SCALES SCORE, FRAMINGHAM AND PROCAM SCALE

Abstract: *This article discusses the literature review of risk factors, the development of cardiovascular diseases and type 2 diabetes mellitus on the SCORE, Framingham and PROCAM scales according to the PUBMED database. Many studies conducted by scientists of the world show the effectiveness of the results of the risk scales for the development of cardiovascular diseases and diabetes mellitus type 2 PROCAM, Framingham and SCORE in different countries varying.*

Key words: *SCORE, Framingham, PROCAM.*

Language: *Russian*

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ФАКТОРЫ РИСКА РАЗВИТИЯ СЕРДЕЧНО СОСУДИСТЫХ ЗАБОЛЕВАНИЙ И САХАРНОГО ДИАБЕТА 2 ТИПА ПО ШКАЛАМ SCORE, FRAMINGHAM И PROCAM

Аннотация: *В данной статье рассматривается литературный обзор факторов риска, развитии сердечно-сосудистых заболеваний и сахарного диабета 2 типа по шкалам SCORE, Framingham и PROCAM по данным базы PUBMED. Множество исследований проведенное ученными мира, показывают эффективность результатов шкал риска развития сердечно-сосудистых заболеваний и сахарного диабета 2 типа PROCAM, Framingham и SCORE в разных странах неодинаковая.*

Ключевые слова: *SCORE, Framingham, PROCAM.*

Introduction

Основными проблемами современной медицины остаются сердечно-сосудистые заболевания (ССЗ), сахарный диабет (СД) (в частности сахарный диабет 2 типа) и в последние годы уделяется большое внимание также метаболическому синдрому, связанному с абдоминальным ожирением [1-5].

По прогнозам ВОЗ к 2030 году от ССЗ умрет 23.3млн. человек [6], а число больных сахарным диабетом возрастет на 55.2млн. человек [7]. По данным ВОЗ в Европейских странах в отличие от стран СНГ (страны независимых государств) отмечается низкая доля смертности от ССЗ и СД. Низкий показатель смертности от ССЗ отмечаются в странах Финляндия (44,5 на 100 тыс. населения), Германия (35,7 на 100 тыс. населения), Нидерландия (26,0 на 100 тыс. населения) В то время в таких странах как Литва, Латвия и Румыния этот показатель был намного выше (108,9-140,2 на 100 тыс. населения). Высокий показатель смертности от ССЗ и СД отмечается в России, Республике Беларусь, Украине и Республике Казахстан, (204,8-240,6 на 100 тыс. населения) [8].

В результате множество исследований показано, что восемь факторов риска: артериальная гипертензия, курение, гиподинамия, дислипидемия, гипергликемия, избыточная масса тела и нерациональное питание до 75% обусловливают смертности от ССЗ и СД 2 типа [9]. В течение многих лет факторы риска были

выявлены во многих эпидемиологических исследованиях [10-14].

В клинической практике у пациентов, как правило, имеется сочетание двух и более факторов риска. В конце XX века разработаны многомерные модели оценки суммарного сердечно-сосудистого риска с учетом совокупности основных факторов, определяющих прогноз.

Materials and Methods

Европейская модель SCORE (Systematic Coronary Risk Evaluation) разработана экспертами Европейского общества кардиологов на базе данных 12 европейских когортных исследований с участием более 205 тыс. человек, в том числе 3325 человек из России [15]. Исследование началось с конца 70-х годах XX века и продолжалось 27 лет. Эта модель разработана на основе исследования европейской популяции и для нее. Поэтому имеет ряд отличий от американской модели Framingham. Так как шкала Framingham оценивает 10 летний риск развития фатальных и нефатальных сердечно-сосудистых осложнений, а модель SCORE определяет только 10 летний риск развития ССЗ.

Шкала Framingham – модель оценки суммарного риска развития ССЗ и их осложнений. Она разработана на основе самого продолжительного эпидемиологического исследования (Framingham Heart Study, 1948—1984 гг.), которая началась в американском городе Фрамингем [16]. В исследовании участвовали 5209 человек от 30 до 62 лет. Благодаря этому исследованию были выявлены главные факторы риска сердечно-сосудистых заболеваний и общей сердечно-сосудистой смертности. Раньше шкалу Framingham применяли только для жителей Америки, где совпадали прогнозируемые и наблюдаемые результаты риска. Русифицированный вариант этой модели был разработан для России, но, в практической медицине широкого применения она не нашла. В дальнейшем европейскими экспертами были опубликованы работы, в которых анализировалась целесообразность применения шкалы Framingham в европейской популяции. Так, например, в British Regional Heart Study ее использование привело к завышению абсолютного риска коронарной смерти на 47%, а суммарного показателя фатальных и нефатальных коронарных событий - на 57%.

Компьютерная программа PROCAM. Значительно более точные данные по определению суммарного риска дает математическая модель PROCAM в виде компьютерной программы CERCA (Coronary Events Risk Calculator) [17]. Она разработана на основе результатов проспективного исследования PROCAM - Prospective Cardiovascular Munster Study, которая началась в городе Мюнстер (Германия) в 1979 г. В исследовании участвовали 21306 человек в возрасте от 40 до 65 лет. Эта шкала позволяет выявить факторы риска ишемической болезни сердца.

Целью исследования ученных Кательницкой и др. было оценить суммарный сердечно-сосудистый риск по шкале SCORE, до лечения и после лечения препаратом «Энам». В исследовании участвовали 143 больных с артериальной гипертензией. Результат исследования показал, что снижение артериального давления с помощью 4-недельной терапии препаратом «Энам» позволяет снизить суммарный риск ССЗ на 21% от исходного положения [18].

В Бразилии ученные изучали риск развития ССЗ по шкалам Framingham, PROCAM у ВИЧ инфицированных пациентов. В исследовании участвовали лица старше 19 лет (средний возраст 36,8±10,3), 76,9% пациентов составляли мужчины, 66,3% - получали антиретровирусную терапию, 47,8% пациентов имели абдоминальное ожирение, 23,1% были курильщиками, 20,0% страдали артериальной гипертензией и у 2,0% пациентов был сахарный диабет. У многих пациентов была дислипидемия (ХС ЛПНП >3,0 ммоль/л, Хс ЛПВП <1,0 ммоль/л). При оценке риска развития ССЗ по шкале PROCAM показал, что в группе высоко риска доля пациентов самый низкий, по шкале Framingham наоборот, доля пациентов в группе высокого риска – высокий. Таким образом, шкала Framingham предсказывает более высокий риск развития ССЗ среди ВИЧ инфицированных [19].

В Турции Yalcin M. и другие провели исследования, целью которого является сравнение часто используемых оценочных шкал риска развития ССЗ. 350 пациентов, перенесших коронарную ангиографию, участвовали в исследовании. Риск развития ССЗ оценивали с помощью шкал SCORE, Framingham и PROCAM. Оценка риска развития атеросклероза коронарных артерии могут предсказать все три модели. Однако шкала Framingham имеет лучшую прогностическую ценность, чем другие модели [20].

Аналогичное исследование провели в Нидерландах. Ученные сравнивали три шкалы риска развития ССЗ SCORE, Framingham и PROCAM. В исследовании участвовали 1296 пациентов, перенесших коронарную ангиографию. Результат исследования показал, что модель Framingham является наиболее эффективной шкалой риска развития ССЗ [21].

Conclusion

В Швейцарии риск развития ССЗ у пациентов с атеросклерозом оценивали по четырем шкалам PROCAM, Framingham, SCORE и SMART. Изучая

средние показатели всех четырех шкал, ученные в своем исследовании показали, что шкала SMART является лучшей моделью для оценки риска развития ССЗ [22].

Английские ученные применили шкалы риска развития ССЗ у 234 пациентов и в результатах своего исследования показали, что шкала Framingham является наиболее эффективной, чем шкала PROCAM [23].

Таким образом, эффективность шкал риска развития ССЗ PROCAM, Framingham и SCORE в разных странах неодинаковая.

References:

1. Williams, B. (2009). The changing face of hypertension treatment: treatment strategies from the 2007 ESH/ESC hypertension Guidelines. *J. Hypertens,* №27, 19-26.
2. Lazzini, A., & Lazzini, S. (2009). Cardiovascular disease: an economical perspective. *Curr. Pharm. Des.* №10, 1142-1156.
3. Bokeriya, L. A., et al. (n.d.). «Serdechno sosudistyye zabolevaniya na rubezhe vekov: smertnost', raspostranennost', faktory riska».
4. Shinbolatova, A., Kulzhanov, M., Aringazina, A., & Nurbakhyt, A. (2014). Screening of Arterial Hypertension in the Republic of Kazakhstan: Advantages, Disadvantages and Ways of Improving. *Iran J Public Health.* №43(12), 1695-701.
5. (2013). *Health of population and health care in the Republic of Kazakhstan in 2013.* Official Statistic MedInform. (p.258). Astana. Available on www.medinfo.kz
6. (2013). Kardiologiya, Materialy VOZ *Informatsionnyy byulleten' №317, Mart 2013*.
7. Cho, N. H. (2013), Executive summary International Diabetes Federations IDF Diabetes Atlas. № 6, 11.
8. Kalashnikov, K. N., Lastochkina, N. A., & Duganov, M. D. (2015). Osobennosti zabolevayemosti i smertnosti v Volgogradskoy oblasti ot serdechno-sosudistykh zabolevaniy. *Gumanitarnyye nauchnyye issledovaniya. №1,* 16-23.
9. Boytsov, S. A., & Chuchalin, A. G. (2013). *Profilaktika khronicheskikh neinfektsionnykh zabolevaniy*. Monografiya. (p.7).
10. Li, Y., et al. (2015). Birth weight and later life adherence to unhealthy lifestyles in predicting type 2 diabetes: prospective cohort study. *BMJ, №21*, 351.
11. Mons, U., et al. (2015). Impact of smoking and smoking cessation on cardiovascular events and mortality among older adults: meta-analysis of individual participant data from prospective cohort studies of the CHANCES consortium. *BMJ, №4*, 350.
12. Kumar, R., & Indian, J. (2015). Anthropometric and behavioral risk factor for non-communicable diseases: a cluster survey from rural Wardha. *Public Health. №59(1),* 61-64.
13. Anghel, L., Ghiuru, R., & Gavrilescu, C. M. (2010). Dislypidemia as a risk factor for cardiovascular disease. *Rev Med Chir Soc Med Nat Iasi. №114(4)*, 977-981.
14. Subramoney, S., Bjorkelund, C., Guo, X., Skoog, I., Bosaeus, I., & Lissner, L. (2014). Age-related differences in recommended anthropometric cut-off point validity to identify cardiovascular risk factors in ostensibly healthy women. *Scand J Public Health. №42(8)*, 827-833.
15. Conroy, R. M., et al. (2003). Estimation of tenyear risk of fatal cardiovascular disease in Europa: the SCORE project. *Eur Heart J, №24*, 987-1003.
16. Anderson, K. M., Odel, P. M., Wilson, P. W., & Kannel, W. B. (1991). Cardiovascular disease risk profiles. *Am Heart J, №121,* 293-298.
17. Assmann, G., Cullen, P., & Schulte, H. (1998). The Munster Heart Study (PROCAM). *European Heart J, №19,* 2-11.
18. Katel'nitskaya, L. I., Khaisheva, L. A., & Glova, S. Y. (2007). Summarnyy serdechno-sosudistyy risk u bol'nykh gipertonicheskoy bolezn'yu: vozmozhnosti ingibitorov APF. *Ratsional'naya Farmakoterapiya v kardiologii №5, tom 3*, 9-14.
19. Nery, M. W., et al. (2013). Cardiovascular risk assessment: a comparison of the Framingham, PROCAM, and DAD equations in HIV-infected persons. *ScientificWorldJournal. №21*, 2128-2136.
20. Yalcin, M., et al. (2012). Cardiovascular risk scores for coronary atherosclerosis. *J. Acta Cardiol. №67(5),* 557-563.
21. Versteylen, M.O., Joosen, I.A., Shaw, L.J., Narula, J., & Hofstra, L. (2011). Comparison of Framingham, PROCAM, SCORE, and Diamond

Forrester to predict coronary atherosclerosis and cardiovascular events. *J Nucl Cardiol. №18(5)*, 904-911.

22. Uthoff, H., et al. (2010) PROCAM-, Framingham-, SCORE- and SMART-risk score for predicting cardiovascular morbidity and mortality in patients with overt atherosclerosis. *Vasa. №39(4)*, 325-333.
23. Vrentzos, G.E., et al. (2007). Predicting coronary heart disease risk using the Framingham and PROCAM equations in dyslipidaemic patients without overt vascular disease. *Int J Clin Pract. №61(10)*, 1643-1653.

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THE WAYS OF TRAINING HIGH QUALIFIED PERSONNEL FOR AN INNOVATION ECONOMY

Abstract: *The article analyzes the development of personnel training in higher education, taking into account the needs, potential and resources of the economic sectors. The main directions of reforming high qualified personnel training system for innovation economy have been analyzed.*

In order to develop job creative ethics of personnel, it was suggested to increase the number of students in higher education and adopt the STEM system of education in accordance with the international experience.

Key words: *High qualified personnel, Creative worker, STEM system.*

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Introduction.

Creation of highly productive working places on account of the modernization and technological re-equipment of enterprises through innovative economic development of the country, does not fully meet current requirements. This creates serious problems in the labor market in terms of ensuring the employment of young people - graduates of educational institutions.

Therefore, the President of the Republic of Uzbekistan "Today we are on the path of innovative development, aimed at radical renewal of all spheres of state and society. Innovation is a future. We must start with the innovative ideas, innovative approach, if we are to begin building our great future"[1]

Accordingly, the strategy of innovative development of the Republic of Uzbekistan for 2019-2021 was developed [2]. The main objective of the strategy was to develop human capital as a key factor determining the competitiveness and innovative development level of the country on the international arena. In addition, the strategy focuses on the creation of highly productive workplaces, thus creating a basis for the employment of the population.

Above stated strategy analyzes the improvement of the education and training system in higher education in accordance with the demand, capacities and resources of economic sectors. The main directions for reforming the education system of training highly qualified personnel for the innovation economy have been clarified. Indicators of creative workers and the advantages of staff training on the basis of the STEM - education system was demonstrated.

Body part.

The level of education of the population is assessed from the point of view of the individual, state and society, which influences the formation of the spiritual and intellectual needs and abilities of a person. At a personal level, it is the ability to fully demonstrate one's self-esteem and develop intellectual abilities. At the state level, education has become the most important component of economic development and the accumulation of national wealth. At

[1] The appeal of the President of the Republic of Uzbekistan, Shavkat Mirziyoev to the Oliy Majlis on December 23, 2017 www.prezident.uz

[2] Presidential Decree Of The Republic Of Uzbekistan of September 21, 2018 No. UP-5544 “About approval of Strategy of innovative development of the Republic of Uzbekistan for 2019-2021” www.lex.uz

community level education is the basis of social development.

Therefore, according to the Presidential Decree of July 27, 2017 № UP-3451 "On Measures for Further Expansion of Participation of the Spheres and Industries in the Spheres of Improving the Training of Higher Education Professionals" training the highly qualified specialists that meet modern standards and the demand for the specialities is formed in line with the needs of sectors and industries of the economy, the training programs of higher education are formed in accordance with the production, technical and technological relations of the enterprises and prospective development programs of the Republic of Uzbekistan.

The imbalance between the number of highly qualified personnel that was quoted and the need for them in the country has led to a sharp contrast between demand and supply in the labor market. For example, during the period of 3 years from 2014 to 2016, the number specialists in the sphere of information and communication technologies was less than required in the economy by around 100-1400. Only in 2017 this difference was reduced till 800 (table 1).

Table 1. Training high qualified specialists in the sphere of ICT.

Index	2013	2014	2015	2016	2017
Number of specialists (thousands of people)	3,4	3,8	4,1	4,2	4,8
Demand for the specialists (thousands of people)	4,1	4,8	5,4	5,6	5,6

Source: Ministry of Economy and Industry of the Republic of Uzbekistan

In the session held by The President of the Republic of Uzbekistan on October 24, 2018 which was dedicated to the issues of further development of higher education, the quality of training, expansion of science and production integration, Shavkat Mirziyoyev said "It is a pity that in the midst of a rapidly developing economy of the country the higher education system was one of the locomotives of the development. It is a bitter truth that there is not any system that meets the structural changes of the labor market, training young people for the vocational and entrepreneurial skills"[3].

Therefore, Ministry of Higher and Secondary Special Education and Ministry of Employment and Labor Relations have been tasked with forecasting the demand for specialities of the real sector of the economy for at least 10 to 15 years and taking appropriate measures[4].

The classics of economic theory argue that the basis of achieving economic growth is dependent on natural resources, current labor, interest rates, or purchasing power of the national currency. However, the American economist, M. Porter (Harvard Business School) in his scientific work maintains a new concept - the main factor leading to growth - the state's competitiveness.

M.Porter has rightly asked why despite of the insufficient natural resources of Germany, Japan, Switzerland, Italy and South Korea stated high economic rates. Besides, Germany, Switzerland and Sweden they have the highest rates of economic growth despite the lack of labor force. In his opinion, the competitiveness of each country depends on its ability to innovate and modernize the national economy. Therefore, the main factor of competitiveness at the national level is the level of labor productivity[5].

[3] Need for modern skills for a rapidly developing economy // UzA, October 24, 2018

[4] The speech of the President of the Republic of Uzbekistan at the solemn ceremony dedicated to the 26th anniversary of the adoption of the Constitution, www.prezident.uz

[5] Porter M. E. Competitive Strategy: Techniques for Analyzing Industries and Competitors (2nd ed.) - New York: Free Press, 1998. - 397 p.

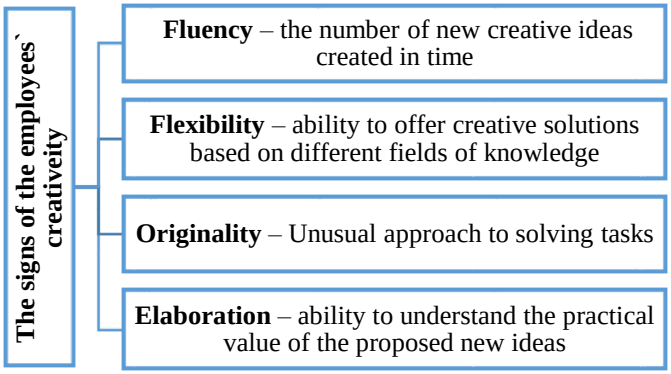

Figure 1. The signs of the employee`s creativeity [6]

Sustainable improvement of productivity in innovative development conditions, first of all, depends on modern knowledge and creativity of employees. Creativity (Latin, "creatio" - from the word "creation") is the ability of employees to create radically new ideas and creative decisions making. American psychologist Joy Paul Gilford has clarified four signs of creativity (figure 1).

The higher education system plays an essential role in shaping the creativity potential of the personnel. For example, training entrepreneurs, who are able to integrate innovations into production and market, is oneof the most important directions of US universities. Training of innovative entrepreneurs is different from the preparation of scholars or professionals. Business-schools, entrepreneurship centers, engineering and applied sciences departments have been set up to reveal the essence of the process of transforming the scientific and technological developments into social benefit within the framework of universities for the preparation of innovative staffs[7].

In the World Bank President Jim Yon Kim's article titled "How to Promote Human Capital Level Development or Government's Investing in human capital", published by the US-based magazine, points out that in countries with low human capital, currently the productivity of the human capital that have a good quality education and more productive health care is higher than those whose human capital is less developed by 30 -50.

Over recent years, the number of new national and international higher education institutions (including branches) operating in our country reached 98. As the head of our government mentioned “The percentage of the graduates of secondary speciali zed educational institutions who pursued further higher education was 9 to 10% in Uzbekistan. Thanks to the measures taken over the past two years, we have managed to increase this figure was increased over the 15 percent. But that is not enough. If we look at the experience of developed countries in the world, it is 60-70 percent. Therefore, it is our task to raise the level of enrollment of higher education graduates in our country till 20% in 2019 and continue increasing them in the coming years”.

The figure 2 provides information about the opportunities of having higher education for youth in different countries These indicators are comparable to the UNESCO's “Gross Entry Ratio to First Tertiary Programs 2015” (where the percentage coverage of adolescents with appropriate education, in %), reflecting differences among countries and percentage of Uzbekistan is 6 times less than other others (figure 2).

[6] Gilford Dj. Structural model is intellectually. Psychology myshleniya. - M., 1965. - 244 h.
[7] Gildons M. Engineering by the numbers. Washington, DC: American Society for Engineering Edication, 2008. -P.63-67.

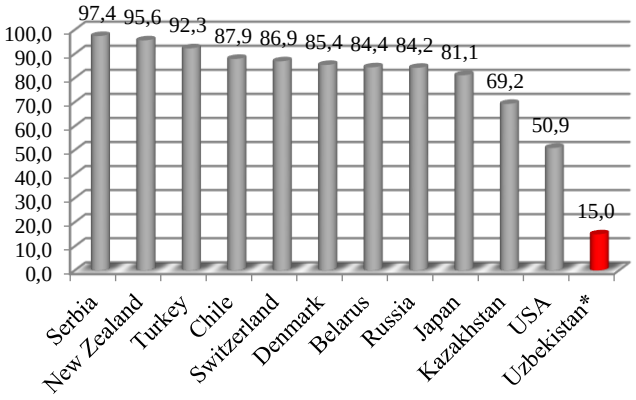

Figure 2. The percentage of applicants who entered to the higher education institutions with overall[8]

Strategy of innovation development of the Republic of Uzbekistan in 2019-2021 was adopted in order to ensure dynamic development of the country on the basis of innovative ideas, developments and technologies. The Strategy of Uzbekistan is to enter into the top 50 most developed countries in the world by 2030 accordingly with the Global Innovation Index. It is also envisaged to improve the quality and coverage of education at all levels, to develop a continuous education system, and to ensure the flexibility of the staff training system in order to meet the needs of the economy[9].

Meanwhile, the analysis revealed that as a result of the lack of integration of the theory and practice at the higher education system of the country, the lack of the interrelations between the higher education - science - production and the inadequate organization of qualification practices, most graduates could not become specialists which will require further training. The prestige of higher education institutions and the academic potential of professors and teachers still do not have a decent place in the international scientific community. There are no conditions for the development of science at the higher educational institutions, integration with research, the effectiveness of scientific activities and the ability of gifted students to pursue scientific researches, as well as the introduction of innovative techniques in the educational process.

Therefore, on the base of the country's strategy of innovative development, the following trend reforms at the higher education system identified:

increasing the coverage of the population with higher education;

Establishment of new higher educational institutions, including branches of foreign higher educational institutions;

gradual abolition of admission limits for higher education institutions;

making an open access for applicants to enter several higher education institutions at once;

increase the share of students in in the sphere of natural and technical subjects;

development and implementation of the national quality assurance system for the education system and its impact on the country's innovative development;

development of STEM education system in the country;

establishment of forwarding centers in leading higher education institutions.

Therefore, foreign specialists are being involved in the teaching process of the higher education institutions and the measures of organizing the classes with the modern literature that is used in developed countries, have been taken. Advanced training courses of perspective scientific and pedagogical personnel (first of all, in engineering, technical and architectural education) are available.

Only in 2018, 13 new universities, including the Ipak Yuli International Tourism University, the branch of the National University of Technology Research in Almalyk city, Puchon and Adju universities of South Korea started their work in Tashkent. According to the results of the Uzbek-Russian Education Forum, which was held in Tashkent for the first time in 2018, 114 contracts and agreements on educational and scientific activity were signed, which envisages the organization of 6 branches of the prestigious higher educational institutions of Russia including 52 joint educational programs and 2 faculties in Uzbekistan.

At the Tashkent State Economic University in cooperation with the Austrian IMC University Krems, The Faculty of International Economic Relations was established. For the first time,

[8] UNESCO indicator - Gross Entry Ratio to First Tertiary Programs, 2015 // uis.unesco.org/index *) The level of enrollment of tertiary education institutions graduates with higher education.

[9] The Decree of the President of the Republic of Uzbekistan dated 21.09.2018. No. UP-5544 Approval of the Strategy for Innovative Development of the Republic of Uzbekistan for 2019-2021" www.lex.uz

100 bachelors are trained on the department of "export-oriented management" and "tourism and hotel management", which today are extremely competitive in the labor market.

Training of creative students for the modern innovation economy requires a radical renewal of teaching methods at higher education. Nowadays, most higher education institutions are using traditional reproductive methods of teaching. Especially, in many countries of the world STEM (S - science (natural sciences); T - technology (technologies); E - engineering; M - mathematics system software has been introduced. In particular, in the US in 2013 a strategic plan for the development of STEM education was adopted. According to this plan, it is planned to increase the share of employees receiving STEM education by 16% by 2024. According to experts, the sharp increase in demand for STEM training in the labor market will increase the creation of new jobs by more than 1 mln[10] (figure 3).

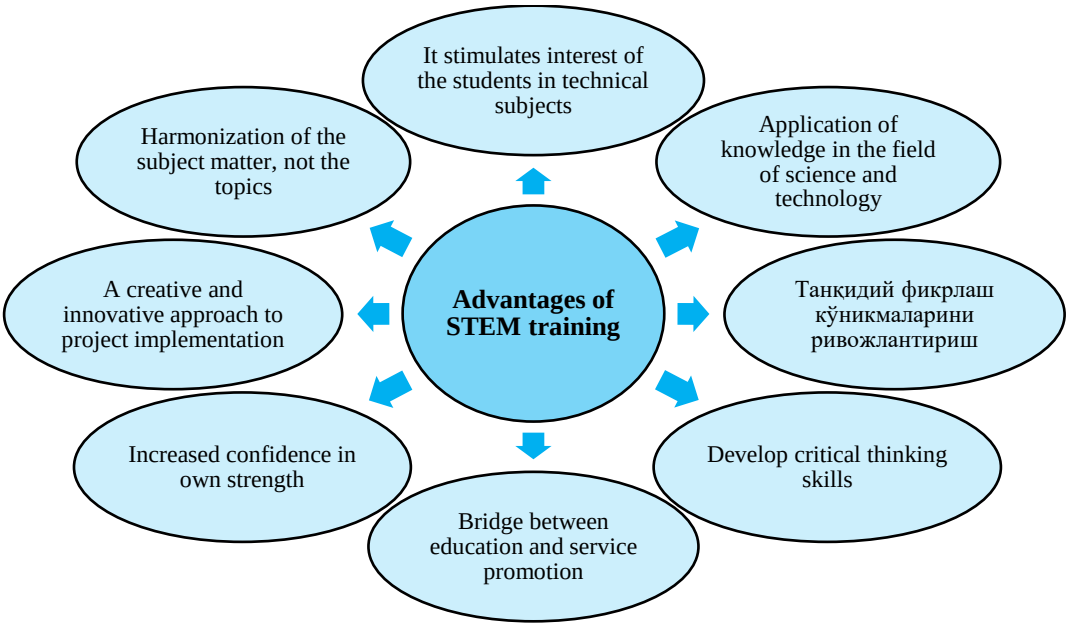

Figure 3. Advantages of STEM training

Austria, Germany, Greece, Ireland, Italy, Norway, Romania, Turkey and the United Kingdom participated in The INSTEM project which was organized by the EU during 2012-2015 years. As a result employment increased by 12% among the specialists trained in STEM education system. According to the labor market analysis, it is desirable to continue this project, because demand for STEM-trained specialists is expected to increase by 8% till 2025[11].

The essence of the STEM education system is that in the case of reproductive teaching, students need to memorize and repeat the material mentioned in the textbooks by the instructor and in this innovative teaching methodology, first of all, students should be encouraged to think critically, approach unusually, format the ability to implement the acquired knowledge in practice. At the same time, four STEM-educators are taught separately, but not in isolation.

In order to develop the STEM education system in Uzbekistan, first of all, it is necessary to train teachers who can adopt this technique. It is desirable to develop developed countries` practice. For example, the program "100Kin10" is being implemented by the initiative of leading universities of the USA. The program envisages the training of 100,000 teachers for the STEM-education system by 2021 in the US. In the United States, more than 50,000 teachers have been trained for the STEM education system.

The STEM-training system in Singapore for the past five years has increased by 13.6%. The doctorate dissertations that have been supported in this area over the last 10 years have tripled. the STEM-education system was adopted in 32% of higher education institutions and 68% of education centers in Australia. The salary of STEM-educators is considered as the highest one in the country[12].

[10] Dugger W. E. Evolution of STEM in the United States // 6th Biennial International Conference on Technology Education Research, Gold Coast, Queensland, Australia. 2010. URL: http://www.iteea.org/Resources/PressRoom.

[11] G.Nogaybayeva. Development of STEM-education in the world and Kazakhstan // “Bilimdi el - Educated country”, №20 (57) from October 25, 2016.

[12] Calof J., Smith J.E. Foresight impacts from around the world: a special issue // Foresight. 2012. Vol. 14, № 1. P. 5- 14.

Summary.

The most important task of ensuring the employment of the population is the formation of a system of training creative personnel that meets the structural changes in the labor market. A creative worker for the innovation economy is a creative person who is capable of adopting unusual approach to problem solving, proposing new ideas and proving their practical value.

One of the primary goals of economic development in developed countries is to enrich human capital. Therefore, in order to train creative personnel for the modern innovation economy, it is proposed to increase the number of students in higher education institutions and to radically update students' teaching methods in the higher education system based on advanced international experience, ie introduction of a special STEM system. In order to increase the number of students in higher education institutions, special attention should be paid to the preparation of highly qualified specialists in the field of information technologies and communications, taking into account reforms in the field of "digital economy" in the country

Since the 11-year compulsory education system has been introduced at secondary schools, it is advisable to establish "Departmental" colleges of the relevant ministries and agencies and "Multi-band" vocational educational institutions on the basis of existing vocational colleges.

Experts who have experience and graduates should work together in order to develop their skills team working, along with the improvement of their skills directly at the workplace.

References:

1. (2017). The Decree of the President of the Republic of Uzbekistan "On the Strategy for the Further Development of the Republic of Uzbekistan" dated February 7, 2017 PF-4947 Decree No.
2. (2018). The decree of the President of the Republic of Uzbekistan from September 21, 2018 of N UP-5544 "About approval of strategy of innovative development of the Republic of Uzbekistan for 2019-2021".
3. (2017). Resolution of the President of the Republic of Uzbekistan "On measures for further development of the higher education system" from April 20, 2017, N PP-2909.
4. (2017). Application of the President of the Republic of Uzbekistan Shavkat Mirziyoev to the Oliy Majlis of December 23, 2017.
5. (2018, October 24). *Needs for modern personell for a rapidly developing economy*. UzA.
6. (n.d.). Statement by the President of the Republic of Uzbekistan at the solemn ceremony, dedicated to the 26th anniversary of adoption of the Constitution.
7. (2018). Decree of the President of the Republic of Uzbekistan Shavkat Mirziyayev to the Oliy Majlis of the Republic of Uzbekistan dated December 28, 2018.
8. Calof, J., Smith, J. E. (2012). *Foresight*: A special issue foresight. Vol. 14.
9. Gildons, M. (2008). *Engineering by the numbers.* Washington, DC: American Society for Engineering Edication.
10. Dugger, W. E. (2010). *Evolution of STEM in the United States // 6th Biennial International Conference on Technology Education Research, Gold Coast, Queensland, Australia.* Retrieved 2010, from: http://www.iteea.org/Resources/PressRoom/AustraliaPaper
11. Porter, M. E. (1998). *Competitive Strategy*: Techniques for Analyzing Industries and Competitors (2nd ed.). (p.397). New York: Free Press.
12. Gilford, J. (1965). *Structural model of intelligence.* Psychology of thinking. (p.244). Moscow.
13. (2015). *UNESCO Indicator - Gross Entry Ratio to First Tertiary Programs.* Retrieved 2019, from uis.unesco.org/index
14. Nogaybayeva, G. (2016, October 25). Development of STEM-education system in the Kazakhstan and in the world. *Bilimdol ale - Formed Country, №20 (57).*

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INTERPRETATION OF THE IMAGE OF MASIH IN THE DIVAN OF ALISHER NAVOI «BADOYI UL-BIDOYA» («THE RARITY OF THE BEGINNING»)

Abstract: *This article explores the problem of the artistic interpretation of the image of Masih (Jesus) in Eastern classical poetry, in particular in the lyric couch "Badoyi ul-bidoya" ("The rarity of the beginning") by the poet and thinker Alisher Navoi. In the poetry of the East, including, in the Uzbek classical literature, attention is repeatedly drawn to the problem of the artistic representation of images of historical and legendary persons, prophets and literary heroes. In this area in the world literature there are no such examples of creativity as Alisher Navoi. Images of this type are widely depicted in the poet's eight lyric couches. Especially, such images as Medjnun, Khizr, Masih, Farhad are often found in the poetry of the thinker. In classical poetry, images of personalities are called poetic handicraft. However, the interpretation of these types of images is connected by a whole poetic world of artistic text. If in the poetry of Alisher Navoi, the image of Masih was mentioned more than 200 times, then in the painting "Badoyi ul Bidoya" ("The rarity of the Beginning") it is used about 70 times. This, in turn, shows that among the lyric sofas of the poet, the image of the Messiah is much more common in the sofa "Badoyi ul Bidoya" ("The rarity of the beginning"). Consequently, this article reveals a variety of poetic paintings and artistic functions of the Masih image on the basis of the poet's first divan, "Badoyi ul Bidoya" ("The rarity of the beginning").*

Key words: *The lyrics of Alisher Navoi, the image of Masih, form and content, poetic function, artistic interpretation, gazelle genre, theme and idea, lyrical hero, theme of love, the motive of animation.*

Language: *English*

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Introduction

Alisher Navoi is considered to be a great representative of the era of the revival of Oriental literature. If the thinker with his various works continued the traditional forms of Oriental literature, then in content he revealed the world images of the art of the word. Artistic images of epic heroes, historical and legendary kings, and prophets in classical poetry of the Muslim East are repeatedly depicted. This tradition is considered a kind of literary and aesthetic law providing the classical level of poetry of the East. Therefore, classical poetry of the East is attractive artistic, aesthetic and historical-philosophical side. In this sense, these images link artistic thinking to the distant past and traditional view. Especially, in the poetic world of classical poetry, images of the prophets of these sacred sources occupy an enormous place. They perform various poetic functions as part of an artistic text. In this regard, the work of the great representative of Uzbek literature, Alisher Navoi, is a unique event not only in the literature of the East, but also in the world.

Materials and Methods

The personality of Masih (Jesus) is considered one of these images in the poetry of Alisher Navoi. He is one of the 25 mentioned number of prophets in the Quran. The story of Jesus Christ is first told in the book of Torah (Tavrot). The full content of the Gospel (Injil) is related to the activities of the personality of the Messiah. In the Quran, his name appears 25 times. As is well known, in the Qur'an the past prophets and the sacred books given to them are spoken with respect. The Koran and the collection of Hadiths have a unique place in the ideological and artistic world of classical literature of the East. Classical literature is regarded as an artistic depiction of these sacred sources. All features of these sources, including the

interpretation of the personalities of the prophets in Uzbek literature, are deeply reflected. In this sense, the work of Alisher Navoi is considered a rich poetic source. The poet calls these holy books "Kutubi Osmonium" (the heavenly books). In particular, the poet of his biggest dastan, Sadi Iskandariy (The Wall of Iskander), says that the Most High sent down the book Tavrot (Torah) to Moses, Zabur (Psalm) David, and Injil ("Gospel") to Jesus, each word was considered a miracle "Kal" ("Koran") to Muhammad. These celestial books reported the arrival of the Prophet Muhammad.

*Чу Мусоға "**Таврот**" этиб Ҳақ баён,*
Санга ул баён ичра муъжиз аён.
*Бўлуб чунки Довуд қисми "**Забур**",*
Сенинг муъжизинг анда айлаб зуҳур.
*Чу Исоға "**Инжил**" нозил бўлуб,*
Ҳақ анда сифотингга қойил бўлуб.
***Калом**еки сендин топиб интизом,*
Анинг лафз бар лафзи муъжизнизом.
*Нечаким **кутуби осмони** келиб,*
Борисинда сендин нишоне келиб[1.5.19].

(**Translation:** God told Moses the book "Tavrot" And in her he told you the news (Muhammad). David was told a part of his "Zabur", and it reported on your miracles. Jesus sent the book "Injil" and in her talked about your quality. You sent a "feces", considered every word miracles. Thus, all the "books of heaven" reported the news of you)

In the works of Alisher Navoi, the images of the prophets are underlined in such names as "nubuvvat haili" ("a number of prophets"), "nubuvvat bo'stoni" ("a chain of prophets"), "nubuvvat gulshani" ("garden of prophets"), "nubuvvat bahri" ("Sea of prophets"), "nubuvvat guruhi" ("group of prophets"), "nubuvvat halqasi" ("circle of prophets"), "nubuvvat spehri" ("sky of prophets"). In this, the poet interprets prophecy as a separate degree of holiness. Alisher Navoi also wrote a work on the history of the prophets. This work is called "Tarihi anbiyo va hukamo" ("History of the Prophets and Scholars"). It depicts 12 prophets. In the work of the poet "Khamsa" ("Five poems"), separate chapters are devoted to images of prophets. In the eight lyric sofas of Alisher Navoi there are works in large numbers in the genres of "madh" (praise), "naat" (praise of the prophet), dedicated to the images of prophets. If the poet created 16 lyrical genres, then in almost all of these genres he used images of prophets, historical and legendary personalities, literary heroes. In addition, Alisher Navoi, in almost all his works, drew attention to the images or thoughts of the prophets. As is known, the gazelle is leading in the poet's lyrics and throughout the poetry of the East. In the genre of gazelle plays a special place poetic images of the prophets. In the poetry of Alisher Navoi among the prophets, the most fruitfully depicted image of Iso Masih is interpreted mainly in the gazelle genre. It is necessary to emphasize that symbolism and metaphorical images of Khizr, Iso Masih, Majnun, Farhod, Jamshid are repeatedly found in the poetry of the thinker. This, in our opinion, such concepts as blessing, rebirth-inspiration, love, justice, and perfection are reflected in these images in the works of the poet. Thus, in the poetry of Alisher, Navoi embodied blessings in the form of Khizr, Masih - inspiration, Majnun - love, Farhod - perfection, and Jamshid - justice. As mentioned above, in the lyrics, in particular, in the sofa "Badoyi ul-bidoya" ("Rarity of the beginning") by Alisher Navoi, the image of Masih is fruitfully depicted. In classical literature, it is used in such names as Iso, Masih, Ruhulloh (spirit of the Highest), Iso binni Maryam (Jesus son of Mary), Iso Ruhulloh (Jesus spirit of God), Iso Masih (Jesus Christ). Especially, this image is used in the poetry of Alisher Navoi in the form of Masih and is given in the form of Masiho (inspired), Masihod (reviving), Masihnafas (reviving), Masihvash (similar to reviving). It is mainly due to the inspiration of the breath of the beloved. In the "Explanatory Dictionary of the Works of Navoi" the following is cited: "Masih, Masiho from Arabic, the name of the prophet Iso. In religious legends it is said that Jesus (Iso) quickens the dead with his breath. In literature and poetry, the beloved and his lips are personified reviving as Masih. Therefore, the beloved is commented on Masihodam, Masihonafas, Masihoanfos, which in translation means inspiring-animating". According to prof. H. Karamatov: "Christ in Greek has the meaning of "anointed one". Masih - from the Arabic verb "Masah", which means " oily. This means that the Almighty made him a prophet and anointed his forehead" [8.23]. When it comes to the artistic image of Masih in Uzbek literature is understood the prophet Jesus, who has a great influence in world history, culture and literature. He is considered as one historical personality of the three (Judaism, Christianity, Islam) great religions. In Islam and its culture, it is highly respected. Consequently, the personality of Masih (Jesus) is portrayed as a poetic image in the literature of the Muslim East. It must be emphasized that Islam as a logical conclusion of religious views, at the same time, raised the teaching of prophecy to a high level. About this philosopher Z. Z. Shoev emphasizes: "The Quranic doctrine of prophecy is characterized by a high spirit of humanism, religious tolerance and deep respect for the prophets and adherents of other religions. These qualities found their practical implementation in the words and deeds of the Prophet of Islam - the prototype of a perfect person for every Muslim. The Quranic teaching about prophets and prophecies had and continue to exert a tremendous creative influence on the national culture of Muslim peoples individually and on Islamic and human culture as a whole" [19.16]. From this point of view, the personality and image of Masih has a significant place in the world of the

Muslim East, the poetics of Sufi and classical literature.

The image of Masih is reflected with its various poetic functions in the works, in particular, in the poetry of the great thinker Alisher Navoi. In this place the lyric sofa “Badoyi ul-Bidoya” (“The rarity of the beginning”) is of great importance. Alisher Navoi, both in other sofas and in the sofa, “Badoyi ul-bidoya” (“The rarity of the beginning”), depicts the image of Jesus mainly in the form of Masih. In this sofa, Iso Masih occurs about 70 times, of which 10 times Iso, 6 times Ruhulloh and Isoi Ruhulloh, 2 times Isoi Mary, 52 times as Masih. This poetic image performs various artistic and aesthetic images and displays lyrical pictures. When the image of Masih is explored, attention is first paid to the animating miracle. As is known, this miracle in the history of prophecy only applies to Jesus. When the motive of animation is interpreted in classical lyrics, the image of Masih is implied. As stated in the sources, monotheism was first founded by Judaism. Jesus receives the initial spiritual education from the source of this religion. In it, the future life, that is, the doctrine of the soul is not reported. This is stated in the work “Kissasi Rabguzi” (“The Tale of the Prophets”), by the famous 13th century writer Nosiriddun Burhanuddin Rabguzi [11.167]. Jesus feels this flaw and tries to find out. At that moment, he is presented with a miracle of animation. This means that the body cannot exist without a soul. With this, Jesus became a symbol of vivification-revival. This miracle in the poetry of the East, including in the lyrics of Navoi, is compared to the lips of a surrogate. The poet in his couch, “Badoyi ul-Bidoya” (“The rarity of the beginning”) in the fard (double) genre, writes: **“Labingni sўzga that gўё қilibsen, Masiҳo muzhizin and xe ibibsen”** (Translation: Speech of your lips shows the miracle Masih) [2.615]. In classical poetry, the lips - on the inside means "divine words". Its function - to animate love in the heart of a beloved is likened to the miracles of Masih.

Лаби лаълинг ҳалокимен, агарчи жонфизолиқда,

Масиҳо бирла ул гўё ўлук бирла Масиҳодур[2.223].

(**Translation:** My sweetheart's lips ruined me. This revival is like a lover and beloved or dead and Jesus)

The poem reflects the poetic content with the help of symbolic and metaphorical images. In it, it is first necessary to pay attention to the interpretation of the image of laby laal (red lip). This image constitutes the semiotic center of the verse. “Lain” in its lexical meaning means a precious red stone. It is applied to the ratio of red lips. Therefore, in poetry, the redness of the lips means “lali lab” (“red lips”). In the poetry of Sufism, “lab” (lips) - the divine word and gift, “la'li lab” (red lips) - means the depth of these divine words. It is symbolically interpreted by the animation and revival of human souls. Therefore, Alisher Navoi depicts the sacred books of heaven as human souls and the spirit of the world in his Khamsa dastan. In the sources, the images of Khizr, Iles (Elijah), Idris (Enoch), Masih (Jesus) are considered living personalities. The cause of their eternal life is divine words. The miracle of the revival of Masih also happens on the part of the Most High. Therefore, in the verse the miracle of the beloved's lip is interpreted on the basis of the Most High and Masih or Masih and the dead. In the poet's lyrics, the miracle of the revival of Masih is depicted in a variety of styles.

Нутқи жон бермак қилур ул лаъли хандон бирла баҳс,

Рост Исодекки қилғай оби ҳайвон бирла бас[2.92].

(**Translation:** Speech lover argues with the lips about the revival. This is something like the debate of reviving Jesus with “obi hivon” (“reviving water”).

As mentioned above, the miracle of the revival of Masih is connected with the lips. In classical poetry, another such miracle of the Most High is repeatedly mentioned. This is called “obi hayvon”, that is, quickening water. It is connected with the history of Khizr. As it is told, Iskander and Khizr are looking for quickening water. She is found by Khizr, poet and turns into an eternal living person. In Sufi literature, this quickening water is symbolically interpreted as the “source of love.” From this point of view, the speech of the beloved and the lips are matched with Masih and the reviving water. As you can see, Alisher Navoi interprets the divine word, lips, Masih, animating water as a miracle. According to the poet, these miracles are granted by the Most High.

Лаъли серобин тила, қўй исову ҳайвон суйин,

Эй кўнгулким, орзуйи умри жовид айладинг[2.354].

(**Translation:** O soul, if you want eternal life, ask the lips of the beloved not seek Masih and quickening water)

The poet in this beat refers to the soul. In general, the appeal to the soul in classical poetry is considered one of the traditional method. This reflection in many places denotes the image of a lyrical hero. In this verse, a poetic picture is created using images of lips, Jesus, obi hayvon, eternity, soul. In it, the miracle of “la'li lab” (red lips) in relation to Jesus and the quickening water is put in the first place. However, the beat says: “If you want eternity, ask this lip for help, and not for Jesus and the quickening water.” It is evident that for the hero in love the main thing is the gift of the Most High. The only Supreme is considered a true miracle worker. It hints at the verses of the Quran. The Quran says that "Every living soul will taste death." This thought also applies to Idris, Iles, Iso and Khizr. Therefore, the lyrical hero of the gazal says: "if you want eternal life, leave the other and go to your lover and then you will find peace." Alisher

Navoi, in his friend gazelle, the lip depicts wonders with the grotesque:

Лаъли бир сўз бирла юз йиллиқ ўликни Хизр этар,

Гўйиё Руҳуллоҳ ушбу оби ҳайвон ичрадур[2.154].

(**Translation:** One-word sweetheart lips forever revive a century old dead man. This situation looks like it is reviving inside water is Masih)

It also poetic content figuratively depicts the miracle of animation. In verse, all the images are associated with the motive of animation. Lip - reviving, inspiring divine words, Khizr - a living person, obi Hayvon - reviving water, Ruhulloh (spirit of the Highest) - reviving a prophet, dead - a symbol of revival. From this it can be seen that when Alisher Navoi speaks about one specific topic, he uses the symbolic images associated with this topic in the poem. In the beat poetic pictures of images and details connected with the motive of animation were created. It says: “The lips of the beloved revive a man who died a hundred years ago. He gives life to the eternal Khizr. It looks like Masih has entered the quickening water”.

In the poetry of Alisher Navoi, the image of the sun is considered to be one of the poetic images related to the topic of Masih’s interpretation. This motif is shown in the artistic interpretations of Masih merges with the sun. This episode in Sufi literature is called "Fana." It is interpreted by Masih as a lover, and the sun as a lover. In eastern literature, there are seven layers of heaven and earth. Prophets are reflected in the interpretation of the seven layers of heaven. This is given in the traditional creation stories and themes of the operas (the night ascension of the Prophet Muhammad). They emphasize that Iso Masih (Jesus) is in the fourth layer of the sky. About this in the classical literature there are separate stories. As the story goes, Jesus was a person who renounced worldly goods. However, when he ascended to heaven, a needle was stuck in his clothes. And the needle is considered a worldly blessing. Therefore, I could not rise higher than the fourth layer of the sky. In the literature of the East, the fourth sky layer is interpreted as a galaxy of the sun. Consequently, the sun and Jesus are portrayed in parallel in classical poetry. This picture reflects the beautiful lyrical image. It reveals the symbol of Masih (Jesus) as an image of a lover, and the sun as a lover. Classical poetry has traditional episodes that metaphorically depicts the image of a lover and lover. Of these, the most widely distributed are the episodes “buzz va bulbul” (flower and nightingale), “sham va parvona” (candle and moth), and “hum va dengiz” (jug and sea). A series of such metaphorical episodes includes the image of Jesus and the sun.

Сариғ либос аро ул нўшлабки хандондур,

Эрур Масиҳки хуршид ичинда пинҳондур[2.176].

(**Translation:** She is in yellow clothes laughing. It looks like Masih is hidden inside the sun)

It matches the yellow dress with the sun, and Masih with the beloved. The poem shows as an example the infusion of Masih with the sun. This episode in the poetry of Alisher Navoi is depicted in a variety of poetic style.

Масиҳодин лабинг афсаҳ, қуёштин оразинг аҳсан,

Қуёшингга фалак ҳайрон, Масиҳингга қуёш маскан[2.565].

(**Translation:** Your lips speak more beautifully than Masih, the face is brighter than the sun, the universe is surprised at your face, the sun is in your lips)

In the beat created a picture with images of Masih, the sun, lips, face. It means that Masih (Jesus) is infused with the sun and lips are the animating miracle of Masih. As noted, the lips are animated words, and the face is divine beauty. This beat emphasizes that the lips are better than the miracle of Masih, and the face is brighter than the sun. As the universe marvels at the color of the sun, so the world is amazed at your beauty. Thus, in a two-line verse there are four thoughts: 1. The lip master is a word than a ***machee*** (Jesus). 2. Face brighter than the sun. 3. The face is surprised by the universe. 4. The sun is located in the lip. These thoughts emphasize that the beloved is considered a symbol of beauty and quickening.

Сафҳайи ҳуснунгда жонбахш ирнинг, эй сийминбадан,

Ўхшашурким айлағай Исо қуёш ичра ватан[2.548].

(Translation: Reviving lips sweetheart located in a beautiful face. It is likened to Iso located in the bright sun)

The poet in this poem compares the beauty of the face - the sun, lips - Iso (Jesus). Therefore, the face is interpreted by perfect beauty, the lips - by a quickening word. At the same time, it is necessary to emphasize that when Alisher Navoi draws attention to a certain topic, concepts and details related to this poetic picture are mentioned. For example, when the image of Masih (Jesus) is depicted, such details as the sun, the needle, revival, solitude in the poem are reflected. Ultimately, these details reflect different symbolic and metaphorical meanings. This reflection in lyric poetry is called the art of tanosub (parallelism). According to this art, in the poem, the images and details of the same subject matter are consistent. This is observed in lyrical interpretations of images of historical and legendary persons, literary heroes and prophets.

Йўқ оғиздин нукта айтур маҳвашимдек бўлмағай,

Гар қуёш ҳар заррасидин бир Масиҳо айласа[2.49].

(**Translation:** Even if the sun invents Masih from each dust particle, it cannot be one word from the mouth of the beloved)

The poet emphasizes that every word of the beloved is a miracle of animation. In classical poetry, there is an image of "yo oz" (an invisible mouth) that clarifies the subtlety of the divine world. It is considered a type of grotesque. However, in this poem, poetic art serves to create a different picture. In the beat, such images as the nukta (divine words), the sun (the planet), and Masih (the prophet) are interrelated in the motive of enlivening. At the same time, the internal connections of these images are taken into account. If the divine words revive the spiritual world of man, the sun objects to the universe, then Masih (Jesus) revives the dead man. This means in the works of Alisher Navoi and in the Uzbek classical literature a profound expression of the spiritual and psychological vigor of humanity. In the couch of the poet, the motive of revival is depicted not only in the image of the beloved, but also in others. One of them is considered the image of "wind" (sabot).

Сабо дебон хабар ул гулдин, элни тиргузди,
Масиҳча деса бўлғай анинг рисолати бор[2.205].

(**Translation:** The wind brought news from the beloved and quickened the lovers. Therefore, we can call the wind Masih)

In the poem in the metaphorical sense, the beloved is depicted as a flower (hum), and in love with the people (el). In classical literature, when the motive of the message from the beloved is portrayed, attention is mainly paid to the image of the wind. In Sufi literature, this image is compared to divine revelation. For example, in the "Farhad and Shirin" dastan, Farhad sends a message to his lover with the help of the wind. This message inspires, spiritually animates the lyrical hero. Therefore, this function of the wind is likened to the wonders of Masih (Jesus). In the poetry of Alisher Navoi, the motive of the message expresses various deep meanings. There is a variety of artistic interpretations of this motive. In the poet's lyrics there is a separate gazal, called radiograph "Maddasin" (message). It says about the revival of a lover only the good news of her beloved.

Субҳ еткурди сабо гулбарги хандон муждасин,
Ё кўнгул топти Масиҳ анфосидин жон муждасин.
Ё фалак берди йиғи, кўр айлаган Яъқубнинг
Кўзлари очилмоқ учун моҳи Канъон муждасин.
Не гули хандон, не Исодур, не Юсуф муждаси,
Топти бир маҳжур ўлар ҳолатда жонон муждасин[2.435].

(**Translation:** Or the morning wind brought news from the leaves of flowers, or the soul has heard the news of life from the breath of Masih, or the universe brought news from Yusuf (Joseph), to open the eyes of Jakub (Iakov). Cannot liven up in love or lead from the flowers, not from Masih, nor from Yusuf, but only the news from the beloved)

In the poetry of Alisher Navoi, the image of the "bat" plays a special role in the interpretation of the personality of Masih. The appearance of the image of the bat in the Uzbek classical lyrics is associated with the interpretation of the history and poetic interpretation of the image of Masih. As noted in the Quran, he created a bird out of clay, and this bird, with the will of the Highest, quickened. These episodes are not found in the books of the Torah and the Gospel. In artistic interpretations this bird is called "Huffosh" (bat). She does not see the day, but only flies at night. As stated in some interpretations, the bird was created with imperfections because it was created by the Messenger of the Highest, and not He himself. When depicting the image of Masih, Alisher Navoi draws attention to the image of the bat. In it, the "inability to see the afternoon" of the bat expresses various metaphorical reflections.

Ул Масиҳанфос тарсо сайдидур кўнглум қуши,
Ким малак дайри равоқи кунжида хуффош эрур[2.227].

(**Translation:** Reviving as Masih, the beloved stands ready to catch the soul bird)

As you can see, in the poem the bat is portrayed as a metaphor for the bird of the soul. In the first line of the beit, "Masihonafas tarso" (Christian, animating like Jesus) is used in the meaning of the beloved. According to Alisher Navoi, she is a "bird of the soul" hunter. And the bird of the soul is considered a bat in the ruins of the ancient world. In this place, the "ancient world" metaphorically means the human body, and the "bat" is a symbol of the soul. Consequently, Alisher Navoi in his verse deeply depicted symbolic and metaphorical pictures with the help of images: Masih, tarso (Christian), hunter, soul, bird, mortal world, ruins and a bat. It contains the motive of love. An important side is that the image of the bat in the poet's lyrics is found in a variety of symbolic and metaphorical interpretations. They depict the spiritual cheerfulness of man. Although Alisher Navoi's dastan "The Language of Birds" is devoted to the symbolic interpretation of bird images, there is no image of a bat in it. Usually, the image of a bat is simultaneously presented with the image of Masih. However, in some places, this image creates separate poetic paintings. In one of his poems, Alisher Navoi uses the literary-poetic device "tanosub" (parallelism).

Уруж оқшоми тегрангда ою кавкаблар,
Масиҳ гирдида андоқки бир неча хуффош[2.272].

(**Translation:** The stars and the moon spin around you on the night of the shooting. It looks like a picture with a few bats around Masih)

Here the poet talks about the event mirage. As is well known this event is considered the highest level of the history of prophecy. Interpretations of nights in classical poetry, in particular in the works of Alisher Navoi, are of particular importance. This motif is widely depicted in the lyrics of Alisher Navoi and especially in dastans. The important side is that in classical literature only the image of the Prophet Muhammad is depicted. It also depicts the passing of the prophets. However, interpretations of the image of other prophets are not found in Oriental literature. This means that the history of prophecy is recognized as a single degree of holiness. Therefore, when the night is depicted meraj in the works of Alisher Navoi is embodied in the personality of the prophet Muhammad. The above beat does not indicate the image of Muhammad, but alludes to the meraj and motive. Event meraj is the instant ascension and detour of the whole divine world by the prophet Muhammad. Therefore, the thinker exemplified the rotation of the bat around Masih, like the rotations of the moon and the stars around Muhammad. In this regard, as in the literature of the East, Alisher Navoi also praises the night meraj. The poet in another verse creates a poetic picture with the help of night meraj.

Масиҳ дам ура олмас анга уруж туни,
Магар бизинг маҳи улвийхиром қилди ҳадис[2.90].

(**Translation:** If the beloved begins to speak on the night of meraj, and Masih cannot revive)

It can be seen that meraj is the level of grandeur. At this time, cannot even revive Masih. Therefore, Alisher Navoi estimates the size of the universe as a mole. In the poet's lyrics, one of the poetic functions of Masih's image is the motive of loneliness. As indicated in the sources that Jesus lived alone, there was no interest in worldly goods. In the work "Kisas ul-anbiyo" ("Stories of the Prophets") it is said that among the prophets Solomon, David had many wives. However, Jesus spent his life alone. This situation is given in the interpretation of the image of Masih. This motif is depicted in the lyrics of Alisher Navoi.

Чиқиб бу дайрдин Исоға невчун ҳамнафас бўлмай,
Биҳамдиллаҳ, тажарруд бирла ҳимматдин қанотим бор[2.123].

(**Translation:** I will be companion to Jesus coming out of this world. I have two wings: loneliness and generosity)

According to the poet, the elevation of Masih to the sky was his loneliness. Therefore, the lyrical hero says that he has the same qualities. In the poetry of Alisher Navoi, the elevation of Masih to the sky is connected with solitude.

Ул қуёш васлин тиларсен, бўл мужаррад негаким,
Кўкка Руҳуллоҳни етурган анинг тажридидир[2.689].

(**Translation:** If you want to connect with your beloved be lonely. Because the reason for the rise of Jesus to heaven is loneliness)

In this regard, it is necessary to emphasize that the motive of Masih's solitude is an example of the state of a lyrical hero. History tells us that Jesus spent his life in solitude. However, in classical poetry this motive is interpreted by non-attachment to this mortal world. Famous representative of the Turkic-Sufi literature Khoja Ahmad Yassavi says: "Asceticism is the heritage of Iso (Jesus)." Consequently, the concept of loneliness and asceticism is interpreted as one of the poetic functions of the Masih image.

In the lyrics of Alisher Navoi, the image of Masih together with other personalities is considered a tradition. In particular, it often meets with the image of Khizr. The poet has two gazelles with a redif, which are called "Khizru Masih" ("Khizr and Jesus"). As is known, the image of Khizr in classical poetry is depicted simultaneously with the prophets and historical legendary personalities, kings and literary heroes. It is related to his eternal life. Alisher Navoi, when depicting the image of Masih, repeatedly draws Khizr. It mainly focuses on such interpretations among the images of Khizr and Masih. One of them is the interpretation of the eternal life of Masih in heaven, and Khizra on earth.

Еру кўкта истабон пайдо эмас Хизру Масиҳ,
Қочдилар гўё дудоғинг оби ҳайвонин кўруб[2.71].

(**Translation:** Seeing the wonders of your lips, they did not want to be on earth Khizr, but in the sky Masih)

In the poetry of Alisher Navoi, the beloved is described as Masih. This plan implies the eternal life of Masih and Khizr. The poet interprets this eternity as a gift to the beloved.

Умри жовид элгаким бермиш арода ул Масиҳ,
Юз туман минг Хизр аро бир чашмайи ҳайвон эрур[2.164].

(**Translation:** Beloved gives eternal life. It is just like the quickening water gives Khizr an eternity)

According to Alisher Navoi, Masih is described alive and animating, and Khizr alive. This state inspires the soul and heart of the lyrical hero. Therefore, the thinker to complement it, draws attention to the image of Yusuf (Joseph). In classical literature, Yusuf (Joseph) is considered a symbol of mental and physical beauty. The beauty of the beloved is reflected in the image of Yusuf (Joseph) and his revival is compared to the miracle of Masih.

Оламоро ҳусн ила жонбахш нутқунгму экин,
Ё Масиҳо руҳи Юсуф жисмида қилмиш ҳулул[2.417].

(**Translation:** Are these your animating words or beauty striking your face? Or is Masih's soul reflected in the body of Yusuf (Joseph?))

In the interpretation of the poet, beauty is likened to Joseph, and the word to the miracle of Masih. In the lyrics of Alisher, Navoi, Yusuf (Joseph) is depicted as a symbol of beauty, Masih - a reviving miracle. In Eastern Islamic sources, Masih is exalted as the prophet of the Most High. He is the last prophet of the pre-Islamic era and the Jewish cycle. After him, the Prophet Muhammad is considered the "seal of the prophets."

In eastern sources, one of the features of the prophecy is considered to be the “sleep” motif. Therefore, the "dream of the prophet" is a revelation. In classical poetry, when images of prophets are created, special attention is paid to sleep episodes. For example, such a picture can be seen in the work “Badoyi ul-bidoya” (“Rareness of the Beginning”) by Alisher Navoi:

Тушумда лаълию рухсоридур, уйғотманг мени, гар худ

Масиҳо бирла Юсуф бошим узра етсалар ногаҳ[2.675].

(**Translation:** The dream reflected the lips and face of the beloved. If the prophets Masih and Yusuf come, do not wake me)

In the dream of a lyrical hero, the beauty and revival of the beloved is reflected. In this episode, the miracles of Masih and Yusuf (Joseph) seem like a normal condition to a lover. In classical poetry, this means exalting the beauty of the beloved. In the dream of a lyrical hero, the beloved is reflected by the symbol of beauty. In order to realize this beauty, the poet draws attention to various images and poetic signs. One of them is the image of Muso (Moses) used together with the personality of Masih. Moses in the history of the prophetic cycle ranks first before Jesus. In the poetry of Alisher Navoi, the image of Moses is often found. Details related to the image of Moses, "aso" (staff), "baizo" (shining hands) perform various symbolic and aesthetic functions.

Зулфидин, тонг йўқ, Калимуллоҳдек этса аждаҳо,

Ким яди байзодин айлабдур намудор илгини?

Сўрғали келса Масиҳим бошима доманкашон,

Ул этакдин ким ола олғай бу бемор илгини?[2.682]

(**Translation:** The curl of the beloved as the staff of Moses turned into a dragon, and his hands as shining. If my beloved comes to help me, who can ask him the sorrow of a lover)

It is evident that the “curl” metaphorically reflects the staff of Moses, and the “hands” reflect the shining fingers of Moses, and the beloved itself is a reviving miracle Masih. Here it must be emphasized that the image of Musa (Moses) in the poetry of Alisher Navoi is extremely rare. Whereas, in the Quran, the name Muso (Moses) is repeatedly mentioned in comparison with other prophets. From this point of view, it can be said that the images of the prophets do not depend on the mention of the number of their names in the holy books.

Кўзни афсунсоз этиб жонбахш лабдин нукта айт,

Сомирий сеҳрин, Масиҳо муъжизин изҳор қил[2.448].

(**Translation:** Eyes beloved - magician, lips - animating speech. It reflects the magic of Somyria, the miracle of Masih)

In the sources and stories of Moses Somyria is sometimes found. Somyria is mentioned by a relative of Moses. He practiced witchcraft. Therefore, in classical poetry, the image of Somyria is almost never found. Although Islamic culture negates witchcraft, it is used as a symbolic sign in lyrical poetry. In classical lyrics, if lips is a divine animating word, then eyes are mortifying witchcraft. In the poet's lyrics, Masih is portrayed as Ruҳullo (spirit of the Most High). This is due to the immaculate conception of Jesus. Alisher Navoi in one of his lyrical genres, hinting at this event, says: “a child can be without a father, but there can be no mother”. Both in the biblical and in the Koranic version of the plot about the birth of the Messiah, this phenomenon is treated the same, and therefore in classical literature Masih is considered in the meaning Ruҳullo. This means that Masih is the spirit of the Most High.

Лаъли жонбахшинг эрур гўёки Руҳуллоҳким,

Сочилур жон ҳар тараф қилғон сойи изҳор лафз[2.308].

(**Translation:** Your lips are like Ruҳullo in reviving. When he speaks the soul spreads)

* * *

Руҳум айрилмиш бадандин гар тиларсен, эй ҳабиб,

Айламак Исойи Руҳуллоҳ дамин изҳор, кел[2.424].

(**Translation:** Friend, if you want, the soul will leave my body. You come not to kill, but to quicken as Iso (Jesus))

When the images of the prophets are depicted in the lyrics of Alisher Navoi and, in general, in classical poetry, special attention is paid to the “seal of the prophets”. In particular, the prophet Muhammad is given in the image of the image of Masih, because it is considered the seal of the prophets. After it ends the cycle of prophecy, and begins sacredness. Therefore, all praise to the prophets is dedicated to Muhammad. Together with him, and prophecy is improved.

Йўқ ажаб, отингга гар муҳри нубувват бўлса хатм,

Ким нубувват халқасида йўқ сенингдек хотаме.

Сочқай эрди чашмайи хуршиддин ҳайвон суви,

Ҳамдаминг бўлса эди Исойи Руҳуллоҳ даме[2.681].

(**Translation:** Your name is the seal of the prophets, among the cycle of prophets there is no one like you. If Masih is your companion, that Sun pours out quickening water from its rays)

Conclusion

In conclusion, it should be noted that in the sofa "Badoyi ul-Bidoya" ("Rarity of the Beginning") the poet Alisher Navoi fruitfully depicts the image of Masih. This image serves to perform a variety of poetic functions. The poet with the help of this wonderful image invents various artistic and aesthetic paintings. In the lyrics of Alisher Navoi, symbolic and metaphorical images are quite attractive. Especially this image reflects in the poet's lyrics the motive of encouragement and revival. Therefore, when Sultan Hussein of Baikar assesses the work of a great thinker, he emphasizes: «*турк тилининг ўлган жасадига Масиҳ нафаси билан руҳ киргизган*»[5.13] (**Translation**: "the dead body of the Turkic language inspired by the miracle of Masih"). At the same time, in the lyrics of Alisher Navoi, the image of Masih proves that the poet's work is considered an example of universal human value and a sense of high humanism.

References:

1. Navoiy, A. (2012). *To'la asarlar to'plami. O'n jildlik.* Toshkent: O'zbekiston Matbuot va axborot agentligi G'ofur G'ulom nomidagi nashriyot-matbaa ijodiy uyi.
2. Navoiy, A. (1987). *Mukammal asarlar tўplami. Birinchi tom. Badoyi" ul-bidoya.* (p.724). Toshkent: Fan.
3. Navoiy, A. (1987). *Mukammal asarlar tўplami. Ikkinchi tom. Navodir un-niҳoya*. (p.620). Toshkent: Fan.
4. Yassaviy, A. (1991). *Ҳikmatlar*. (p.256). Toshkent: Adabiet va san"at.
5. Xusayn, B. (1991). *Risola*. (p.24). Toshkent: Sharқ.
6. Girgas, V. F. (2006). *Arabsko-russkiy slovar' k Koranu i khadisam.* (p.928). SPb.: IZDATEL""STVO "DILYa..
7. Zhurovskiy, A. V. (1990). *Khristianstvo i Islam*. (p.128). Moscow: Nauka.
8. Karomatov, X. S. (1996). *Khyrlangan paygambarlar galabasi.* (p.98). Toshkent: Meros.
9. (1983). *Navoiy asarlari tilining izoҳli luғati. 1-tom*. (p.625). Toshkent: Fan.
10. (1983). *Navoiy asarlari tilining izoҳli luғati. 2-tom*. (p.625). Toshkent: Fan.
11. (1990). *Nosiriddin Burҳoniddin Rabғuziy. Қisasi Rabғuziy.* 1-kitob. (p.240). Toshkent: Ezuvchi.
12. Rabғuziy, N. B. (1991). *Kisasi Rabғuziy. 2-kitob.* (p.272). Toshkent: Ezuvchi.
13. Piotrovskiy, M. B. (1991). *Koranicheskie skazaniya*. (p.218). Moscow: Nauka.
14. Saloxiy, D. (2004). *Badoe" ul-bidoya" maloҳati*. (p.135). Toshkent: Fan.
15. (2010). *Tasavvuf adabieti lingvopoetikasi. (Ilmiy maқolalar tўplami).* (p.167). Toshkent: Toshkent davlat sharқshunoslik institute.
16. Xakkulov, I. (2007). *Navoiyga kaytish.* (p.224). Toshkent: Fan.
17. Xakkulov, I. (2007). *Taқdir va tafakkur*. (p.334). Toshkent: Shark.
18. (2006). *Sharқ mumtoz poetikasi. Birinchi kitob (Nashr. tayerlovchi, talқin va sharҳlar muallifi Ҳ. Boltaboev).* (p.430). Toshkent: Davlat ilmiy nashrieti.
19. Shoev, Z. D. (2011). *Uchenie monoteisticheskikh religiy o prorochestve i ego razvitie v islame.* Avt. kand. diss. po filosof. nauk. (p.25). Dushanbe.
20. (1992). *Kur"oni Karim (Tarzhima va izoҳlar muallifi Alouddin Mansur).* (p.544). Toshkent: Chўlpon.

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SECTION 9. Chemistry and chemical technology.

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IMPROVING THE SAFETY OF THE AROMATED SALT MIXTURE

Abstract: *A solution to the problem of the safety of an aromatized salt mixture with a reduced content of sodium chloride is proposed. The salt mixture consists of the following components: sodium chloride in the form of instant scaly salt 40-50%, potassium citrate 20-25%; magnesium citrate 20-25%; dry crop - 10%. The flavored salt mixture has a low content of sodium chloride, a pleasant dill flavor, does not cake for 12 months, and the salinity corresponds to the salinity of ordinary table salt. It is recommended for the prevention of cardiovascular diseases and can be used instead of regular table salt.*

Key words: *safety, flavored table salt, potassium citrate, magnesium citrate, dry grain.*

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ПОВЫШЕНИЕ БЕЗОПАСНОСТИ АРОМАТИЗИРОВАННОЙ СОЛЕВОЙ СМЕСИ

Аннотация: *Предложено решение проблемы безопасности ароматизированной солевой смеси с пониженным содержанием хлорида натрия. Солевая смесь состоит из следующих компонентов: хлорид натрия в виде быстрорастворимой чешуйчатой поваренной соли 40-50 %, цитрат калия 20-25 %; цитрат магния 20-25 %; сухой кроп – 10 %. Ароматизированная солевая смесь имеет пониженное содержание хлорида натрия, приятный укропный привкус, не слеживается на протяжении 12 месяцев, соленость, соответствующую солености обычной поваренной соли. Рекомендуется для профилактики сердечно-сосудистых заболеваний и может использоваться вместо обычной поваренной соли.*

Ключевые слова: *безопасность, ароматизированная поваренная соль, цитрат калия, цитрат магния, сухой укроп.*

Введение.

Поваренная соль состоит из основного компонента - хлорида натрия – 94-99 %, макропримесей – солей кальция, калия и магния 1-6 % и микропримесей – солей железа, свинца, меди, кадмия и др. – суммарное содержание - менее 0,005 % [1].

Рекомендуемое количество поваренной соли для употребления в пищу составляет 5-6 г в сутки. Превышение рекомендуемого количества может привести к развитию гипертензии и другим сердечнососудистым заболеваниям. Более 60 % населения развитых стран употребляет в сутки 8-12 г поваренной соли. При этом, гипертензией страдают 25-60 % населения [2].

Следует отметить, что вредное воздействие на сердечнососудистую систему оказывает основной компонент поваренной соли – хлорид натрия. В связи с чем, для профилактики сердечнососудистых заболеваний, вызванных избыточным количеством употребляемого хлорида натрия, применяют различные солевые смеси с пониженным содержанием хлорида натрия, содержащие различные ароматизирующие добавки и позволяющие наряду с уменьшением количества потребляемого хлорида натрия ароматизировать пищу[3].

Все известные виды ароматизированных солевых смесей, в зависимости от состояния ароматизирующего вещества, подразделяются на две группы: ароматизированные различными эфирными маслами и ароматизированные сухими ароматизирующими приправами и их смесями.

Из первой группы набольшую известность получили следующие рецептуры ароматизированных солевых смесей. Описана рецептура ароматизированной солевой смеси, содержащая следующие компоненты, мас.%: поваренную соль 96-97, эфирное масло лавра благородного 1-2, крахмал – 2 и этиловый спирт - 0,01. Недостатками такой солевой смеси является невозможность ее использования для в процессе приготовления пищи из-за разрушения эфирного масла в процессе кипячения, невозможность использования для лечебного питания больных артериальной гипертензией и с целью профилактики этой болезни из-за большого количества хлорида натрия, а также недостаточный срок хранения - 3 месяца из-за окисления эфирного масла кислородом воздуха и слеживаемости продукта [4]. Известна рецептура ароматизиованной солевой смеси, содержащая следующие компоненты, мас.%: поваренную соль 60-70, сульфат калия 5-10, сульфат магния 5-10, укропное эфирное масло или эфирное масло лавра благородного - 10, крахмал водорастворимый - 10. Данная ароматизированная солевая смесь выпускалась Опытно-экспериментальным предприятием Украинского научно-исследовательского института соляной промышленности (раннее – Всесоюзный научно-исследовательский институт соляной промышленности) в 1984-1986 г.г. и была предназначна для лечебного питания больных гипертензией. Однако недостатки данной ароматизированной солевой смеси – недостаточный срок хранения - 4 месяца из-за окисления эфирного масла кислородом воздуха и слеживаемость продукта привели к прекращению ее выпуска [5].

Более длительный срок хранения имеют виды ароматизированных солевых смесей с ароматизирующими веществами - сухими приправами и их смесями. Описана ароматизированная солевая смесь, которая содержит следующие компоненты, мас.%: соль поваренная пищевая - 45-48, соль морская пищевая - 45-48, сушеные измельченные водоросли Нори и Комбу в равных частях - 4-10. Недостатками такой солевой смеси является невозможность ее использования для лечебного питания больных гипертензией из-за большого количества хлорида натрия, а также недостаточный срок хранения - до 6 месяцев вследствие слеживаемости продукта [6].

Наибольшее распространение получила ароматизированная поваренная соль – «Адыгейская», содержащая следующие компоненты, мас.%: соль поваренная пищевая 81,5-93,0, чеснок - 4,5-9,5, лекарственные травы 2,5-9,0 [7]. Данная ароматизированная поваренная соль используется как при приготовлении пищи так и для подсаливания готовых блюд. Наличие чеснока и лекарственных трав обеспечивает данной ароматизированной соли ароматический, лечебный и профилактический эффекты. Недостатками данной соли является отсутствие в ее составе солей калия и магния, которые являются основными компонентами поваренной соли с антигипертензивными свойствами, а также наличие значительного количества хлорида натрия 81,5-93,0%, что не дает возможности использовать данную соль для лечебного питания больных с артериальной гипертензией [8].

Нами была разработана и выпускалась Опытно-экспериментальным предприятием Украинского научно-исследовательского института соляной промышленности в 1986-1987 г.г. ароматизированная солевая смесь, содержащая следующие компоненты, мас.%: хлорид натрия 60-70, сульфат калия 5-10, сульфат магния 5-10, сухой укроп 10, крахмал

водорастворимый - 10. Данная ароматизированная солевая смесь была была предназначена для лечебного питания больных гипертензией. Однако, уменьшение содержания хлорида натрия в составе ароматизированной поваренной соли по сравнению с обычной поваренной солью, привело к увеличению количества потребляемой поваренной соли для достижения необходимой солености пищи и как результат – к уменьшению лечебного действия данной ароматизированной поваренной соли [9].

Следует отметить, что невозможность достижения привычной солености пищи известными видами заменителей поваренной соли – солевыми смесями приводит к увеличению количества потребления солевой смеси для достижения необходимого уровня солености пищи и как результат - к снижению или к практически полному исключению лечебно-профилактичеких свойств солевых смесей [10]. Таким образом, в составе лечебных и лечебно-профилактичеких солевых смесей – заменителей поваренной соли должен быть компонент, имеющий более высокую соленость, чем соленость обычной поваренной соли.

Нами предложена ароматизированная солевая смесь с пониженням содержанием хлорида натрия, состоящая из следующих компонентов хлорид натрия в виде быстрорастворимой чешуйчатой поваренной соли 40-50 %, цитрат калия 20-25 %; цитрат магния 20-25 %; сухой укроп – 10 %.

Быстрорастворимая чешуйчатая поваренная соль, благодаря специфической кристаллической структуре, имеет скорость растворения в 2,0 – 2,5 раза выше, чем обычная поваренная соль. Соленость быстрорастворимой поваренной соли, примерно, в 2,0 – 2,5 раза выше, чем у обычной поваренной соли. Следовательно, для достижения необходимого уровня солености пищи быстрорастворимой поваренной соли следует взять в 2,0 -2,5 раза меньшее количество[10].

Сухой укроп в количестве 10% уменьшает слеживаемость поваренной соли на 20-40% в зависимости от условий хранения, то есть действует как антислеживающая добавка [11]. Кроме того, укроп вводится в качестве вкусовой и ароматизирующей добавки, обладает целебными свойствами для всего организма человека. Укроп положительно влияет на работу сердца, укрепляет и лечит сосуды, расширяет кровеносные сосуды, уменьшая артериальное давление. Способствует очищению сосудов от вредных жиров и холестерина, улучшая кровоток [2, 9].

Цитрат калия - пищевая добавка Е 332 разрешена к использованию в СНГ, повышает работоспособность и остроту мышления, способствует нормальному течению обмена веществ в организме, регулирует сердечный ритм. Цитрат магния - пищевая добавка Е 345 разрешена к использованию в СНГ, принимает активное участие в обменных процессах стимулирует образование белков, нормализует пульс, расширяет сосуды, снижает артериальное давление, уменьшает вероятность тромбообразования [2, 12].

Приведенная комбинация компонентов солевой смеси с пониженным содержанием хлорида натрия делает ее вкус таким как и обычной поваренной соли, то есть человек будет употреблять такое же количество предлагаемой солевой смеси с пониженным содержанием хлорида натрия, как и обычной поваренной соли, при этом количество хлорида натрия уменьшится и таким образом уменьшится негативный эффект от употребления поваренной соли. Кроме того, такая солевар смесь содержит укроп, цитраты калия и магния, что улучшают состояние сердечно-сосудистой системы и снижают артериальное давление. Предлагаемая работа посвящена изучению предложенной солевой смеси на слеживаемость и соленость.

Экспериментальная часть. Быстрорастворимую чешуйчатую поваренную соль получали упариванием насыщенного рассола при температуре 91-98 ° С, при воздействии ультразвука частотой 1,0-1,5 ГГц, интенсивностью 1,5-2,5 Вт / см^2 согласно [10]. При этом использовали генератор ультразвука типа 24–УЗГИ–К–1,2 и пьезоэлектрические излучатели типа ЦТС–19 компании Релтек (Россия).

Смешивание компонентов солевой смеси выполняли с использованием лабораторного смесителя типа ЛС-23 компании «Опытный экспериментальный машиностроительный завод Украинского научно-исследовательского института соляной промышленности». Испытание образцов солевой смеси на слеживаемость выполняли известным эксикаторным методом. При этом образец смеси считался неслежавшимся при сопротивлении сжатию менее 0,3 кг/см^2 [11]. Органолептические испытания проводили по пятибальний шкале слепым методом по методике Украинского научно-иследовательского института соляной промышленности [11]. Испытания были проведены на 4 сериях проб ароматизированной солевой смеси с чешуйчатой и обычной поваренной солью, количество проб в каждой серии -3.

1 серия проб ароматизированной солевой смеси. 50 г чешуйчатой поваренной соли смешивали с 20 г цитрата калия, с 20 г цитрата магния и с 10 г сухого укропа. Для тщательного распределения в смеси компонентов, перемешивание проводили в три этапа. Вначале смешивали 5 г сухого укропа, 5 г чешуйчатой поваренной соли, 5 г цитрата калия и 5 г цитрата

магния. Затем к полученной таким образом смеси добавляли 15 г чешуйчатой поваренной соли, 15 г цитрата калия и 15 г цитрата магния и перемешивали. Далее к полученной смеси добавляли 30 г чешуйчатой поваренной соли, 5 г сухого укропа и перемешивали.

2 серия проб ароматизированной солевой смеси. 40 г чешуйчатой поваренной соли смешивали с 25 г цитрата калия, с 25 г цитрата магния и с 10 г сухого укропа. Для тщательного распределения в смеси компонентов, перемешивание проводили в три этапа. Вначале смешивали 5 г сухого укропа, 5 г чешуйчатой поваренной соли, 5 г цитрата калия и 5 г цитрата магния. Затем к полученной смеси добавляли 15 г чешуйчатой поваренной соли, 20 г цитрата калия и 20 г цитрата магния и перемешивали. Далее к полученной смеси добавляли 20 г чешуйчатой поваренной соли, 5 г сухого укропа и перемешивали.

3 серия проб ароматизированной солевой смеси. 50 г обычной поваренной соли (ГП Артемсоль, р. № 4) смешивали с 20 г цитрата калия, 20 г цитрата магния и с 10 г сухого укропа. Для тщательного распределения в смеси компонентов, перемешивание проводили в три этапа. Сначала смешивали 5 г сухого укропа, 5 г обычной поваренной соли, 5 г цитрата калия и 5 г цитрата магния. Затем к полученной смеси добавляли 15 г обычной поваренной соли, 15 г цитрата калия и 15 г цитрата магния и перемешивали. Далее к полученной таким образом смеси добавляли 30 г обычной поваренной соли, 5 г сухого укропа и перемешивали.

4 *серия проб ароматизированной солевой смеси*. 40 г обычной поваренной соли (ГП Артемсоль, р. № 4) смешивали с 25 г цитрата калия, с 25 г цитрата магния и с 10 г сухого укропа. Для тщательного распределения в смеси компонентов, перемешивание проводили в три этапа. Сначала смешивали 5 г сухого укропа, 5 г обычной поваренной соли, 5 г цитрата калия и 5 г цитрата магния. Затем к полученной смеси добавляли 15 г обычной поваренной соли, 20 г цитрата калия и 20 г цитрата магния и перемешивали. Далее к полученной смеси добавляли 20 г обычной поваренной соли, 5 г сухого укропа и перемешивали.

Для сличительных испытаний предложенной ароматизированной солевой смеси была выбрана наиболее распространенная ароматизированная поваренная соль «Адыгейская». В *1-й серии проб ароматизированной поваренной соли «Адыгейская»* в три этапа смешивали: 81,5 г поваренной соли, 9,5 г чеснока и 9,0 г смеси лекарственных трав [7]. Во *2-й серии проб ароматизированной поваренной соли «Адыгейская»* в три этапа смешивали: 93,0 г поваренной соли, 4,5 г чеснока и 2,5 г смеси лекарственных трав [7].

Одну часть приготовленного продукта вносили в эксикатор для проведения испытаний на слеживаемость эксикаторним методом (сопротивление сжатию при исследовании слеживания поваренной соли эксикаторным методом считается допустимым менее 0,3 кг / см^2), вторую - использовали для органолептических испытаний слепым методом по пятибальной шкале [11].

Результаты и обсуждение

В табл. 1 и 2 приведены результаты сличительных испытаний рецептур предлагаемой ароматизированной солевой смеси с пониженным содержанием хлорида натрия с ароматизированной поваренной солью «Адыгейская». Как следует из результатов опытов приведенных в табл. 1 ароматизированная солевая смесь с пониженным содержанием натрия хлорида имеет срок хранения 12 месяцев, а ароматизированная поваренная соль «Адыгейская» - до 6 месяцев в зависимости от особенностей рецептуры [11].

Также в табл. 1 приведены испытания на слеживаемость ароматизированной солевой смеси по предлагаемой рецептуре с обычной поваренной солью вместо быстрорастворимой чешуйчатой поваренной солью. При использовании обычной повареной соли продукт слеживался в течение 7-8 месяцев в зависимости от рецептуры с рецептурой (табл. 1). Следовательно, только использование быстрорастворимой чешуйчатой поваренной соли обеспечивает максимально возможный срок хранения - 12 месяцев.

Как следует из результатов опытов приведенных в табл. 2 ароматизированная солевар смесь с пониженным содержанием хлорида натрия вкусовым свойствам (соленость) практически идентична обычной поваренной соли. Ароматизированная поваренная соль «Адыгейская» в зависимости от количества поваренной соли и других ингредиентов имеет вкус от горьковато-соленого с сильным чесночным привкусом и запахом (81,5 г поваренной соли, 9,5 г чеснока и 9,0 г смеси лекарственных трав) до обычного соленого с легким чесночным привкусом (93,0 г поваренной соли, 4,5 г сухого чеснока и 2,5 г смеси лекарственных трав).

Также следует отметить, что при использовании ароматизированной солевой смеси по предлагаемой рецептуре, но при использовании вместо чешуйчатой быстрорастворимой поваренной соли обычной поваренной соли, вкусовые качества продукта по солености ухудшаются (табл.2). То есть, только использование в предлагаемой рецептуре быстрорастворимой чешуйчатой поваренной соли

обеспечивает такую же соленость как и у обычной поваренной соли.

Таблица 1. Сравнение слеживаемости ароматизированных солевых смесей: *предлагаемой рецептуры, предлагаемой рецептуры, но с обычной поваренной солью вместо быстрорастворимой чешуйчатой* и «*Адыгейской*»

№ пробы	Сопротивление сжатию, кг/см^2 через период времени (месяцы)							
	4	5	6	7	8	9	12	13
Ароматизированная солевар смесь по предлагаемой рецептуре								
1	*—	0,05	0,10	0,11	0,18	0,20	0,25	0,44
1	*—	0,04	0,10	0,11	0,17	0,20	0,25	0,48
1	*—	0,05	0,11	0,12	0,18	0,21	0,26	0,47
2	*—	*—	0,07	0,11	0,14	0,16	0,19	0,35
2	*—	*—	0,07	0,11	0,13	0,16	0,20	0,36
2	*—	*—	0,07	0,11	0,14	0,16	0,20	0,35
Ароматизированная солевая смесь по предлагаемой рецептуре, но с обычной поваренной солью вместо быстрорастворимой чешуйчатой								
3	0,06	0,10	0,19	0,27	0,46	0,77	1,08	1,12
3	0,05	0,11	0,18	0,28	0,47	0,78	1,08	1,12
3	0,05	0,10	0,18	0,27	0,47	0,78	1,08	1,13
4	*—	0,06	0,10	0,20	0,29	0,46	0,75	1,04
4	*—	0,07	0,10	0,19	0,29	0,47	0,73	1,06
4	*—	0,07	0,11	0,20	0,28	0,47	0,74	1,06
Арматизированная поваренная соль «Адыгейская»								
1	0,26	0,33	0,45	0,58	0,75	0,89	1,34	1,85
1	0,25	0,34	0,46	0,59	0,76	0,90	1,35	1,85
1	0,26	0,34	0,45	0,58	0,76	0,90	1,37	1,84
2	0,14	0,23	0,29	0,49	0,59	0,78	1,12	1,35
2	0,15	0,24	0,30	0,49	0,58	0,81	1,14	1,33
2	0,15	0,24	0,30	0,49	0,57	0,80	1,12	1,34

*— *Признаков слеживаемости продукта не найдено*

Таблица 2. Сравнение вкусовых качеств ароматизированных солевых смесей: *предлагаемой рецептуры; предлагаемой рецептуры, но с обычной поваренной солью вместо быстрорастворимой чешуйчатой* и «*Адыгейской*»

Номер пробы	Результаты органолептических испытаний ароматизированных солевых смесей методом слепого контроля по пятибальной шкале [11]		
	Ароматизованная поваренная соль «Адыгейская»	*Ароматизированная солевая смесь по предлагаемой рецептуре*	*Ароматизированная солевая смесь по предлагаемой рецептуре, но с обычной поваренной солью вместо быстрорастворимой чешуйчатой*
1	Вкус горьковато-соленый с сильным чесночным при- вкусом и запахом 4,8±0,05	Вкус обычный соленый с легким привкусом и запахом укропа 4,8±0,03	* Вкус горьковато-соленый с посторонним горьким привкусом, ощущается слабый привкус и запах укропа 3,1±0,05

2	Вкус обычный соленый с легким привкусом и запахом чеснока 4,9±0,05	Вкус соленый с легким привкусом и запахом укропа 4,6±0,05	**Вкус горьковато-соленый, ощущается слабый при вкус и запах укропа 3,6±0,05

** Поваренная соль каменная, ГП «Артемсоль», р. № 4, ** Повареннная соль «Экстра» Славянская соледобывающая компания*

Таким образом, нами установлено, что использование ароматизированной солевой смеси с пониженным содержанием хлорида натрия, которая содержит хлорид натрия, цитрат калия, цитрат магния, сухой укроп при следующем соотношении компонентов, мас.%:

хлорид натрия в виде быстрорастворимого чешуйчатой поваренной соли 40-50;

цитрат калия 20-25;

цитрат магния 20-25

сухой укроп - 10

позволяет по сравнению с известными солевыми смесями получить продукт с соленостью идентичной солености обычной повареной соли, увеличить срок хранения до 12 месяцев, улучшить лечебные и профилактические свойства благодаря уменьшению количества хлорида натрия до 40-50 %, введению в состав цитрата калия, цитрата магния и сухого укропа. Предлагаемая солевая смесь с пониженным содержанием хлорида натрия будет полезной для больных с артериальной гипертензией и может также использоваться в профилактике этой болезни.

References:

1. Goloperov, I. V., Belova, E. A., Baklanov, A. N., & Baklanova, L. V. (2017). Solving the problems of safety in the production of iodied salt. *ISJ Theoretical & Applied Science, 04 (48)*: 70-75.
2. Volkov, V. S., Nilova, S. A., & Poselyugina, O. B. (2009). O sootnoshenii povyshennogo potrebleniya povarennoy soli i izmeneniya ritma sutochnogo arterial'nogo davleniya u bol'nykh arterial'noy gipertoniyey. *Kardiologiya, 70, № 1*, 71-78.
3. Furman, A. A., Bel'dy, M. P., & Sokolov, I. D. (1989). *Povarennaya sol'. Proizvodstvo i primeneniye v khimicheskoy pro-myshlennosti*. (p.272). Moscow: Khimiya.
4. Pruidze, V. G., & Kekelidze, N. A. (1966). *Aromatizirovannaya sol'*. Avtorskoye svidetel'stvo SSSR № 185201, A 23 L. Opubl. 30.07.1966.- byul. № 16.
5. Baklanov, A. N., Baklanova, L. V., Golik, V. B. (1987). Aromatizirovannaya solevaya smes' s efirnym maslom lavra bla-gorodnogo. *Trudy VNIIsol', 34, № 3*, 45-51.
6. Parkhomets, Y. V. (2013). *Sposob polucheniya aromatizirovannoy povarennoy soli.* Patent Ukrainy na poleznuyu mo-del' № 79691, A 23 L. Opubl. 25.04.2013, Byul.№ 8.
7. Khuazhev, A. Z., & Khuazhev, Z. A. (2005). *Adygeyskaya sol'.* Patent RF № 2 251346, A 23 L. Opubl. 10.05.2005, Byul.№ 13.
8. Agayev, A. A. (2011). Vliyaniye zlupotrebleniya povarennoy sol'yu na zabolevayemost' naseleniya gipertoniyey. *Svet meditsiny i biologii, № 2*, 88-90.
9. Baklanov, A. N., Baklanova, L. V., & Golik, V. B. (1987). Aromatizirovannaya solevaya smes' s sukhim ukropom. *Trudy VNIIsol', 34, № 3*, 55-63.
10. Baklanova, L. V., Goloperov, Í. V., Sínyugína, G. D., & Baklanov, O. M. (2016). *Sposob polucheniya cheshuychatoy povarennoy soli*. Patent Ukrainy na poleznuyu model' № 110444, S 01 D 3/04. Opubl. 10.10. 2016, byul. №11.
11. Baklanov, A. N., Avdeyenko, A. P., Chmilenko, F. A., & Baklanova, L. V. (2011). *Analiticheskaya khimiya povarennoy soli i rassolov*. (p.281). Kramatorsk: DGMA.
12. Gromova, O. A., Torshin, I. Y., & Grishina, T. R. (2010). Mirovoy opyt primeneniya tsitrata magniya v meditsine. *Trud-nyy patsiyent. 8; № 8*, 20-27.

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SOLUTION TO SAFE POWER PROBLEMS. ULTRASOUND IN RECEIVING CAROTINE COOKED SALT

Abstract: *A solution to the problem of safe nutrition is proposed - a new approach to obtaining carotene table salt. A solution of an emulsifier "distilled monoglycerides" in a 10-15% solution of beta-carotene in oil was used as a carotene-containing additive. To obtain a solution, the effect of ultrasound with a frequency of 20-45 kHz and an intensity of 1,5-2,0 W / cm2 was used. At the same time, beta-carotene was encapsulated in distilled monoglycerides - a wax-like substance used in the preparation of margarine, which prevented its oxidation by air oxygen. The carotene-containing additive thus obtained was mixed with salt heated to 70-75 ° C. The resulting carotene salt practically does not cake, its shelf life is 18 months.*

Key words: *safety, carotene table salt, beta-carotene, ultrasound, frequency, intensity, distilled monoglycerides.*

Language: *Russian*

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РЕШЕНИЕ ПРОБЛЕМ БЕЗОПАСНОГО ПИТАНИЯ. УЛЬТРАЗВУК В ПОЛУЧЕНИИ КАРОТИНОВОЙ ПОВАРЕННОЙ СОЛИ

Аннотация: *Предложено решение проблемы безопасного питания – новый подход к получению каротиновой поваренной соли. В качестве каротиносодержащей добавки использовали раствор эмульгатора «Моноглицериды дистиллированные МГД» в 10-15 % растворе бета-каротина в масле. Для получения раствора использовали воздействие ультразвука частотой 20-45 кГц, интенсивностью 1,5-2,0 Вт/см^2. При этом бета-каротин был закапсулирован в моноглицеридах дистиллированных – воскоподобном*

веществе, используемом при получении маргарина, благодаря чему, исключалось его окисление кислородом воздуха Полученную таким образом каротиносодержащую добавку смешивали с подогретой до температуры 70-75 ° С поваренной солью. Полученная каротиновая соль практически не слеживается и ее срок хранения -18 месяцев.

Ключевые слова: *безопасность, каротиновая поваренная соль, бета-каротин, ультразвук, частота, интенсивность, моноглицериды дистиллированные.*

Введение.

Проблема безопасности питания является одной из важнейших, стоящих перед человечеством. При этом, остро стоит вопрос употребления в пищу антиоксиданотов для профилактики онкологических заболеваний. Одним из наиболее эффективных антиоксидантов является бета-каротин. Ранее считалось, что потребление провитамина А - бета-каротина возможно в любых дозах, т.к. организм сам синтезирует нужное количество витамина А [1]. Суточная норма потребления бета-каротина - 2-6 мг для взрослых. Однако, данные Всемирного фонда исследования рака показали, что превышение суточной нормы употребления бета-каротина более чем в 4 раза провоцирует риск развития рака легких у курильщиков [2].

Для массового дозированного потребления витаминов и лечебно-профилактических препаратов наиболее удобным является использование в качестве носителя поваренной соли. Суточное потребление поваренной соли составляет от 5-6 до 9-12 г в различных странах. Поэтому широкое распространение получило йодирование и фторирование поваренной соли, введение в состав поваренной соли различных витаминов и лекарственных препаратов [3]. В связи с чем, введение в состав поваренной соли бета-каротина – получение каротиновой поваренной соли является весьма важным в системе безопасного питания населения.

Описан [4] способ получения каротиновой поваренной соли, включающий последовательное приготовление трех смесей: первая смесь - перемешивают поваренную соль с натрием двууглекислым; вторая - перемешивают биомассу водоросли «Dunaliella salina» (содержащий бета-каротин) с аскорбиновой кислотой, третья - перемешивают первые две смеси и высушивают полученный продукт при температуре 40-50 ° С до начала деструкции органических ингредиентов. Недостатком способа является непродолжительный срок хранения конечного продукта (до 4 месяцев) из-за окисления бета-каротина кислородом воздуха и слеживаемость поваренной соли.

Имеется также способ получения каротиновой поваренной соли, включающий смешивание поваренной соли с каротиносодержащей добавкой, содержащей следующие компоненты (мас.%): аскорбат натрия (25,5), аскорбиновую кислоту (4,2), бета-каротин (1,6), биомассу водоросли «Dunaliella salina» (17,7), двуокись углерода (1,3) и морскую воду (остальные). Поваренную соль и каротинсодержащую добавку смешивают в соотношении 30: 1 - 10: 1. Полученный продукт высушивают при температуре 30-50 ° С в атмосфере двуокиси углерода. В охлажденную до комнатной температуры смесь вводят ароматизатор - эфирное эвкалиптовое масло. В результате получают каротиновую поваренную соль, состоящую из следующих компонентов (мас.%): Аскорбат натрия (0,84-2,42), аскорбиновая кислота (0,14-0,40), бета-каротин (0,05- 0,15), биомасса водоросли «Dunaliella salina» (0,58-1,66), двуокись углерода (0,04-0,12), эфирное эвкалиптовое масло (0,01-0,03) и поваренная соль (остальное). Недостатком такой каротиновой соли является непродолжительный срок ее хранения (до 6 месяцев) из-за разрушения бета-каротина и слеживаемости поваренной соли [5].

Таким образом, недостатком всех известных видов каротиновой поваренной соли является непродолжительный срок ее хранения, вызванный окисленим бета-каротина кислородом воздуха и слеживаемость продукта.

Нами раннее был разработан способ получения безопасной йодированой соли. Для предотвращения окисления йодида натрия кислородом воздуха предложена технология его введения в пищевой эмульгатор моноглицериды дистиллированные (МГД). Пищевой эмульгатор МГД широко применяется при производстве маргарина и относится к пищевым продуктам и не требует специального разрешения на применение в качестве пищевой добавки [6].

Предлагаемая работа посвящена получению каротиновой поваренной соли с длительным сроком хранения.

Экспериментальная часть

При выполнении данной работы применяли ультразвуковой диспергатор УЗДН - 1М с набором магнитострикционных излучателей, что позволяло создавать в исследуемой системе ультразвуковые колебания частотой от 16 кГц до 100 кГц при интенсивности ультразвука до 25 Вт/см^2 [7, 8].

Опыты проводили следующим образом. Предварительно готовили каротиносодержащую добавку таким образом. Растворяли эмульгатор МГД в 10-15 % растворе бета-каротина в масле

под действием УЗ частотой 20 - 45 кГц, интенсивностью 1,5-2,5 Вт/см^2. Полученную таким образом каротинсодержащую добавку смешивали с подогретой до температуры 70-75 ° С поваренной солью. При этом, количество эмульгатора МГД должно быть 1,0 – 1,5 г на 1 кг поваренной соли. Каждую пробу полученной таким образом поваренной соли разделяли на две части. Одну часть помещали в эксикатор для проведения испытаний на слеживаемость эксикаторным методом [9, 10] , вторую - помещали в стандартную упаковку и через 4, 6, 18 и 19 месяцев определяли содержание бета-каротина по методике [3]. Поваренная соль после испытания эксикаторным методом считается не слежавшейся если сопротивлению сжатию образцов менее 0,3 кг/см^2 [9, 10].

Результаты и их обсуждение

Использование ультразвука частотой 20 - 45 кГц, интенсивностью 1,5 - 2,0 Вт/см^2 обеспечивало налучшую растворимость эмульгатора МГД в растворе бета-каротина в масле. Причем лучшие результаты показало использование 10-15% раствора бета - каротина в масле (табл. 1-3). Следует отметить, что использование различных видов подсолнечного масла, а также оливкового масла практически не сказалось на полученных результатах (табл.1). Без действия ультразвука растворение эмульгатора МГД в масляном растворе бета-каротина возможно только в виде расплава и при нагревании до температуры кипения масла (табл.1).

Таблица 1. Влияние частоты УЗ на растворимость пищевого эмульгатора "Моноглицериды дистиллированные" (МГД) в масляном растворе бета-каротина.

Частота УЗ, кГц	Растворимость эмульгатора МГД, г/100 мл, в масляном растворе бета-каротина, %			
	9 %	10 %	15 %	16 %
19	17	24	26	21
20	22	56	58	50
25	23	57	58	43
30	22	56	60	40
30*	22	57	61	40
30**	22	56	61	40
45	23	54	57	21
46	18	31	36	18
Без УЗ***	17	27	27	20
Без УЗ	-	-	-	-

*В этой таблице и последующих приведены усредненные результаты шести опытов. Интенсивность УЗ – 2,0 Вт/см^2. Время воздействия УЗ – 2 мин. ***Использован расплав пищевого емульгатора МГД и нагрев до температуры кипения масла. Использован раствор бета-каротина в подсолнечном масле «Олейна Традиційна». * Использован раствор бета-каротина в подсолнечном масле «Стожар». ** Использован раствор бета-каротина в оливковом масле «Renieris» (Греція).*

Таблица 2. Влияние интенсивности УЗ на растворимость пищевого эмульгатора "Моноглицериды дистиллированные" (МГД) в масляном растворе бета-каротина.

Интенсивность УЗ, Вт/см^2	Растворимость эмульгатора МГД, г/100 мл, в масляном растворе бета-каротина, %			
	9 %	10 %	15 %	16 %
1,4	12	29	34	17
1,5	20	55	57	45
2,0	23	57	58	43
2,5	22	56	60	35
2,6	18	31	36	16

Частота УЗ – 25 кГц. Время воздействия УЗ – 2 хв. Использован раствор бета-каротина в подсолнечном масле «Олейна Традиційна».

Таблица 3. Влияние времени воздействия УЗ на растворимость пищевого эмульгатора "Моноглицериды дистиллированные" (МГД) в масляном растворе бета-каротина.

Время воздействия УЗ, мин	Растворимость эмульгатора МГД, г/100 мл, в масляном растворе бета-каротина, %			
	9 %	10 %	15 %	16 %
0,5	11	14	16	10
1,0	12	17	18	12
1,5	14	19	20	14
2,0	23	57	58	43
2,5	24	57	58	41
3,0	23	58	58	40

Частота УЗ - 25 кГц. Интенсивность УЗ - 2,0 Вт/см^2. Использован раствор бета-каротина в подсолнечном масле «Олейна Традиційна».

В табл. 4 приведено сравнение методов получения каротиновой поваренной соли согласно методу [5] и по предлагаемому методу. Как следует из данных, приведенных в табл. 4, использование предлагаемого метода позволяет увеличить срок хранения соли с 6 до 18 месяцев. При этом, количество необходимого эмульгатора МГД должна быть 1,0 - 1,5 г/кг пробы соли (табл. 4).

Количество введенного бета-каротина - 1 г на 1 кг поваренной соли обусловлено суточной нормой потребления бета-каротина и поваренной соли [2].

Таблица 4. Сравнение методов получения каротиновой поваренной соли.

№ пробы	Введено бета-каротин, мг/кг пробы	Введено эмульгатора МГД, г/кг пробы	Найдено бета-каротина, мг/кг пробы				Сопротивление сжатию, кг/см^2			
			4 месяца	6 месяцев	18 месяцев	19 месяцев	4 месяцев	6 месяцев	18 месяцев	19 месяцев
Предлагаемый метод										
1	1000	0,50	930	730	201	45	0,21	1,43	2,48	3,97
1	1000	0,50	937	726	198	47	0,27	1,37	2,32	3,12
1	1000	0,50	933	729	187	46	0,24	1,29	2,12	3,04
2	1000	1,00	994	976	900	564	*-	0,08	0,22	1,15
2	1000	1,00	995	981	907	559	*-	0,09	0,22	1,18
2	1000	1,00	996	983	902	557	*-	0,08	0,23	1,17
3	1000	1,50	997	990	920	601	*-	*-	0,07	1,53
3	1000	1,50	998	991	927	600	*-	*-	0,06	1,58
3	1000	1,50	998	993	922	605	*-	*-	0,06	1,52
4	1000	2,00	1000	992	933	754	*-	*-	*-	0,52
4	1000	2,00	1000	991	931	756	*-	*-	*-	0,55
4	1000	2,00	999	990	930	758	*-	*-	*-	0,53
Метод согласно [5]										
1	1000	-	835	627	32	4	0,05	0,33	2,48	3,17
1	1000	-	840	624	31	5	0,07	0,37	2,32	3,12
1	1000	-	830	622	30	5	0,08	0,29	2,12	3,14
2	900	-	712	485	24	2	0,07	0,27	2,48	3,17
2	900	-	716	479	25	2	0,06	0,27	2,32	3,12
2	900	-	718	480	27	2	0,05	0,28	2,12	3,09
3	800	-	634	310	12	-	0,05	0,31	2,48	3,07
3	800	-	630	312	16	-	0,06	0,29	2,32	3,12
3	800	-	625	318	14	-	0,05	0,28	2,12	3,04

4	700	-	554	231	10	-	0,05	0,32	2,48	3,07
4	700	-	560	243	9	-	0,06	0,29	2,32	3,10
4	700	-	558	235	9	-	0,05	0,28	2,12	3,04

**-Признаков слеживания не найдено*

Поваренная соль должна быть нагрета до температуры 70-75 ^{O}C. Именно этот температурный диапазон обеспечивает наибольший срок хранения готового продукта - каротиновой поваренной соли. Нижняя температурная граница обусловлена температурой плавления эмульгатора МГД - 70 ^{o}C. При температуре поваренной соли менее 70 ° С, эмульгатор МГД застывает, что делает невозможным равномерное размешивания каротиносодержащей добавки в объеме поваренной соли и как результат - содержание бета-каротина в разных точках отбора пробы значительно различается. Кроме того, в отдельных точках соль значительно слеживается. Верхняя температурная граница обусловлена тем, что при превышении температуры более 75 ° С, слой моноглицерида МГД вокруг каждой частицы бета - каротина утончается и к бета-каротину проникает кислород воздуха, который его окисляет и как результат - срок хранения готового продукта уменьшается (табл. 5).

Таблица 5. Влияние температуры повренной соли на срок хранения готового продута.

Температура поваренной соли, ^{o}C	Найдено бета-каротина, мг/кг пробы				Сопротивление сжатию, кг/см^2			
	4 месяца	6 месяцев	18 месяцев	19 месяцев	4 месяца	6 месяцев	18 месяцев	19 месяцев
69**	998	979	901	576	*-	0,08	0,24	1,15
69**	534	343	112	344	0,26	1,37	2,45	3,10
69**	1120	1103	994	745	*-	*-	*-	*-
70	976	965	897	554	*-	0,12	0,28	1,33
70	970	963	894	554	*-	0,14	0,29	1,40
70	975	958	895	557	*-	0,15	0,29	1,35
72	994	976	900	564	*-	0,08	0,22	1,15
72	995	981	907	559	*-	0,09	0,22	1,18
72	996	983	902	557	*-	0,08	0,23	1,17
75	990	970	900	560	*-	0,12	0,26	1,35
75	991	971	900	554	*-	0,13	0,27	1,41
75	993	975	901	552	*-	0,14	0,27	1,44
76	976	943	654	251	0,06	0,22	0,54	2,23
76	965	947	643	255	0,07	0,19	0,52	2,23
76	962	944	640	254	0,08	0,20	0,53	2,20

*Частота УЗ – 25 кГц. Интенсивность УЗ – 2,0 Вт/см^2. Время воздействия УЗ - 2 мин. Использован раствор бета-каротина в подсолнечном масле «Олейна Традиційна». Введено бета-каротин – 1000 мг на кг пробы. Введено эмульгатора МГД 1,00 г/кг кухонної солі. *-Признаков слеживаемости не найдено. **При температуре поваренной соли менее 70 ^{o}C, эмульгатор МГД застывает, что приводит к невозможности равномерного перемешивания каротинсодержащей добавки в объеме соли.*

Таким образом нами предложен способ получения каротиновой поваренной соли, обеспечивающий сохранность бета - каротина и отсутствие слеживаемости готового продукта на протяжении 18 месяцев.

References:

1. Avdeenko, A. P., et al. (2017). Milosavljević Efficient two-frequency ultrasound extraction of β -carotene from the fungus Blakeslea trispora. *Hem. ind., 71 (4),* 329–336.
2. Kyriakopoulou, K., Papadaki, S., & Krokida, M. (2015). Life cycle analysis of β -carotene extraction techniques. *J. Food Eng., 167*, 51–58.
3. Baklanov, A. N., Avdeyenko, A. P., Chmilenko, F. A., & Baklanova, L. V. (2011). *Analiticheskaya khimiya povarennoy soli i rassolov*. (p.281). Kramatorsk: DGMA.
4. Bidusenko, A. A. (2009). *Ímunopriprava solevaya.* Patent Ukrainy na poleznuyu model' № 85363 S2. Opubl. 12.01.2009. Byul. №1. 5.
5. Bidusenko, A. A. (2009). *Ímunopriprava solevaya i sposob yeye polucheniya.* Patent Ukrainy na poleznuyu model' № 85336 S2. Opubl. 12.01.2009. Byul. №1.
6. Goloperov, I. V., Belova, E. A., Baklanov, A. N., & Baklanova, L. V. (2017). Solving the problems of safety in the production of iodied salt. *ISJ Theoretical & Applied Science, 04 (48)*: 70-75.
7. Goloperov, I. V., Belova, E. A., Baklanova, L. V., & Baklanov, A. N. (2018). Improving food safety - increase of expressive analysis to toxic elements. *ISJ Theoretical & Applied Science, 01 (57):* 260-265.
8. Goloperov, I. V., Belova, E. A., Baklanov, A. N., & Baklanova, L. V. (2018). Solving the problems of safety in operation of salt exchangers of nuclear power plants. *ISJ Theoretical & Applied Science, 01 (57)*: 253-259.
9. Baklanova, L. V., Belova, E. A., Baklanov, A. N. (2018). Improving the safety of the salt. Content determination various forms of chrom. *ISJ Theoretical & Applied Science, 04 (60)*: 43-49.
10. Baklanov, A. N., Baklanova, L. V., Avdeyenko, A. P., Konovalova, S. P. (2012). Ul'trazvuk v analiticheskoy khimii i khi-micheskoy tekhnologii. (p.383). Kramatorsk: izd-vo DGMA.

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ACTUAL ISSUES OF ACTIVATION OF FOREIGN ECONOMIC ACTIVITY IN THE ECONOMY OF UZBEKISTAN

Abstract: *In the work, on the basis of the system analysis, some topical issues of activating the foreign economic activity of the economic entities of the Republic of Uzbekistan are considered. It is proved that an effective management mechanism in the sphere of foreign economic relations should be formed on the basis of an innovative approach. The intensification of foreign economic entrepreneurial initiatives and the influence of government bodies contribute to the improvement of the concept of state regulation of processes of foreign economic cooperation and the creation of foreign policy instruments of state government bodies in the post-crisis period. In accordance with the Action Strategy for the five priority directions of development of the Republic of Uzbekistan in 2017-2021, the strategy of innovative development is a necessary factor for the integration of Uzbekistan into the world community. The author offers a number of effective measures for the further expansion of foreign economic relations of the Republic of Uzbekistan in the context of global economic integration and the digital economy.*

Key words: *Foreign economic relations, foreign economic relations, foreign trade, innovations, management mechanism, digital economy, knowledge economy.*

Language: *English*

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Introduction

In the Republic of Uzbekistan for the years of independence a system of state regulation of foreign economic activity has been formed, which, as a complex system, depends on the effectiveness of a multi-level management mechanism, and its implementation is possible provided mutual adaptation of the instruments of foreign economic policy of enterprises and state structures. The activation of foreign economic entrepreneurial initiatives and the influence of management bodies contribute to the improvement of the concept of state regulation of foreign economic cooperation processes and the creation of a tool for foreign policy of state bodies in the post-crisis period.

In accordance with the Strategy of Action on the five priority development directions of the Republic of Uzbekistan in 2017-2021, the strategy of innovative development is an essential factor of Uzbekistan's integration into the world community. Innovative economy is, first of all, a flexible and dynamic economy in which new and disappearing companies are created and disappear, new markets are being searched for and new market niches are being developed [1].

An important incentive in this process can be foreign economic activity (FEA) and its key component - the export of goods of a high degree of processing. However, this requires the formation of a mechanism for managing the innovative development of Uzbekistan's foreign trade activities, industries and individual enterprises based on raising the level of management, modernizing production, and developing high-tech export industries. This is the

reason for the policy pursued by the President of the country, Sh. Mirziyoyev, who in his message to Oliy Majlis notes: "We will resume negotiations on accession to the World Trade Organization. In order to further stimulate exports, it is necessary to bring the technical regulation system in line with international standards. One of our main tasks is to bring quality and certified products to the foreign market under the Uzbek brand" [2].

Based on the adopted laws and fundamental principles, an independent foreign economic policy was formed in Uzbekistan that meets the interests, the growth of authority and the country's position in the world community.

So, according to the State Statistics Committee, in January-December 2018, the republic's foreign trade turnover amounted to 33809.1 million USD, including exports - 14253.9 million USD, its structure has been qualitatively changed due to an increase in the share of finished products with high added value [3].

The main factor in accelerating structural reforms was the creation of a favorable investment climate in the republic. For example, in January-December 2018, the development of the economy and social sphere of the Republic of Uzbekistan from the sources of financing mastered 107333.0 billion soums of investments in fixed assets (in dollars equivalent to 13.3 billion dollars), or 118.1 % to the corresponding period of 2017. During the reporting period of 2018, a high level of investment activity was observed in the Republic of Uzbekistan with an increase of 18.1 % compared with the previous year. In the dynamics of investment in fixed assets in 2005 amounted to 2.0 tln. soums, or increased by 12.0 %, 2010 - 10.8 trillion soums, or increased by 9.0 %, in 2015 they reached 28.5 trillion soums, or by 8.1 %.

The ratio of investments in fixed assets to GDP was 26.3 %, which is by 3.7 percentage points more than in comparison with the same period of 2017.

The volume of export services in January-December 2018 amounted to 3029.9 million USD, or 21.3 % of its total volume and increased, compared to the same period last year, by 22.4 %. As part of the export of services, the lion's share is taken up by transport services, tourism, as well as telecommunication, information, computer and financial services (Fig.1).

In the conditions of the world economic crisis, the important directions of the development of the national economy are innovative, investment and intellectual development. Along with this, the world economy is changing, in which turbulent processes of regional international integration and global liberalization are taking place. The foreign economic activity of states is also being modified, and consequently their role in managing and regulating foreign economic processes. Uzbekistan is included in the world economic processes under the influence of the external environment of already formed foreign economic relations.

Literature review

Among foreign studies, in the field of regulation of foreign economic activity, it is possible to mention the works of M. Alle [4], J. Keynes [5], P. Krugman [6], A. Marshall [7] and scientists of Uzbekistan - A.Vahobov [8], A. Rasulev [9], E. Trushin [10], B. Khodiev [11] and others.

For the theoretical comprehension and deepening of the problem of state regulation of foreign economic policy, the works of B. Balassa [12], J. Bhagwati [13], R. Jones [14], R. Samuelson [15], J. Stiglitz [16] and others are of great importance.

At the same time, there is still a significant gap between the theory and practice of regulation of foreign economic activity on the basis of innovative development of the national economy. Immunity to innovations, separation from world trends in scientific and technological development can lead to socio-economic and structural and technological backwardness. The fundamentals of the organizational and economic mechanism of scientific and innovation policy have not been fully developed yet, the responses of the branch management bodies to the challenges of the modern economy that require increasing the efficiency of innovation development are inadequate.

There remain a number of insufficiently developed questions connected with the definition of the place and role of state regulation of foreign economic operations in the management system of the modern market economy. A detailed analysis of factors affecting the management of local, regional and international liberalization of foreign economic relations is required. Meanwhile, the implementation of the goals of foreign economic activity in the context of globalization presupposes a strategic level of management of activities, including, among other things, decisions related to determining the opportunities and forms of entering foreign markets, selecting target segments, ways of penetrating them, understanding the requirements of consumers in other countries, etc. All of the above and predetermined the choice of the topic of this study.

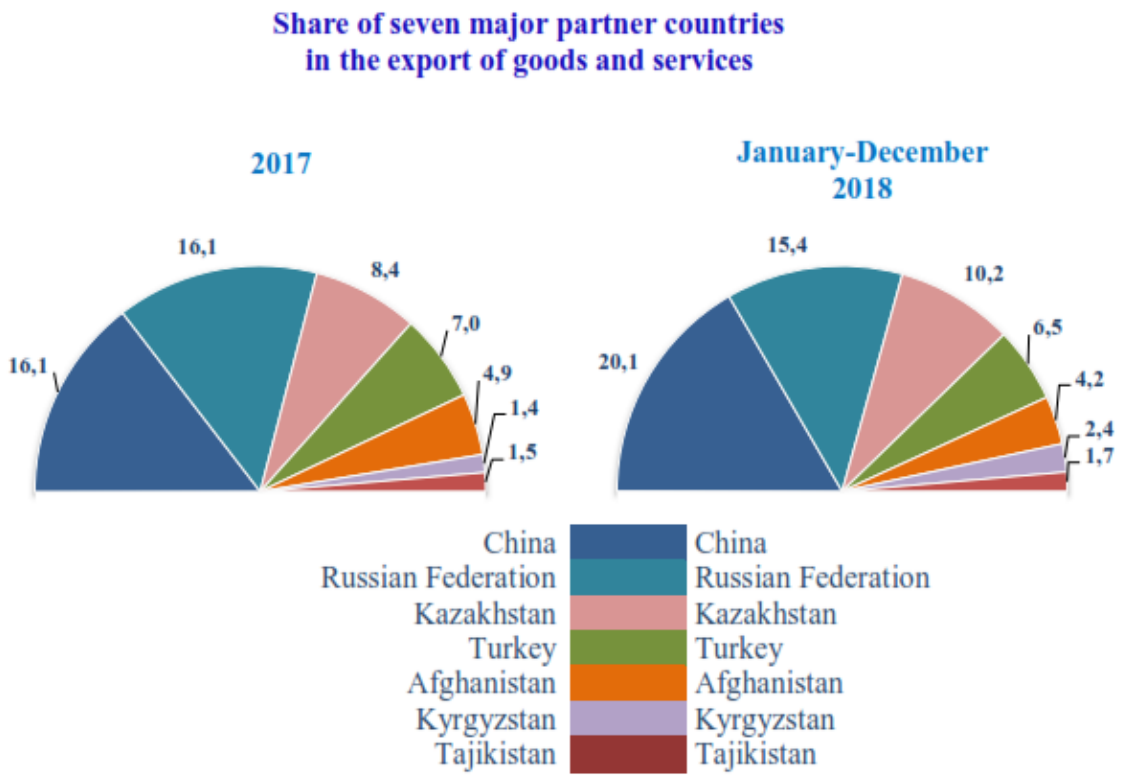

Fig. 1. Share of seven major partner countries in the export a goods and services

Literature review

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Methods of research.

The basis of theoretical development of the problem posed and the solution of problems are general scientific methods: systematic, system-functional, comparative, econometric and economic-statistical analyzes, as well as approaches involving the study of the problem at the micro- and macro level, the use of forecast and rating estimates

Analysis and results

In modern conditions, a new model of economic development of states is forming, the most important feature of which has been the activation of innovative processes. In this regard, the formation of the national

innovation system in Uzbekistan is a key task not only for the scientific and technical sphere, but also for increasing the competitiveness of the domestic economy.

As an element of the system of state regulation, the program of innovative development of the economy should have:

- clearly defined goals;
- management bodies and implementing functions capable of ensuring the achievement of the formulated goals;
- system that forms an information image of the regulatory object, sufficient for the implementation of management functions;
- regulation and support instruments, through which the government bodies influence the enterprises and the environment in the performance of their functions.

Effective use of the available scientific and technical potential is possible only with the help of a consistent and steadily carried out scientific and technical policy, corresponding to the real socio-economic conditions of the republic and aimed at addressing the pressing problems of its development. Innovative technological development requires very considerable financial resources and a certain time. In this respect, priorities are given to the accelerated development of those sectors of the economy where there are traditional advantages in international trade. These are labor-intensive and resource-intensive industries for the production and advanced processing of agricultural and mineral raw materials. The implementation of innovative development envisages a purposeful industrial policy applied to each individual industry. When solving the problem of the effectiveness of scientific and technical potential, the concentration of forces and resources in the direction of intensifying work in the development of highly effective scientific and technical products in all stages of the chain, from the generation of ideas, their prototype, to their introduction into production and to obtain a certain economic effect.

In order to further develop innovation as a priority area of the national economy, it is advisable to change economic policy in the direction of building up national competitive advantages on the main lines of formation of a new technological order and concentration of financial, information and intellectual resources available in the country.

The most effective form of foreign participation in the scientific and technical sphere is the creation of joint innovation structures, although it is advisable to use other forms of participation, for example, foreign loans and loans.

In our opinion, the strengthening of the innovative orientation of investment policy and its activation presuppose the solution of a number of urgent tasks, namely:

- improvement of innovative and motivational mechanisms for the implementation of scientific and technical programs with the full economic support of the activity of invention and innovation;
- the formation of a modern system "science-production", providing for a significant change in the structure of investment of its individual subsystems (research, design, development and testing of prototypes, their introduction and development in production);
- increase in the share of investments directed to the development of fundamental research in the field of foreign trade;
- the entry to the forefront of economic growth is possible only with the active interaction of investment and innovation complexes.

Based on these positions, the formation of investment and innovation markets, as well as the creation of mechanisms for their interaction, has now become a reality. The most important elements of the investment-innovative mechanism are the provision of resources for programs and projects, including material, technical, financial and personnel; transition to an innovative type of economy implies a change in its entire organization, as well as a qualitative improvement of the mechanism for managing scientific and technological development (Fig. 2.).

Studies have shown that one of the crucial conditions for stable innovative development for the future is the early identification of the need, development and creation of new technologies adapted to the predicted changes in sources of raw materials, energy, etc.

In practice, the degree of use of program-targeted methods for managing scientific and technological development is comparatively small because of the need to adapt known methods and models to the features of specific objects, as well as the creation of mandatory organizational-eq onomical conditions for the formation of a mechanism for managing scientific and technological development as an innovative form.

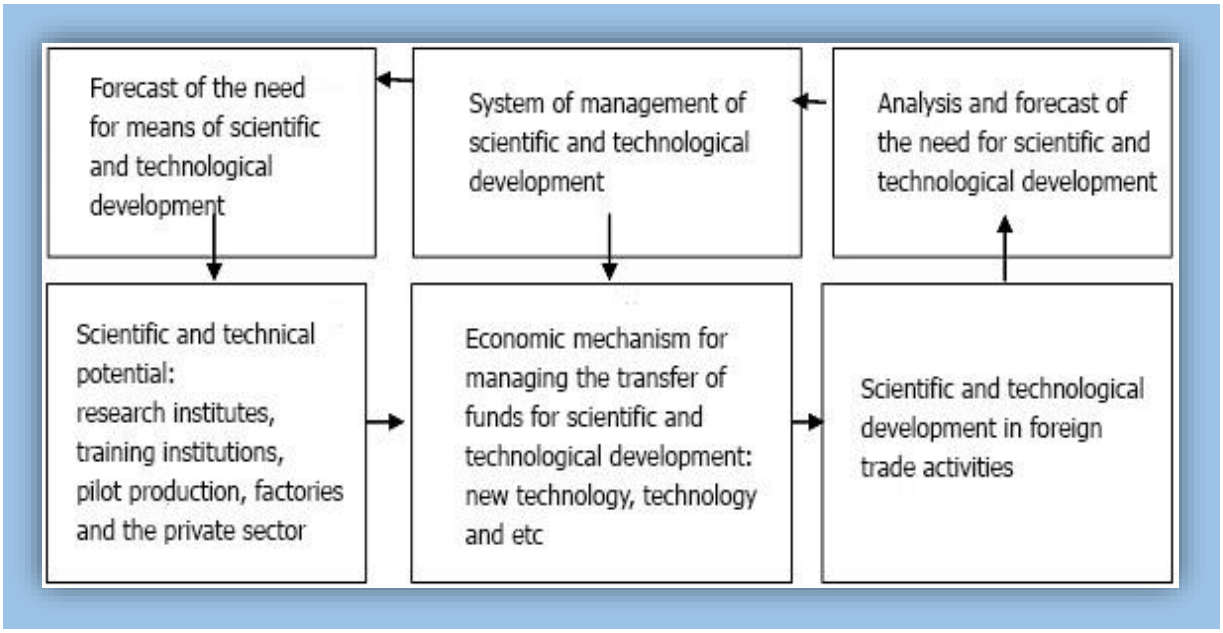

Fig. 2. Mechanism of management of scientific and technological development of FEA

Further improvement of ideas and tools of program-target management can become a basis for the formation of a new management mechanism. The formulation and practical solution of the long-term tasks of developing foreign economic activity on the basis of an innovative approach will ensure the achievement of effective results.

Discussion of research results

Improving the quality of the development of the strategy of scientific and technological development of foreign economic activity, based on the improvement of state innovation policy, significantly affects the economic performance of all industries that ensure a qualitative growth in exports of national products. Innovative policies oriented specifically on scientific and technological development will contribute to technological changes in all areas of foreign economic activity. In modern conditions, scientific research affects the progress of technology and the organization of production by improving the means of labor including technology, machinery, production facilities, etc. [17].

The most important areas of innovative development of foreign economic activity are:

- scientific and technological, since the progress of social production is a consequence of the progress of technology and technology in the aggregate of the means of labor created by people, and the progress of social production is a consequence of the progress of technology and technology in combination with the quality of the labor employed;
- development and liberalization of the economy aimed at further strengthening macroeconomic stability and maintaining high economic growth rates, increasing its competitiveness, modernizing and intensively developing agriculture, continuing institutional and structural reforms to reduce the state's presence in the economy, further strengthening the protection of rights and the priority role of private property, stimulating the development of small business and private entrepreneurship, an integrated and balanced social Economic and economic development of regions, regions and cities, the active attraction of foreign investment in the economy and regions of the country by improving the investment climate.

Conclusions and suggestions

An important mechanism for effective state innovation policy in foreign economic activity should be the selection, preparation and financing of the most important innovative projects of national importance. This will contribute to the adoption of effective managerial decisions, taking into account the priority areas for the development of science, technology and technology in the medium term [18].

The most important direction in the modern development of globalization is the formation of international innovation networks, joint scientific and technical creativity of different countries and their corporations in the interests not only of business, but also of the economic and scientific and technological development of the world economy [19]. In this regard, at present, the Republic faces the task of accelerating scientific and technological progress, shifting its industrial production to an innovative development path based on the software-based formation of an intellectual economy based on knowledge (knowledge-based economy), expanding scientific and technical ties and partnership with world scientific and technological leaders [20].

Given the continuing decentralization and liberalization of foreign trade activities, the previously

functioning mechanisms for its regulation (licensing, quoting, etc.) are becoming ineffective. At the same time, solving problems on optimizing the external economic complex and using its capabilities to accelerate the processes of reconstruction and development of the country's production potential requires strengthening coordination of the activities of the subjects of foreign economic activity on the basis of effective implementation of its priorities.

In order to modernize the foreign economic complex, it is necessary to adopt fundamental laws, for example, such as the Law on Innovations and Modernization of the Economy, the Law on Competition, etc. It seems to us that improving the management of the wind farm in Uzbekistan on an innovative basis will further deepen democratic market reforms and liberalization of the economy.

References:

1. (2017). Strategy of actions on five priority directions of development of the Republic of Uzbekistan in 2017-2021. Decree of the President of the Republic of Uzbekistan of February 7, 2017 № DP-4947. *Collected Legislation of the Republic of Uzbekistan, 2017, № 6.*
2. Mirziyoyev, S. M. (2017, December 23). *Message of the President of the Republic of Uzbekistan to the Oliy Majlis.* Narodnoye slovo.
3. (2019). *Social and economic situation of the Republic of Uzbekistan in 2018*. Tashkent.
4. Alle, M. (2003). *Globalization: the destruction of employment and economic growth.* Empirical Evidence. Moscow, Russia.
5. Keynes, J. M. (2018). *The General Theory of the Rate of Interest.* In The General Theory of Employment, Interest, and Money (pp.145-153).
6. Krugman, P., Obstfeld, M., & Melitz, M. (2017). *International Economics: Theory and Policy, the latest edition*. Addison-Wesley.
7. Marshall, A. (2009). *Principles of economics: unabridged eighth edition*. Cosimo, Inc.
8. Vakhobov, A.V.(2015). *World Economy and International Economic Relations*. T.: SHARK.
9. Rasulev, A., Pavlov, K., & Asadullina, N. (2013). Spetsifika sovremennogo etapa razvitiya mirovoy ekonomiki. Stabil'nost' i perspektivy ekonomiki Uzbekistana. *Obshchestvo i ekonomika*, (4), 37-60.
10. Trostyanskiy, D., & Rasulev, A. (2007). Institutsional'nyye preobrazovaniya na etape modernizatsii ekonomiki Uzbekistana. *Vestnik Instituta ekonomiki RAN*, (1).
11. Khodiev, B. Y. (2000). Export-oriented development of the economy of the Republic of Uzbekistan. *Russian Entrepreneurship. №. 6*.
12. Balassa, B. (1985). Exports, policy choices, and economic growth in developing countries after the 1973 oil shock. *Journal of development economics*, *18*(1), 23-35.
13. Bhagwati, J. (1998). The capital myth: the difference between trade in widgets and dollars. *Foreign Affairs*, 7-12.
14. Jones, R. W., & Kierzkowski, H. (2018). The role of services in production and international trade: A theoretical framework. *World Scientific Book Chapters*, 233-253.
15. Samuelson, P. A. (1948). International trade and the equalisation of factor prices. *The Economic Journal*, *58*(230), 163-184.
16. Stiglitz, J. E. (2002). *Towards a new paradigm for development: strategies, policies and processes.*
17. Kurpayanidi, K. I, & Abdullaev, A. M. (2018). Activation of FER on the basis of innovative development. Monograph. *Germany, Lap Lambert Academic Publishing*, 160.
18. Melnikas, B. (2008). The knowledge-based economy in the European Union: Innovations, networking and transformation strategies. *Transformations in Business & Economics*, *7*.
19. Malhotra, Y. (2002). Knowledge assets in the global economy: assessment of national intellectual capital. In *Intelligent Support Systems: Knowledge Management* (pp. 22-42). IGI Global.
20. Margianti, E. S., Ikramov, M. A., Abdullaev, A. M., Kurpayanidi, K. I., & Ashurov, M. S. (2014). *Systematical analysis of the position and further development of Uzbekistan national industry in the case of economic modernization. Monograph.* Indonesia, Jakarta, Gunadarma Publisher.

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SECTION 31. Economic research, finance, innovation, risk management.

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DEVELOPMENT OF THE BANKING SYSTEM OF KAZAKHSTAN

Abstract: *The article discusses the development and implementation of innovative banking services, the target function of managing bank liquidity, which is to maximize profits while complying with the economic standards set and determined by the bank itself.*

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Introduction

One of the most important financial and economic tasks in Kazakhstan is the creation and maintenance of stable, flexible and efficient banking infrastructure. In addition to purely economic difficulties added social: constantly changing the legal framework; rampant crime in the country, as a result-the desire of mafia structures to take over such a high-income in terms of inflation, as banking; the desire of most bankers to get a momentary profit, as a result - the development of only one area of activity, which leads to threats of bankruptcy of individual banks and the crisis of the banking system as a whole.It is not enough just to announce the creation of new credit institutions it is necessary to study the peculiarities of foreign practice to restore the lost rational principles of functioning of credit institutions adopted in the civilized world and based on the centuries-old experience of market financial structures.

Materials and Methods

Today's Kazakhstan's economy crisis processes significantly complicate the situation in the banking sector of Kazakhstan. There is a reduction in the possibility of obtaining reliable profits as a result of serious financial difficulties of banking partners and customers, the crisis of non-payments complicates the situation of banks, and the least stable of them lead to bankruptcy.The credibility of financial institutions is undermined by the fraud of the population. It should also be noted that inflation surges, forecasts of instability growth, weak predictability of state economic policy increase the risk not only of production investments but also of any long-term processes.

But at the same time, the largest banks accumulate a certain potential for financing projects in priority sectors, the creation of strategic financial and industrial alliances as "locomotives" of the Kazakh economy, it should be noted the increased interest of large banks to invest in economically necessary or original and competitive at the world level of production.

The strategic directions of development of the banking sector of Kazakhstan were the expansion of the network of branches throughout the country, the establishment of relations with banking institutions abroad, the desire to enter the financial markets of Asia. The dynamism of changes in the banking sector is growing, due to the instability of the credit market, the strengthening of interbank competition, stratification among banking institutions.

Ultimately, banking affects the expectations, feelings and plans of specific people. Banks seeking to survive in today's competition should strive to ensure that the aspirations of its customers become a reality. The main objective of the components of the basis on which the funds of shareholders and

customers are saved and multiplied is the reliability of the Bank.

The mechanism of improvement of the banking system of Kazakhstan begins to function, and only if it will take the whole society: the bankers, the state, and the press, and the population - we will get fast and positive results.

The development of banks and commodity production and circulation has historically been parallel and closely intertwined. At the same time, banks, conducting monetary settlements, lending to the economy, acting as intermediaries in the redistribution of capital, significantly increase the overall efficiency of production, contribute to the growth of productivity of public labour.

Under the conditions of developed commodity and financial markets, the structure of the banking system is becoming increasingly complex. There are new types of financial institutions, new credit instruments and methods of customer service.

Banks are looking for the most optimal forms of the credit system, an effective mechanism in the capital market, new methods of servicing commercial structures. Banks ensure the life of the economy while remaining out of sight of the masses. But do not forget about their problems and needs that need to be addressed and provided. Changing the activities of banks will create favourable conditions for the development and operation of the banking system - a necessary component for the effective operation of market mechanisms.

A special place in the development of the banking system of Kazakhstan is given to the Halyk Bank, its development strategy. Strengthening its position as" the best provider of financial services in the market of consumer and corporate banking in Kazakhstan " is the main task of Halyk Bank. This determines the fact that the Bank needs to fulfil its obligations to the public sector, serving a large number of the population of Kazakhstan, putting commercial goals on a par with its privatization program. The Bank's ability to maintain this balance sheet is crucial to its success.

In order to adapt to the growing needs of customers and the external environment, with the development of banking activities in Kazakhstan, banks faced the task of diversifying the portfolio of banking services through the introduction of innovative banking services. Innovative lever through which banks are moving in difficult market conditions to the planned strategic boundaries is the use of innovative banking services is considered by them as.

The development and implementation of innovative banking services in Kazakhstan require high costs for banks to implement changes, all this is determined by the following factors:

- increased competition between banking institutions;
- the continuous movement of entrepreneurial thought;
- Kazakhstan's accession to the WTO;
- integration into the EurAsEC;
- integration of the banking system into the European Union;
- tightening regulation of second-tier banks;
- increasing the size of domestic banks;
- risk diversification based on the correlation between cash flows from innovative banking services and the movement of existing banking services;
- cooperation of Kazakh banks with the world's largest banks;
- penetration of foreign banks in the Kazakh banking market;
- development of information and other technologies.

The situation today in the banking sector of Kazakhstan is quite twofold. If we look at the statistics for the last years, we can note the growth of all indicators in a positive direction. Despite this, our banking system and each Bank individually are not yet ready for the upcoming changes in the near future. We can also note the accession of Kazakhstan to the WTO, the transition from Basel-2 to Basel 3, the increasing integration of our country, the economy and the banking system in the global economic architecture in the context of globalization.

It is possible to present the following recommendations contributing to increasing the liquidity and solvency of the Bank, which was at the limit of its liquidity, and this is possible due to errors in his policy, underestimation of the market, shortcomings in the analytical work and other reasons, and who is forced to resort to urgent measures.

First, a Bank with an unstable situation can be advised to improve the organizational structure of the Bank, that is, to pay attention to the development of management, in particular, to create, for example, an internal audit service, which would reduce abuse within the Bank.

Secondly, the Bank needs to assess the liquidity of the balance sheet by calculating liquidity ratios. In the process of analysis of the balance sheet on liquidity may be identified deviations in the direction of both reducing the minimum allowable values and their significant excess. In the first case, banks need to bring liquidity indicators in line with regulatory values within a month. This is possible due to the reduction primarily of interbank loans, accounts payable and other types of attracted resources, as well as by increasing the Bank's own funds. however, it should be borne in mind that raising additional capital in the form of issuing new shares will cause a reduction in dividends and disapproval of shareholders.

On the other hand, for the Bank, like any other enterprise, the General basis of liquidity is ensuring the profitability of production activities (operations).

Thus, if the actual value of the main regulatory liquidity ratio is much greater than the minimum allowed, the activities of such a Bank will be negatively assessed by its shareholders, in terms of unused opportunities for profit.In this regard, it should be noted that the analysis of the balance sheet liquidity should be carried out simultaneously with the analysis of the Bank's profitability. the experience of banks shows that banks receive more profit when they operate on the verge of the minimum acceptable values of liquidity ratios, i.e. fully use the rights to raise funds as credit resources.

At the same time, the peculiarities of its work as an institution based on the use of clients' funds dictate the need to apply liquidity indicators. Maximum liquidity is achieved by maximizing cash balances and correspondent accounts in relation to other assets. But in this case, the Bank's profit is minimal. Profit maximization does not require the storage of funds, but their use for loans and investments. Because of this, you should minimize the cash on hand and balances on correspondent accounts to a minimum, profit maximization threatens the continuity of the Bank fulfilling its obligations to clients.

Therefore, the essence of Bank liquidity management is a flexible combination of opposite liquidity and profitability requirements. The objective function of the Bank's liquidity management is to maximize profits, subject to mandatory compliance with the economic standards established and determined by the Bank itself.

Third, the Bank should determine the need for liquidity at least for the short term. As already noted, this need can be predicted in two ways. one involves an analysis of the credit needs and expected level of deposits of each of the leading clients, and the other involves forecasting the volume of loans and deposits. both methods have a drawback: they are based on the average, not the maximum level of liquidity. This may be sufficient to assess the liquidity of the banking system as a whole, but it will not tell the management of the individual Bank what its cash flow should be next week to cover the withdrawal of deposits and loan applications. Only an analysis of the accounts of individual customers of the Bank will allow it to determine the cash needs at the moment.

The preliminary study of economic and financial conditions in the local market, the specifics of the clientele, opportunities to enter new markets, as well as the prospects for the development of banking services, including the opening of the Bank, will also help to solve this problem new types of accounts, conducting transactions by the trust, leasing, factoring, etc. And, in addition to local factors must also be considered and nationwide. For example, changes in monetary policy, legislation, etc..

The study of all this, as well as forecasting, will help the Bank to more accurately determine the necessary share of liquid funds in the Bank's asset. At the same time, the Bank should rely on its experience.

Based on the predicted value of the required liquid funds, the Bank needs to form a liquid reserve for the performance of unforeseen obligations, the appearance of which may be caused by changes in the state of the money market, the financial position of the client or the partner Bank.

Fourth, maintaining liquidity at the required level is carried out by means of a certain policy of the Bank in the field of passive and active operations, developed taking into account the specific conditions of the money market and the characteristics of the operations. That is, the Bank should develop a competent policy for managing active and passive operations.

In this case, in asset management, the bank should pay attention to the following issues:

1. Cash management should be more efficient, there is no need to plan for cash income and cash flow, as well as to develop payment schedules.

2. Periods to which the bank allocates funds must meet the requirements of the resources attracted. We do not allow the excess of cash in the accounts of the asset over cash in the liabilities accounts.

To focus on increasing the profitability of work for the efficiency and in the range of individual operations in particular. So in the management of credit portfolio, it is essential to:

- to refer to the placement of credit properties according to the degree of their risk, to provide for the return of loans, to pay off loans. The credit properties of the bank should be classified according to a number of criteria (level of credit, customer satisfaction, loan reimbursement, loan insurance, etc.). For each group of loans, in the total amount of bank credit ratings and its change serve as a basis for improving the level of the liquidity ratio, show the potential of the previous credit policy of the bank or lack of credit or loss. Grouping of the loans by borrowers is realized with the help of the computer system, which allows controlling the liquidity coefficient level daily and controls to analyse possibilities of the future large loans by the bank independently or by attending in banking consortium.

- analyze the placement of loans in terms of osnoe database. In particular, a method has been developed for analyzing the repayment and presentation of a loan to individual customers and types of loans (a credit card and a credit card) in the next 30 days;

Such an analysis can be done daily, as well as taking into account the data of credit agents who are at the stage of development. The results of the analysis can be used by banks for the efficient solution of the decision to purchase or sell resources. Such an analysis reveals the deep, hidden processes, reveals the trends that occur in the presence of unchanged abilities in the region can cause a fall in the level of

liquidity and solvency of the bank and can give warning to these consequences by putting the key.

- more carefully study the credit borrower;
- to limit the size of the loan, we represent a single borrower with a part of own funds;
- issue loans to a larger number of clients when storing the total

the volume of credit;

- Increase the return of credit, in that way, at the expense of more reliable support;
- take measures to recover outstanding loans and accrued interest for borrowing;

To apply the methods of analysis of the group of settlement accounts in the client and the intensity of the payment account to the bank's corporate account. The results of the analysis also serve as the basis for a reasoned regrouping of assets in the bank's balance sheet.

Change the structure of assets, i.e. increase the number of liquid assets due to the debt repayment, clearing the balance by allocating separate types of activity for the independent balance, increasing own funds, borrowing money from other banks, etc.

Work to reduce the risk of operations. In this case, it is not necessary to remember that urgent measures taken by credit institutions to maintain their liquidity and solvency, as a rule, are connected with the growth of bank expenses and the reduction of their profits. Managing the risks of imbalance of balance and insolvency of the bank reduces the potential losses of the bank, creates a strong basis for their future activities. The risk management system for the imbalance of the balance sheet and the non-payment of the bank is oriented towards the requirements of the national bank of the country to observe the established liquidity and solvency of banks. To recognize the risks of imbalance in the liquidity of the balance sheet and non-payment of the bank, it is necessary to create a special system of daily accounting for the above liquidity indicators, analysis of the factors affecting their change. For this purpose, it is advisable to create a database, which will efficiently generate all the required information to perform analytical work, the Bank's license will be generated on the basis of this information.

As a source of information database creation, we consider credit and deposit contracts, loan contracts from other banks, information on the need of loans, payments terms, a daily summary of the balance of accounts, daily entry of balance of personal accounts, information of off-balance accounts, loss of credit, and etc.

In liabilities management, a bank should be advised:

Apply a method of analyzing the placement of passives in their terms, who is responsible for managing the obligations of the bank, optimizing and changing their structure depending on the level of liquidity ratios, making the weighted policy in the area of accumulation of funds, but not adjusting the funds.

Follow up on the equity of capital attracted.

Analyze the deposit base of the bank:

Pay attention to the structure of deposits: short-term and savings deposits are more stable than deposits before demand;

Determine a strategy for maintaining the viability of a deposit. A part of this strategy is marketing - improving the quality of customer service so that they would remain loyal to the bank and during times of crisis. The increase in the savings deposits, their average amount also mitigates the deposit losses during times of crisis.

It is not only stability that is considered, but also the source of deposits, that is, deposits of individuals are more reliable than deposits of legal entities, due to differences in the number of contributions.

Bring credit resources accounting accordingly;

Assess the reliability of deposits and loans made by other credit institutions.

To stop the obligations of enforcing when regrouping passives in order to justify them.

In general, to recognize the risks of unbalancing liquidity of balance non-insolvency of the bank requires the creation of a special system of daily control for the level of indicators given in the first and second chapters, analysis of the factors affecting their change. For this purpose, it is advisable to create a database, which will efficiently generate all the necessary information to perform analytical work, the Bank's license will be generated on the basis of this information. For the purposes of the database, the prisoners will be in charge of the settlement of the loans. balance accounts, information about reversing loans, etc.

On the basis of the daily database of banks, the values of indicators of solvency and liquidity should be disclosed and an analysis of the prospects for the development of bank operations taking into account solvency and liquidity should be analyzed. This calls for interconnecting the decision to place funds, attract resources, raise funds for the bank’s funds, increase the bank’s participation in other enterprises and banks, draw up sources of investment funds and develop new bank operations with demands for funds from the bank’s investment funds and develop new bank operations with demands for funds. Reviewing the analysis gives the possibility to foresee various changes in the level of liquidity and solvency of the bank and to take urgent measures to stabilize them.

In international practice, managers of bank liquidity management have developed a number of practical recommendations for improving this type of business. The first of these is done in that the liquidity management managers should cite the activities of all the bank branches that are responsible for using and attracting funds, and coordinate their activities with the activities of these banks.

The second recommendation is that liquidity management managers should foresee the largest depositors and users of the bank who plan to withdraw funds from the bank or increase deposits. This directors and managers plan their actions in case of a shortage or surplus of liquidity.

In accordance with the third recommendation, liquidity management managers in cooperation with the seniors and managers of departments mustensure that the priorities and objectives of liquidity management are obvious. In recent years, when placing funds, the liquidity of the bank often had a higher priority. Today, the liquidity management in the General Assembly of the mechanism in comparison with the bank's priority number 1 - the presentation of loans to all categories of clients. The bank has to submit any successful loans, setting the task of the liquidity manager to raise sufficient cash to secure loans.

Conclusion

The essence of the fourth recommendation is as follows: the suitability of a bank in liquid funds and the decision to “thoroughly” place them should be analyzed in order to avoid both surplus and shortage of liquid funds. Excessive liquidity, which is not reinvested on the same day, leads to the benefits of the bank, while their deficit must be quickly eliminated in order to avoid the unpleasant consequences of unsuccessful loans or delivery of assets that also lead to funds.

Thus, each bank must self-sustainingly ensure the maintenance of its liquidity at a given level on the basis of an analysis of its composition, emerging at specific periods of time, and the prediction of the results of activities and implementations in the next scientific basis of advanced research in the field of charter capital, funds of special purpose of reserves, attraction of borrowed funds of foreign organizations, the implementation of active credit operations.

References:

1. (2008). *Banking: strategic leadership*. ed. V. Platonov and M. Higgins (Eds.). Moscow: Consoltbanker.
2. (2012). *Bank management*: a textbook. ed. E.F. Zhukov (Eds.). (p.319). Unity-Dana.
3. (2010). *Banking* /ed. Beloglazova G.N. and Krolivetskoy L.P.(Eds). Moscow: Finance statistics
4. (2009). *The international financial market* / Ed. V.A. Slepova, E.A. Ping (Eds.). (p.34). Moscow: Master.
5. (2012). *Banks, non-bank credit organizations and their operations: a textbook*. / ed. E.F.Zhukova, N.D. Eriashvili (Eds.). (p.559). Unity-Dana.
6. Kovzanadze, I. (2000). Kentrul for the activity of the commercial banks and their liquidity. *Finance, N 10*, 70-71.
7. Solovyeva, S. (2010). Banking system: backstop or a stimulus for the growth of the economy? *Finance, N 11*, 26-28.
8. Kolesnikov, V. I. (2000). *Bankovskoe delo*. Moscow: Finansy i statistika.
9. Lavrushin, O. N. (2000). *Bankovskoe delo*. Moscow: Finansy i statistika.
10. Zhukova, E. F. (1997). *Banki i bankovskie operatsii*. Moscow: Banki i birz.

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SECTION 4. Computer science, computer engineering and automation.

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ARTIFICIAL NEURAL NETWORK FEATURES

Abstract: *The article describes how the theory of artificial neural networks is rapidly developing, which has worked well in the field of management, where the use of human intelligence is essential.*

Key words: *neural networks, artificial intelligence, information systems.*

Language: *English*

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Introduction

Time - this is one of the most interesting concepts that interest people since Ancient times. Mankind has always sought to understand and subjugate time because knowledge of the future gives unprecedented power of decision-making in various fields of human activity. The question of determining the future was and remains relevant today. Of great interest are the problems of weather forecasting based on the results of appropriate atmospheric measurements, selection of new species of plants and animals, determining the capabilities of individuals in certain areas with the help of an appropriate system of control tests, etc. Particular importance is forecasting in such areas as industry, Economics, Commerce (forecasting economic indicators, price dynamics for a particular product, the rate of shares for some time ahead, etc.).

However, to create a time machine man cannot, we know that it was in the past, but it is precisely to assert the state of things in the future is not given to any of us. Despite this, people have always sought to predict the future, using a variety of ways: in the common people for a long time popular folk signs, mathematicians use more formal methods and methods of forecasting, they use statistical and probabilistic characteristics, which is possible with a certain probability to say that the future event will happen or not.

Along with the traditional methods of forecasting, the theory of artificial neural networks is rapidly developing, which has proven itself in the field of management, where it is necessary to use human intelligence, in particular in solving forecasting problems. This scientific direction was born at the junction of such Sciences as neurobiology, chemistry, physics, mathematics, computer science, philosophy, psychology, etc. Interest in neural networks was caused by both theoretical and applied achievements in this field. Neural networks have suddenly opened up the possibility of using computing in areas previously related only to the field of human intelligence, the possibility of creating machines, the ability to learn and remember in an amazing way reminiscent of human thought processes.

Materials and Methods

Artificial neural networks consist of elements, the functionality of which is similar to most of the elementary functions of a biological neuron. These elements are then organized in a way that may or may not correspond to the anatomy of the brain. Despite this superficial similarity, artificial neural networks exhibit a surprising number of properties inherent in the brain. For example, they are trained on the basis of experience, generalize previous precedents to new cases and extract essential properties from the incoming information containing unnecessary data.

Despite this functional similarity, even their most optimistic defender will not assume that in the near future artificial neural networks will duplicate the functions of the human brain. The real "intelligence"

demonstrated by the most complex neural networks is below the level of the earthworm, and enthusiasm should be moderate in line with modern realities. However, it would also be wrong to ignore the surprising similarities in the functioning of some neural networks with the human brain. These capabilities, however limited today, suggest that a deep penetration into human intelligence, as well as a host of revolutionary applications, may be just around the corner.

Artificial neural networks can change their behaviour depending on the external environment. This factor is more responsible than any other for the interest they generate. After the input signals are presented (possibly together with the required outputs), they are self-tuned to provide the required response. Many training algorithms have been developed, each with its own strengths and weaknesses. There are still problems as to what the neural network can learn and how the training should be conducted.

The network response after training can be somewhat insensitive to small changes in the input signals. This inherent ability to see an image through noise and distortion is vital for pattern recognition in the real world. It overcomes the strict precision required of an ordinary computer and opens the way to a system that can deal with the imperfect world in which we live. It is important to note that an artificial neural network makes generalizations automatically due to its structure, rather than through the use of "human intelligence" in the form of specially written computer programs.

Some of the artificial neural networks have the ability to extract the essence from the input signals. For example, a network can be trained on a sequence of distorted versions of the letter "A". After appropriate training, the presentation of such a distorted example will lead to the fact that the network will generate a letter of perfect form. In a way, she'll learn to produce something she's never seen. This ability to extract the ideal from imperfect inputs raises interesting philosophical questions. It resembles the concept of ideas put forward by Plato in his "Republic". Anyway, the ability to extract perfect prototypes is a very valuable quality in humans. Artificial neural networks are not a panacea. They are obviously not suitable for tasks such as payroll. It seems, however, that they will be preferred in a large class of problems of pattern recognition, forecasting, the creation of associative memory, Economics, management of objects that are poorly or not cope with conventional computers.

Climate change on Earth may not only be gradual. A catastrophic shift is also possible, which will require emergency, including military, response measures. This is the main conclusion of the report "The Weather Report: 2010-2020", prepared by professional futurists commissioned by the US Department of Defense. According to experts, global climate change can completely destabilize the political situation on the planet. Among the" plausible " scenarios are the famine in Europe and the rivalry of nuclear powers over scarce water resources. In their forecasts, the authors-Peter Schwartz and Douglas Randall-proceed from the possibility that as a result of natural changes in completely different laws will suddenly live the world ocean. Europe, Asia and North America than lose the usual heat. And in the southern hemisphere, on the contrary, will become hotter. According to scientists, the Earth has already experienced something similar 8200 years ago. Mankind is known, in particular, very recent historical phenomenon - a Small glaciation. It lasted from about 1300 to 1850. Because of the deteriorating weather conditions, Europeans had to leave Greenland, the Viking civilization faded.Only with 1315g. by 1319, the famine had wiped out tens of thousands of people, the report says. But then humanity was much smaller. Despite the huge increase in scientific and technical weapons, man is now extremely vulnerable to the forces of nature. The world's population is enormous, with a large proportion living in poverty, as well as in areas that are "at risk" from a natural point of view. In the event of a catastrophic climate change, food, water, and strategic minerals (not least oil) are the main threats. All this creates the ground for wars. The proliferation of nuclear weapons also appears to be" inevitable".

Artificial neural network (-s) - a mathematical model, as well as its software or hardware implementation, built on the principle of the functioning of biological neural networks—networks of nerve cells of a living organism. This concept arose in the study of processes occurring in the brain, and in an attempt to simulate these processes. After the development of training algorithms, the obtained models were used for practical purposes: in forecasting problems, for pattern recognition, control problems, etc.

Ins is a system of connected and interacting simple processors (artificial neurons). Such processors are usually quite simple (especially compared to the processors used in personal computers). Each processor on such a network deals only with the signals it periodically receives and the signals it periodically sends to other processors. And, nevertheless, being connected to a sufficiently large network with controlled interaction, such separately simple processors together are able to perform quite complex tasks.

Neural networks are not programmed in the usual sense of the word, they are trained. The possibility of learning is one of the main advantages of neural networks over traditional algorithms. Technically, the training is to find the coefficients of connections between neurons. In the learning process, the neural network is able to identify complex

relationships between input and output data, as well as perform generalization. This means that if the training is successful, the network will be able to return the correct result based on the data that was not in the training sample, as well as incomplete or "noisy", partially distorted data.

During the learning process, the network views the training sample in a specific order. The order can be sequential, random, etc. Some network studying without a teacher looking at a sample only once. Other networks that study with the teacher view the sample multiple times, with one full pass through the sample called the learning age. When training with a teacher, the set of initial data is divided into two parts — the actual training sample and test data; the principle of separation can be arbitrary. The training data is fed to the network for training, and the test data is used to calculate the network error (the test data is never used to train the network). Thus, if the error on the test data is reduced, then the network does perform a generalization. If the error on the training data continues to decrease and the error on the test data increases, then the network has stopped generalizing and simply "remembers" the training data. This phenomenon is called network retraining or overfitting. In such cases, training is usually discontinued. In the process of learning can manifest other problems, such as paralysis or the ingress of the network into a local minimum of surface errors. It is impossible to predict in advance the manifestation of a problem, as well as to give clear recommendations for their resolution.

All of the above applies only to iterative algorithms for finding neural network solutions. For them, really nothing can be guaranteed and it is impossible to fully automate the training of neural networks. However, along with iterative learning algorithms, there are non-iterative algorithms that have very high stability and allow to fully automate the learning process.

Even in the case of successful, at first glance, a learning network is not always taught exactly what it wanted from the Creator.

Testing the quality of neural network training should be carried out on examples that did not participate in its training. At the same time, the number of test cases should be higher, the higher the quality of training. If neural network errors have a probability close to one billion,then a billion test cases are needed to confirm this probability. It turns out that testing well-trained neural networks becomes a very difficult task.

There are two directions of Artificial Intelligence (AI) development:

The decision of the problems connected with the approach of specialized AI systems to

human capabilities, and their integration, which is realized by human nature. Creating an artificial intelligence that represents the integration of already created

AI systems into a single system capable of solving the problems of mankind (*see:* Strong and weak artificial intelligence).

But at the moment in the field of artificial intelligence, there is the involvement of many subject areas that have more practical relation to AI, rather than fundamental. Many approaches have been tried, but no research team has yet approached the emergence of artificial intelligence.

An artificial neuron simulates in the first approximation the properties of a biological neuron. At the input of an artificial neuron receives a set of signals, each of which is the output of another neuron. Each input is multiplied by a corresponding weight, similar to the SYNOPTIC force, and all products are summed, determining the level of activation of the neuron. For rice.1 a model implementing this idea is presented.

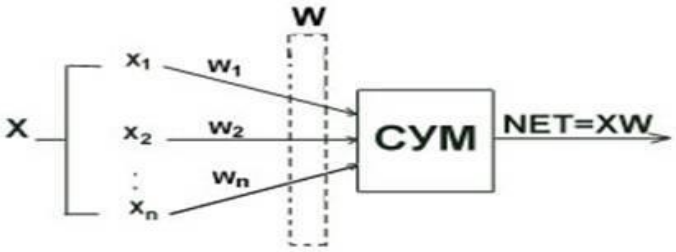

Figure 1. Artificial Neuron

Conclusion

Although network paradigms are very diverse, almost all of them are based on this configuration. There are many inputs denoted by x1, x2, x3 .xn, is fed to the artificial neuron. These input signals, collectively denoted by the vector X, correspond to signals coming into the synapses of a biological neuron. Each signal is multiplied by the corresponding weight w1, w2, w3 .wn, and is supplied to the summing unit, indicated SUM. Each weight corresponds to the "strength" of a single biological

synaptic connection. (The set of weights is collectively denoted by the vector W). The summing block corresponding to the body of the biological element adds the weighted inputs algebraically, creating an output.

The development of neural networks has caused a lot of enthusiasm and criticism. Some comparative studies have been optimistic, others pessimistic. For many tasks, such as pattern recognition, dominant approaches have not yet been developed. It is necessary to try to understand the possibilities, prerequisites and scope of different approaches and to make maximum use of their additional advantages for the further development of intelligent systems.

References:

1. Akhmetov, B. S. (2015). *Neural Networks*: Laboratory Workshop: Tutorial. (p.152). Almaty: KazNTU. ISBN 978-601-239-387-3. www.neuropro.ru/neu4.shtml
2. Kourouz, D. (2016). *Computer networks*. Downward approach: a tutorial. (p.912). Moscow: ed. "E". ISBN 978-5-699-78090-7
3. Crows, J. (2016). *Computer Networks*. - 6th ed. (p.912). Moscow: Publishing house E.
4. Kogay, G. D., & Ten, G. D. (2018). *Computer networks: Electronic textbook.* Karaganda: KSTU.
5. Battiti, R. (1992). First and second order methods for learning: Between steepest descent and Newton's method. *Neural Computation, vol. 4, no. 2*, pp. 141-166.
6. Caudill, M. (1989). *Neural Networks Primer*, San Francisco, CA: Miller Freeman Publications.
7. Caudill, M., & Butler, C. (1992). *Understanding Neural Networks: Computer Explorations, Vols. 1 and 2*, Cambridge, MA: the MΓT Press.
8. Charalambous, C. (1992). Conjugate gradient algorithm for efficient training of artificial neural networks. *IEEE Proceedings, vol. 139, no. 3*, pp. 301-310.
9. Chen, S., Cowan, C. F. N., & Grant, P. M. (1991). Orthogonal least squares learning algorithm for radial basis function networks. *IEEE Transactions on Neural Networks, vol. 2, no. 2*, pp. 302-309.
10. Elman, J. L. (1990). Finding structure in time. *Cognitive Science, vol. 14*, pp. 179-211.

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SECTION 4. Computer science, computer engineering and automation.

QR – Issue QR – Article

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METHODS AND MEANS OF INFORMATION NETWORK PROTECTION

Abstract: *The article discusses the choice of the optimal network protection option that would be convenient, did not create great difficulties in using the network and at the same time guaranteed a decent level of information privacy protection.*

Key words: *Information security, network, information, information security system.*

Language: *English*

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Introduction

Initially, the development of the problem of protecting the privacy of the network arose due to the fact that the owner of the information for their own reasons did not want to share it. And with the development of NTP and NTR, there was an increase in the scale of human activity, as a result of which a new characteristic distinction from simple knowledge - "price" - appeared. A person who possesses information can produce all sorts of manipulations with it, but the final result will still be getting a certain benefit (material, military, political, etc.), it all depends on what goals the owner of a limited resource has.

Information technologies are rapidly developing in the 21st century, more and more taking root in our everyday life, and life without them is already unimaginable. Information technologies have penetrated into all spheres of activity: education, economics, politics, manufacturing, so-called service services have appeared, which markedly facilitated the exchange of information between different business units. Information at the present stage is not just an expensive, exclusive resource, but also a stream of certain information about the strategic nature of a particular entity, the disclosure of which causes irreparable damage and may lead to bankruptcy. For example, losses due to the recovery of information, losses due to interruptions of production, losses due to the loss of most significant customers.

Materials and Methods

Information technology, being a military development of the NATO, significantly simplified such processes as production, distribution, exchange and consumption, which contributed to accelerating the product life cycle and maximizing profits. Actually, such a "tidbit" as information about the data of a successful company cannot remain unnoticed for a long time by attackers who carry out various types of attacks in order to gain access to confidential information. In this connection, the problem of information security becomes more acute. After all, it was not without reason that Mayer Rothschild said the phrase, which became winged: "Who owns the information, he owns the world."

Using the latest methods and means of information network protection, it is impossible to achieve absolutely perfect network security and, moreover, network security increase leads to inconveniences in its use, restrictions and difficulties

for users. Moreover, it is necessary to choose the best option to protect the network, which would be convenient, did not create great difficulties in using the network and at the same time guaranteed a decent level of information privacy protection.

The relevance of the topic of this work is to properly ensure the security of information in the network - this is one of the fundamental components of its optimally stable operation. Maintaining of which requires the performance of controlling functions, timely modernization of outdated anti-virus databases and the use of innovative methods and means of such information protection. Therefore, as long as there are threats to the security of information in networks, questions of methods and means of protection will remain relevant.

The Information Security System (ISS) is a multifaceted, multilateral set of tools, methods and measures to protect information. When considering the structure of an ISS, a traditional approach is possible that would single out the subsystems providing it.

In the information security system, the target functions have specific types of their own software and other software, with which the system will perform protective functions. Next, we consider in more detail the types of such software. It is impossible to talk about security guarantees without a legal framework, which is a set of regulatory and by-laws, regulations, job descriptions, manuals, the requirements of which are mandatory.

Organizational support is of paramount importance, as it usually implies the implementation of information security with the help of specialized structural units (for example, security, security service, etc.)

Information support contains the parameters, information, indicators and basic data for solving problems that ensure the functioning of the ISS. Hardware is a complex tooling system with technical means for the functioning of an effective security system.

Of course, the ISS has the necessary software. This refers to various accounting, statistical and information programs that can provide an objective assessment of the presence of dangerous channels of leakage and identify ways of unauthorized access to confidential data.

In addition, the ISS also has its foundational basis on mathematical software, which contains mathematical methods used in calculating the risk assessment of technical means that intruders have to calculate the norms of sufficient protection.

And finally, the regulatory and methodological support has the norms and regulations of the activities of the services, bodies and means, which are various methods of ensuring information security. It should be noted that of all protective measures in the present, the main role is played by organizational measures. So, the question arises about the organization of security services.

Let us turn to specific methods and means of ensuring the security of information.

The fundamental and paramount method of protection is the obstacle method, which is based on physically blocking the attacker's path to information.

The second, more important method is the access control method - a method of protecting the confidentiality of information by regulating the use of all IT and IP resources.

You can also secure data transmission over communication channels using encryption mechanisms. The encryption mechanism is a cryptographic closure of information. It should be emphasized the special reliability of this method. But there is a weak spot in cryptographic systems - this is the problem of key distribution.

The most important protection function is the function of countering attacks of virus programs, which has in its arsenal a whole range of various measures and the use of anti-virus programs and, if necessary, the restoration of IP after a virus attack.

Software tools are of no small importance and are a complex of special programs and software systems designed to protect the confidentiality of information in the IP.

In addition to the above, there are still organizational, legislative and moral-ethical remedies. Organizational means carry out production activities in IP in such a way that information leakage is impossible and all processes in IP are under the control of management.

Legislative remedies are described by the laws of the country that regulate the rules for using, processing and transmitting information of limited access and establish penalties for violation of these rules.

There are moral and ethical remedies that have traditionally been established earlier but can also be developed intentionally. A typical example of such regulations is the Code of Professional Conduct of the Members of the US Computer Users Association.

We list the standard operating system security tools:

1. This is primarily a security event log.

The security event log for the enterprise is mandatory, as it allows you to monitor the attempt to hack the network and track the source.

2. A second, equally important tool is the Encrypting File System (EFS) encrypted file system.

It makes it possible to significantly strengthen the protection of information by encrypting files and folders on NTFS volumes. The principle of encrypting

an EFS file system is that folders and files are encrypted using pair keys.

Therefore, to decrypt data, the user who wants to access files and folders must have a special key.

3. Registration cards of users.

At the enterprise, each employee has a special registration card for using the resources of the local network where the user information is located — the name, password, and restrictions on the use of the network.

4. Control over network activities.

5. Determination of user rights, which include logging into the local computer, setting the time, copying and restoring files from the server and performing other tasks.

6. Control over sessions at workplaces.

If the username and password are similar to those in the account card, the server notifies the workstation that the session has started. The server also loads other information when starting a user session, such as user settings, its own directory, and environment variables.

7. The policy of registration cards and passwords.

The enterprise has all aspects of the password policy: a password length of 8 characters, the age of the password and the originality of the password, which guarantees the protection of the user from changing his password.

At the present time, none of the directions of the branches of economic activity cannot do without the means and methods of protecting the confidentiality of, especially important resources.

The modern market for innovative technologies has a huge range of hardware and software designed to ensure data integrity.

Therefore, it is very important to choose such a rational ratio as the optimal data privacy protection and reasonable price.

To date, it is impossible to imagine what responsibility the choice of antivirus is reliable for any user, who could easily guarantee the stable operation of a personal computer and immunity to its files. According to the rating of the most popular free programs you can select the following types:

1. Avast Free Antivirus - an excellent proven free antivirus, which has earned recognition of millions of users thanks to its reliable protection against Trojans and viruses.

2. 360 Total Security - a powerful set of tools to maintain the normal functioning of the operating system.

3. Panda Antivirus Pro - a characteristic feature is the protection of the user's computer from the most well-known types of virtual threats.

4. ESET NOD32 Smart Security - a great comprehensive solution to protect your computer from viruses, trojans, adware and from spam.

5. Avira Free Antivirus - the most common antivirus, which is capable of quite effective protection against viruses. Not many can boast such an advantage over rivals like going to cloud technology, which is able to protect a computer from the latest threats.

Conclusion

In the course of researching the topic of the article: “Methods and means of protecting information in networks”, it was revealed that anti-virus protection is a fundamental, dominant basis for maintaining the integrity of an information system, especially as those wishing to encroach on the confidentiality of information circulating in networks increases exponentially.

Thus, the most rational decision, according to the author, to ensure security in the IP, the system administrator needs to take into account not only the basic principles of information security but also to monitor constantly improving methods and methods of protection. A specific information security policy should be created, taking into account such parameters as the characteristics of the organization, the nature of its activities and budget. In the age of progress and rapid development of innovations, constant quality monitoring is required to identify new potential threats, and, in accordance with this, timely updating of software and hardware protection systems.

Information is the most valuable and expensive resource, serving as an exclusive product in the world, for which there has always been and will be in demand. For this reason, the attackers, using all sorts of sophisticated methods, have tried and will try to seize this limited resource to meet their own needs.

At the moment, IT technology is the most profitable line of business, requiring minimal investment and guaranteeing maximum profit in the case of creating unique, previously non-existent innovations. According to the latest media reports, this activity is ranked first in the world. But, unfortunately, venture companies pursue, as is known, not always noble goals. Therefore, the development of information technologies encourages the unification of efforts by various IT specialists around the world to improve methods and means that could fully and qualitatively assess the threats to the security of the information sphere and react to them in a timely manner.

References:

1. Kupriyanov, G. I. (2009). *Internet Information Resources.* (p.132). Moscow: EDEL.
2. Levin, V. K. (2009). Information protection in information and computing systems and networks. *Programming, N3*, p. 67.
3. Pravikov, D. I. (2009). *Key diskettes. Development of elements of systems to protect against unauthorized copying.* (p.67). Moscow: Radio and communication.
4. Severin, V. A. (2010). *Comprehensive information security in the enterprise.* Grif UMO MO RF. (p.77). Moscow: Gorodets.
5. Severin, V. A. (2010). *Comprehensive information security in the enterprise*. Grif UMO MO RF. (p.108). Moscow: Gorodets.
6. Hofman, L. (2009). *Modern methods of information security.* (p.45). SPb.: Peter.
7. Schneier, B. (2009). *Applied Cryptography. Protocols, algorithms, source texts in the S. language*. (p.173). Moscow: TRIUMPH Publishing House.
8. Fufayev, D. E. (2010). *Development and operation of automated information systems*. Moscow: Academy.
9. Stankevich, K. S. (2018). *Methods and means of information protection in networks.* Scientific community of students of the XXI century. TECHNICAL SCIENCES: Sat. Art. on the mat. LI Intern. stud scientific-practical conf. Number 3 (50). Retrieved Dec. 03, 2019, from https://sibac.info/archive/technic/3(50).pdf
10. Melnikov, V. P. (2011). *Information Security and Information Security*. Moscow: Academy.

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INTERRELATION OF THEORIES OF DEVELOPMENT AND THE CONCEPT OF HUMAN DEVELOPMENT (SOCIAL AND PHILOSOPHICAL ANALYSIS)

Abstract: *The relationship between theories of development and the concept of human development until the last quarter of the 20th century, each of these sciences chose its own, specific criterion of development, which led to an artificial separation of the concepts of economic development, social development, democratic and social progress. These developmental perspectives were combined only in the concept of human development. In the concept of human development, the main indicator is progress in human development.*

Key words: *Concept, development, human, humanistic, consciousness of freedom, level of development, economics, science and technology, model, progress, regress, national-cultural traditions, justice, social development, material benefits, social security, development society, human development, difficulty changing process.*

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Introduction

There are various models of economic development (model of Germany, USA, China, the countries of Southeast Asia, Uzbekistan, Japan and other countries). Developed countries are distinguished in terms of economic development (USA, Japan, Germany, Sweden, France, etc.); developing countries (Brazil, India, etc.), including the least developed (mainly the states of Tropical Africa), as well as countries with economies in transition (former Soviet republics, countries of Central and Eastern Europe, China, Vietnam, Mongolia), most of which occupy an intermediate position between developed and developing countries.

The essence of progress was differently understood in sociology, philosophy, and economics. This understanding depended to a large extent on what criterion to take as the basis of this progress - the consciousness of freedom, the level of economic development, the achievements of science and technology.

Materials and Methods

The relationship between theories of development and the concept of human development until the last quarter of the twentieth century, each of these sciences chose its own, specific criterion of development, which led to an artificial separation of the concepts of economic development, social development, democratic and social progress. These developmental perspectives were combined only in the concept of human development. In the concept of human development, the main indicator is progress in human development. The formation of the concept took place as the result of a search for a single, universal, humanistically oriented development criterion. Such criteria embody the level of economic development, the achievements of science, the principles of management and the socio-political state of society, the level of education and health, the environment, as well as a way of life up to moral consciousness and worldview. “The concept of human development, notes Mahbub ul Haq, is in fact a comprehensive concept of development, encompassing both goals and means, both productivity and equity, both economic and social

development, both material benefits and social provision [1]. In general, if we talk about the development of society, not only from the point of view of economic development, but also human development, this is a complex, contradictory and rather difficult-to-change process. This development is characterized by unevenness, it cannot be straightforward, in the ascending line, but includes periods of growth and recession, quantitative and qualitative changes, positive and negative trends. From this position it is necessary to talk about the socio-economic category of development.

As a social category, development is a process of reorganization and reorientation of the entire social system, including social and administrative structures, as well as in public consciousness, traditions and stereotypes. Social growth can play a positive role with an even distribution of its results, especially among vulnerable segments of the population. Other determining factors in expanding choices and opportunities are a long healthy life, education, the availability of an adequate standard of living, and the enjoyment of political and civil liberties.

The philosophers of antiquity, Democritus, Plato, Aristotle, Lucretius, and others tried to comprehend the nature of social development. A sample of the utopian social and political structure of society was portrayed by Plato (the dialogues "State" and "Laws"). The ideal state, according to Plato, is the just rule of the best by philosophers.

The concept of progress is inseparable from equality and social justice. This postulate, being one of the main aspects of the concept of human development, runs through the works of scientists and philosophers of the East, who also tried to assess the role of man in development. As the great Abu Ali Ibn Sina asserted, “a person becomes a person precisely because it satisfies the needs of others and others act in the same way. One plants the plants, another bakes bread, the third sews, the fourth makes a needle, and so everyone gathers to meet each other's needs. ” [2]. According to the statements of A.Navoi, man is the most valuable, the best, “the most desirable of the created things” on the Earth. Everything is created for the sake of man and for him. "The purpose of all creations, the sun and the universe, mountains and plains, seas and rivers, plants and animals, flowers and nightingales, air and fire, the seasons of the year, i.e. all beautiful nature, its inexhaustible wealth, charms, is the service of man. "[3]. Beruni argued that the prosperity of the country is determined by the state of the sciences, their flourishing. According to Beruni, the highest happiness of a person is knowledge, since he is endowed with reason. Only such an understanding of happiness will bring peace and prosperity to society. “True pleasure is delivered only by the fact that the desire for something increases the more, the more a person owns it. And this is the state of the human soul when it comes to know what it did not know before ” [4]., and the highest human dignity is caring for others and, especially, for poor people.

A significant contribution to the development of the concept of social development was made by scientists of the Enlightenment. Diderot considered man to be the highest value, the only creator of all the achievements of culture on earth, the rational center of the universe, the point from which everything should proceed and to which everything should return.

Jean-Jacques Rousseau, who was also looking for ways to combine a rational and justly organized social life, had a dialectical idea of combining progress and regress in social development. Thus, the emergence of inequality was both a manifestation of progress and a manifestation of regression in the development of society. It was a progress because it was based on the process of improvement, and regress - because, as a result of development, it won the race as a whole, the individual lost. The political ideal of Rousseau was direct democracy, carried out on the basis of a social contract, the essence of which is that “each of us gives our personality and all our strength under the supreme leadership of the common will, and together we accept each member as an indivisible part of the whole” [5]..

The essence of the philosophical and historical concept of Hegel’s development is formulated in the words: “reason in history”. The reason in history is carried out in such a way that every nation gets the right to contribute to the process of ascending self-knowledge of the world spirit. According to Hegel, history moves forward not as an automatic process; it is made up of the actions of individuals, each of whom seeks to realize their own interests and goals. At the same time, there are also some other, public results in which the "cunning of the mind of history" is hidden. This "trick" was noticed by an eminent British economist, the founder of the theory of market economy Adam Smith in his famous "Invisible Hand" principle. Every individual, according to Smith, striving to satisfy his interests and goals contributes to the achievement of public benefit: “in this case, as in many others, he goes with an invisible hand to a goal that was not at all part of his intentions. Pursuing his own interests, he often serves the interests of society more effectively. ” [6]. It should be noted that the problems of development and the choice of the optimal criteria for its assessment are the most important research topic of representatives of various schools of philosophical thought.

The modern historical situation is unique and inimitable. Its uniqueness lies in the fact that in our epoch humanity faced common global problems, which brought it together with a common historical destiny caused by the global interdependence of the socio-economic, political and socio-cultural development of all countries and peoples. The uniqueness of modernity is determined by the diversity of development paths and types of economic

systems, the difference in national cultural and political traditions of different countries. It is the effect of these factors that caused the emergence of a new paradigm of social development - human development. Taking into account these factors, social orientation towards human development is the most acceptable, perhaps the only effective way to achieve progress.

Conclusion

Human development is of particular relevance, which means that the reorientation of the economy towards solving social problems has acquired against the background of aggravating environmental problems. The solution of global and regional environmental problems is impossible without a transition to an "economy for man". This thesis is based on the studies of modern globalists, as well as on the works of the great Russian scientist and academician V.I. Vernadsky, who showed that as the biosphere turns into the noosphere, man and society become responsible for the reproduction of life on Earth.

Thus, the concept of human development is focused on the end result - on welfare, freedom and empowerment, and not on the means to achieve - abundance, measured by real income and a set of goods and services. The development of the concept of human development made it possible to formulate a qualitatively new, promising approach to understanding social progress. This postulate, being one of the main aspects of the concept of human development, is traced in the writings of the great philosophers.

References:

1. Mahbub ul Haq (1995). *Reflections on Human Development, chapters 2 and 3.* Oxford University Press.
2. (1977). Tsit. po kn.: Ocherki istorii obshchestvenno- filosovskoy mysli v Uzbekistane. Pod red. I.M.Muminova i M.M. Khayrullaeva (Eds.). Tashkent: Fan.
3. Zakhidov, V. Y. (1961). *Mir idey i obrazov Alishera Navoi.* Tashkent.
4. Russo, Z. Z. (1938). Ob obshchestvennom dogovore. (p.13). Moscow.
5. Smit, A. (1962). *Issledovaniya o prirode i prichinakh bogatstva narodov*. (p.332). Moscow.
6. (1996, 2003). Doklad o chelovecheskom razvitii. UNDP.
7. Safarova, N. (2009). *Terrorism: (tarikhiĭ-falsafiĭ taḥlil).* Toshkent: Noshir. Library of Congress Washington, DC 20540 United States.; Retrieved 2019, from http://searchworks.stanford.edu/
8. Tarushkin, A. B. (2004). Institutsional'naya ekonomika. (p.345). SPb: Piter.
9. Safarova, N., Aslanov, N. (2013). New Research Approach: Cognitive Abilities of a person. *International Journal of Health Sciences. Vol. 1 No. 1, December 2013*. http://ijhsnet.com/vol-1-no-1-december-2013-ijhs
10. McNeill, D. (2007, March). Human Development: The Power of the Idea. *Journal of Human Development, V 8, No. 1*.
11. Safarova, N. O. (2010). Terrorism as a political phenomenon. *International Journal of Academic Research*. search.ebscohost.com.

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THE HISTORY OF IDEOLOGICAL VIEWS THAT INFLUENCED THE FORMATION OF THE WORLDVIEW OF ABU HAMID GHAZALI

Abstract: *This article is devoted to the great thinker of the Muslim East Abu Hamid Ghazali, as well as the history of the formation of his ideological views. The thinker lived during the development of science and the decline of Islamic values in the eyes of believers, due to the large number of religious groups. It is not for nothing that he is also called "Muhyid-Din" - the reviver of religion, since he managed to adapt Islam to the requirements of his time, without introducing innovations into religion. Ghazali acknowledges the doctrine of the inconvenience and eternity of the Quran; moreover, he assures that the Quran, Taurat (Pentateuch), Injil (Gospel) and Zabur (Psalms of David) are the same book of God, communicated through the revelation to the messengers of God, existing eternally in substance of god.*

In shaping his ideological worldview, Ghazali adopted from the Sufis their love for God, his knowledge of him, as well as his ethical views, which were close to the interests of religion. Thanks to Ghazali, the Sufi doctrine ceased to contradict the Qur'an, the Sunnah, and the Shari'ah. In matters of social justice, kindness, moral and ethical values, in the classification of sciences Ghazali proceeded from the teachings of Sufi Abu Talib Mackey, which are expressed in the work of the thinker "Ihya ulum ad-din".

Abu Hamid Ghazali was not a philosopher in the full sense of the word, but he found the answer to all his questions and worked out his laws for the development and progression of human society. His views and theories have gone through many centuries and proved their right to actuality and existence in our time.

Key words: *excrement, Ashari, church, islam, mutazilits, Selidzhukids, xanbalits, Nizamiya, xaridjits, shiiti, sunna, ismailits.*

Language: *English*

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Introduction

Today, society feels the power of historical documents which are invaluable from the moral point of view, and seeks to comprehend their historical essence.

The core idea contained in the ideological heritage of al-Ghazali, the call for perfection, the humanization of social relations, comprehensive concern for the spiritual development of man are successive and relevant today. They became a new orientation in covering the traditional problems of the Muslim history of the Middle century.

Materials and Methods

The ideological inconsistency of the historical view of feudalism on the concept of society was one of the most important ideological prerequisites for the development of scientific interest to this issue. The studied period of time in which Abu Hamid Ghazali lived and worked in history is called the Middle centuries. The life of the scholar covers the second half of the XI - the beginning of the XII century. The 11 th century, historian V.V. Barthold, calls the century of the highest flourishing of Muslim culture and the beginning of its decline [3,183]. The life of Ghazali, which is one of the least studied periods in the medieval history of the Arab state, falls in the period of Seljuk rule. In the XI century, there is a decline in peasants uprisings.

"One of the most important phenomena in the socio-economic and political life of the Arab caliphate during this period was the arrival in the territory of the state of a large mass of Turkic nomads. One of the Turkmen - Oguz clans - the Seljuks - later created a

powerful state in the territory of the caliphate ”[2,17]. During this period, the state took measures for the development of urban life, trade and industry. The period of the Seljuks was also characterized by the fact that they were patrons of poetry and science. Many scholars and poets wrote their works at their court.

The Seljuks were devout Muslims (Sunnis) and tried to destroy Shiism, which was the focus of Abu Hamid Ghazali, who was supported by the Vizier, as well as the de facto ruler in the country Nizam ul-Mulk (1063-1092). These were the years of economic and cultural growth. Nizam ul-Mulk was the patron of science, literature and art. In Basra, Herat, Nishapur, Bukhara, Samarkand and Baghdad, he opened religious schools (Nizamiyya) [2,19]. This time was also a period of fierce religious struggle, the activity of various sects, professing the views adopted from other beliefs, intensified. As Bartold V.V. points out, the struggle was already fought not between landlords and farmers, but between castles and cities [3.185]. Under the castles, the scientist is referring to the Ismailis (assassins). * The Ismailis were supported by the south-western part of Khorasan (Kuhistan), where 2/3 of all Ismailits castles were located, and the fortress of Alamut was the seat of the head of the sect. If the Fatimid dynasty * initially fully supported the Ismailis, then at the end of the XI century there was a gap between them. The complex socio-political and social life in the Caliphate, along with the Ismaili sect, gave rise to a plurality of different religious and political trends. Russian academic of Islam S.M. Prozorov in his book reveals the ideological origins of these religious movements. In the 7- 8 th centuries, among Muslims there were differences in the understanding of faith and in relation to the person who committed a serious sin. The most radical position was occupied by Kharijites (al-Khavarij). They argued that a person who committed a serious sin ceases to be a Muslim and becomes an unbeliever (kafir) [4, 7]. The Muridzhits (al-murdzhia) proclaimed the actions of man as secondary, and those who preserve the purity of faith in the heart, despite the sin committed, are a true Muslim.

Mutazilites (al-mutazil) occupied the middle position. They developed the doctrine of "average condition" (al-manzil bayn-l-manzilatain) of a Muslim and called for a neutral position in conflicts. First-generation Muslims argued about the predestination of human actions and actions. A group of Muslims who believed in divine predestination received the name of the Dzhabritov (al-Jabriya). Later in Islam, the Qadarite (al-Qadariya) was born, relying on human freedom in their actions, and their successors were the Mu'tazilites. Muridzhits remained neutral in this dispute. Also, the fact of the origin of the Koran was considered a controversial issue. Particularly distinguished in this dispute were the advocates of the creation of the Qur'an — the mutazilites, and its incompatibility — the hanbalites [4,10].

But at the root of all these disputes and unresolved issues remained the problem of sovereign power. Each religious grouping tried to convince the population of the Caliphate of the truth of their dogmas, which especially became the ideological slogan of the struggle of “righteous” movements against “unrighteous rulers”, namely the Kharijite and Shiite movements [4,10]. The reason for such disputes was the discrepancy about the predestination of human destiny. The early Muslims were convinced that the life of a person with all his works and thoughts was premature. With the emergence of such disputes, the question of what is true faith arose before Muslims with all the urgency, which contributed to the appearance of the antonyms of "orthodoxy". As S.M. Prozorov notes, an expert on Islam as an ideological system, the reason for these disputes was that Islam did not have an institution for the legalization of dogmas like the Ecumenical Councils, and that Islam (Sunni) did not know the sole infallible chapter churches [4,10,11].

Islam rejected the existence of the institution of the church, along with the state. The interpretation of the dogmas of religion was not the responsibility of the caliph or state institutions. Public opinion involved private individuals - religious leaders (ulama and faqih). The doctrines of these ulamas, which the Caliph adopted, became generally accepted and official only for a limited period of time. In other words, Islam does not recognize the mediation between God and the believers, the mediation that the Church performs in Christianity [4,11].

Already in the middle of the 8th century, Islam was filled with various theological and legal schools. Representatives of one school could be hostile to certain views of another, and at the same time agree with them on other matters. For example, the dirarites agreed on some issues of dogma with Sunnis, in others with mutazilites, in the third with najdzharits, while at the same time diverging with them on a number of other issues.

At the beginning of the 10th century, the theological school of Asharites (al-Ashariya) succeeded in creating a compromise doctrine on predestination and freedom of human will. “While recognizing Allah as the creator of all things, the Asharites at the same time argued that a person“ acquires ”his actions, participates in their accomplishment” [4,9]. This doctrine later became the subject of heated debate among Muslims. Asharism had a great influence on Abu Hamid Ghazali. He became one of the ideological origins of the formation of the concept of the thinker. The founder of asharism is Ali b. Ismail Abu-l-Hassan al-Ashari - the famous Muslim theologian - Mutakallim *. A fundamental step in the life of Ashari was his public renunciation of the teachings of the Mu'tazilites.

At the beginning of his life, the theologian was a jealous advocate of the Mutazilites, but after about a quarter of a century, Ashar was known as Nemutazilite, who converted to Shafi'i madhhab. * Academician S. Prozorov, who studied al-Ashari's work as a doxographic source, claims that the theologian was in the center of the ideological struggle, which led among themselves representatives of different directions and schools of Islam for the approval of their teachings only "faithful." In his writings Ashari paid more attention to the Qur'an and the Sunnah. In these major sources of Islam, the theologian saw a rationalistic method of resolving disputes - the basis of al-kalam, and considered the Mutakallim true Sunnis. If Ghazali adopted his view on the Qalam from Ashari, then the Shafiite mazhab helped him in forming his views on fiqh *.

At that time, the political situation in the Caliphate was aggravated, the government was not determined about the theological and legal sense (mazhab) of the state religion and Abu Hamid Ghazali's speech about the spiritual revival of the Muslim community were by the way. Al-Ghazali's desire to reconcile opposing ideological tendencies in a society dominated by religion is explained by his desire to alleviate the social and ideological contradictions that have a destructive effect on the foundations of the Caliphate.

The theologian al-Ghazali, appointed at one time to a leadership position at the Nizamiya Madrasa in Baghdad, could not help but understand that his efforts, both in the field of teaching and composing, should be aimed at protecting the centralized state, from the types of the incarnation on earth of divine will . Nizam ul-Mulk, the patron saint of Mohammed Ghazali, deliberately appointed him to the post of rector of Nizamiya in Baghdad, hearing his speech against religious sects. Vazir Malik Shah saw in the face of the young Ghazali a "reviver" and conciliator who would balance religious conflicts.

Conclusion

Summarizing the above, it should be pointed out that, despite his short life, Abu Hamid Ghazali left a huge legacy as a guide for future generations. Awarded the high title of Imam, "Islam Cause" the thinker proved the consistency of his doctrine, as well as its significance for Muslim believers, who preferred his views to others. Studying the life of Ghazali shows that his activity was not aimed at conquering his vocation. Ghazali thoroughly studied all the doctrines that existed at that time, and could conduct disputes on all topics.

The breadth and versatility of the thinker's views, his belief in the improvement of human nature, his struggle with various sects that undermined the foundations of the Caliphate, and efforts to reconcile Sunnism and Sufism make Ghazali one of the foremost thinkers of the East of the late 11th - early 12th centuries of great interest for modern researchers.

References:

1. Abu Hamid al-Ghazali (1980). *The resurrection of the sciences of faith.* Translation from Arabic, research and comment by V.V. Naumkin. Moscow.
2. Bartold, V. V. (2002). *Works on the history of Islam and the Arab Caliphate.* T.VI. "Eastern Literature", Russian Academy of Sciences. Moscow.
3. Prozorov, S. M. (2004). *Islam as an ideological system.* Moscow: Institute of Oriental Studies, St. Petersburg Phil. Eastern literature.
4. Nasyrov, I. R. (n.d.). *Al-Ghazali-"The argument of Islam."* http://islamdag.ru.//lichnosti/
5. Safarova, N. (2009). *Terrorism*: (tarikhiĭ-falsafiĭ taḥlil). Toshkent: Noshir. //Library of Congress Washington, DC 20540 United States.; http://searchworks.stanford.edu/
6. Yunusova, G. S. (n.d.). The viewpoints of Abdulkadir Giloni about the "human"and man conceptions. *Philadelphia, USA. ISJ Theoretical & Applied Science,*176-178
7. Safarova, N., & Aslanov, N. (2013, December). New Research Approach: Cognitive Abilities of a person. *International Journal of Health Sciences. Vol. 1 No. 1*. http://ijhsnet.com/vol-1-no-1-december-2013-ijhs

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SECTION 9. Chemistry and chemical technology.

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SOLUTION TO THE PROBLEM OF SAFETY OF COOKED SALT. ULTRASOUND IN THE CLEANING OF COOKED SALT FROM IMPURITIES OF ARSENIC, CADMIUM AND COPPER

Abstract: *The proposed solution to the problem of safety of salt - a new approach to the purification of concentrated solutions of salt (≥ 280 g/l) from impurities of toxic elements: arsenic, cadmium and copper. It was established experimentally that when cleaning concentrated solutions of sodium chloride ≥ 280 g / l, using as a collector a mixture of magnesium hydroxide and calcium carbonate, with an amount of magnesium hydroxide not less than 4 mmol / l, and calcium hydroxide 1 -2 mmol/l with the intensification effect ultrasound with a frequency of 18–53 kHz, an intensity of 1.0– 2.5 W / cm^2 and ultrasound with a frequency of 2–4 MHz with an intensity of 0.75–1.25 W / cm^2 for 30–45 s allows an increase in the degree of purification of concentrated solutions of sodium chloride from 12-33% to 90-97%.*

Key words: *safety, salt, ultrasound, frequency, intensity, arsenic, copper, cadmium.*

Language: *Russian*

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РЕШЕНИЕ ПРОБЛЕМ БЕЗОПАСНОСТИ ПОВАРЕННОЙ СОЛИ. УЛЬТРАЗВУК В ОЧИСТКЕ ПОВАРЕННОЙ СОЛИ ОТ ПРИМЕСЕЙ МЫШЬЯКА, КАДМИЯ И МЕДИ

Аннотация: *Предложено решение проблемы безопасности поваренной соли – новый подход к очистке концентрированных растворов поваренной соли (≥ 280 г/л) от примесей токсичных элементов: мышьяка,*

кадмия и меди. Экспериментально установлено, что при очистке концентрированных растворов поваренной соли ≥280 г/л, использование в качестве коллектора смеси гидроксида магния и карбоната кальция, при количестве гидроксида магния не менее 4 ммоль/л, а гидроксида кальция 1 - 2 ммоль/л с интенсификацией воздействием ультразвука частотой 18 - 53 кГц, интенсивностью 1,0 - 2,5 Вт/см^2 и ультразвука частотой 2-4 МГц интенсивностью 0,75 - 1,25 Вт/см^2 в течение 30-45 с позволяет повысить степень очистки концентрированных растворов поваренной соли с 12-33 % до 90-97 % .

***Ключевые слова**: безопасность, поваренная соль, ультразвук, частота, интенсивность, мышьяк, медь, кадмий.*

Введение.

Поваренная соль является важнейшим пищевым продуктом. Безопасность поваренной соли определяется содержанием примесей токсичных элементов. Причем, очистка от примесей мышьяка, кадмия и меди считается сложной технологической задачей [1, 2].

Описан [3] способ очистки поваренной соли, включающий складывание ее в бурты и промывку атмосферными осадками от солей магния и нерастворимых в воде примесей [1]. Недостатком способа является длительность процесса, занимает 3-4 месяца, потери готовой продукции 15-20% и недостаточная степень очистки от примесей токсичных элементов мышьяка, меди и кадмия, не превышающая 5% [3].

Также описан способ очистки поваренной соли, включающий ее охлаждение до температуры (-15) - (-20) ° С, растворение в пероксиде водорода под действием ультразвука (УЗ) частотой 18 - 100 кГц, интенсивностью 0,15 ... 0, 25Вт/см^2 и УЗ частотой 1,0 - 2,5 МГц, интенсивностью 0,25 ... 0,50 Вт/см^2 (при этих условиях растворяется только хлорид натрия), фильтрование раствора и кристаллизацию хлорида натрия при температуре 130 - 150 ° С [4]. Недостатком способа является сложность процесса, связанная с необходимостью охлаждения поваренной соли до температуры (-15) - (-20) ° С [4].

Наиболее эффективным является способ очистки поваренной соли, включающий растворение поваренной соли в воде и соосаждение примесей на коллекторе - гидроксиде магния при pH 12-13 при воздействии УЗ частотой 22 - 44 кГц, интенсивностью 1,7 - 3,5 Вт/см^2 в течение 20-25 с. Способ позволяет очищать растворы поваренной соли концентрацией до 140 г/л от примесей мышьяка, меди и кадмия со степенью очистки 98 - 99%. Недостатком способа является недостаточная степень очистки концентрированных растворов поваренной соли ≥ 280 г / л, что не превышает для мышьяка - 12%, для меди - 33%, для кадмия - 29%. В связи с чем, эффективность процесса очистки значительно уменьшается [5].

Известно, что для интенсификации массообменных процессов наиболее эффективным является использование одновременного воздействия УЗ высокой и низкой частот [6].

Предлагаемая работа посвящена изучению использования двухчастотного УЗ в интенсификации процессов очистки растворов поваренной соли ≥ 280 г/л от примесей мышьяка, кадмия и меди.

Экспериментальная часть

При выполнении данной работы применяли ультразвуковой диспергатор УЗДН - 1М с набором магнитострикционных излучателей, что позволяло создавать в исследуемой системе ультразвуковые колебания частотой от 16 кГц до 100 кГц при интенсивности УЗ до 25 Вт/см^2 [7, 8]. Также использовали УЗ генератор типа 24–УЗГИ–К–1,2 с набором пьезоэлектрических излучателей типа ЦТС-19, что позволяло создавать в изучаемых растворах ультразвуковые колебания частотой 0,9 – 3,5 МГц с интенсивностью до 12 Вт/см^2(ограничивалась прочностью излучателя) [9].

Опыты проводили следующим образом. В химические стаканы вместимостью 1500 мл вводили по 1000 мл раствора поваренной соли концентрацией 140, 180, 200, 250, 280, 300, 320 г/л. Приливали по 4 мл 1 М раствора хлорида магния и по 1 мл 1 М раствора хлорида кальция и 3 М раствор гидроксида натрия до pH 12 (10 мл). На полученную смесь действовали УЗ частотой 0,9 – 3,5 МГц интенсивностью 0,7- 1,25 Вт/см^2 и ультразвуком частотой 22 кГц, интенсивностью 1,5 Вт/см^2 в течение 30 с. Отделяли осадок от раствора сифонированием и центрифугированием. В полученном растворе определяли содержание меди и кадмия атомно-абсорбционным методом [10], а мышьяка - спектрофотометрическим методом с диэтилдитиокарбаматом серебра [11].

Результаты и их обсуждение

В табл. 1 приведены результаты опытов по изучению влияния частоты высокочастотного УЗ на степень очистки поваренной соли. Как следует из табл. 1 оптимальной частотой УЗ является 1,0-3,0 МГц. При использовании УЗ менее 1,0 МГц, степень очистки поваренной соли уменьшается. При увеличении частоты УЗ более чем 3,0 МГц также уменьшается степень очистки поваренной соли. Вероятно, что диапазон частот высокочастотного УЗ 1,0-3,0 МГц является оптимальным для интенсификации данных процессов.

Таблица 1. Влияние частоты высокочастотного ультразвука на степень очистки поваренной соли

Частота УЗ, МГц	Степень очистки поваренной соли, %		
	Мышьяк	Медь	Кадмий
0,9	74	85	87
1,0	91	98	91
2,0	92	97	92
3,0	90	97	91
3,1	88	89	78

В этой таблице и последующих приведены усредненные результаты шести опытов, а для очистки использован раствор поваренной соли концентрацией 280 г/л.

Частота низкочастотного УЗ 22,0 кГц, интенсивность низкочастотного УЗ 1,5 Вт/см^2. Интенсивность высокочастотного УЗ 0,75 Вт/см^2, время воздействия УЗ 30 с. Концентрация гидроксида магния 4 ммоль/л, концентрация карбоната кальция – 1 ммоль/л.

В табл. 2 приведено влияние частоты низкочастотного УЗ на степень очистки поваренной соли. Как следует из табл. 2 оптимальной частотой УЗ является 18 - 53 кГц. При использовании УЗ частотой менее 18 кГц степень очистки поваренной соли уменьшается. При увеличении частоты УЗ более чем 53 кГц также уменьшается степень очистки поваренной соли.

Таблица 2. Влияние частоты низкочастотного ультразвука на степень очистки поваренной соли

Частота УЗ, кГц	Степень очистки поваренной соли, %		
	Мышьяк	Медь	Кадмий
17	87	85	89
18	93	97	91
22	90	97	91
53	90	96	92
54	80	81	83

Частота высокочастотного УЗ 3,0 МГц. Интенсивность низкочастотного УЗ 1,5 Вт/см^2. Интенсивность высокочастотного УЗ 0,75 Вт/см^2, время воздействия УЗ 30 с. Концентрация гидроксида магния 4 ммоль/л, концентрация карбоната кальция – 1 ммоль/л.

В табл. 3 приведено влияние интенсивности высокочастотного УЗ на степень очистки поваренной соли. Как следует из табл. 3 оптимальной интенсивностью высокочастотного ультразвукаУЗ является 0,75 - 1,20 Вт/см^2. При использовании высокочастотного УЗ интенсивностью менее 0,75 Вт/см^2 степень очистки поваренной соли уменьшается. При увеличении интенсивности УЗ ультразвука более чем 1,20 Вт/см^2 также уменьшается степень очистки поваренной соли. При использовании только одного низкочастотного УЗ степень очистки поваренной соли резко уменьшилась.

Таблица 3. Влияние интенсивности высокочастотного ультразвука на степень очистки поваренной соли

Интенсивность УЗ, Вт/см^2	Степень очистки поваренной соли, %		
	Мышьяк	Медь	Кадмий
0,74	85	89	80
0,75	90	97	91
1,00	91	98	92
1,20	92	96	92
1,21	83	88	85
*	12	33	29

*Частота высокочастотного УЗ 3,0 МГц. Частота низкочастотного ультразвука 22,0 кГц. Ин-тенсивность низкочастотного ультразвука 1,5 Вт/см^2. Время действия ультразвука 30 с. Концентрация гидроксида магния 4 ммоль/л, концентрация карбоната кальция - 1 ммоль/л. * Без действия высокочастотной составляющей ультразвука (действует только низкочастотный ультразвук).*

В табл. 4 приведено влияние интенсивности низкочастотного УЗ на степень очистки поваренной соли. Как следует из табл. 4 оптимальной интенсивностью низкочастотного УЗ является 1,0-2,0 Вт/ см^2. При использовании низкочастотного УЗ интенсивностью менее 1,0 Вт/см^2 степень очистки поваренной соли уменьшается. При увеличении интенсивности низкочастотного УЗ более чем 2,0 Вт/см^2, также уменьшается степень очистки поваренной соли. При использовании только одного высокочастотного УЗ степень очистки поваренной соли была незначительной. Почти такой же была степень очистки поваренной соли без воздействия УЗ с использованием механического встряхивания, 80 встряхиваний / мин (табл. 4).

Таблица 4. Влияние интенсивности низкочастотного ультразвука на степень очистки поваренной соли

Интенсивность УЗ, Вт/см^2	Степень очистки поваренной соли, %		
	Мышьяк	Медь	Кадмий
0,9	82	85	83
1,0	90	95	90
1,5	90	97	91
2,0	92	96	92
2,1	83	89	87
**	5	7	7
***	6	7	8

*Частота высокочастотного УЗ 3,0 МГц. Интенсивность высокочастотного УЗ 1,5 Вт/см^2. Частота низкочастотного УЗ 22,0 кГц. Время действия УЗ - 30 с. Концентрация гидроксида магния 4 ммоль/л, концентрация карбоната кальция - 1 ммоль/л. * Без действия высокочастотной составляющей УЗ (действует только низкочастотный ультразвук). ** Без действия низкочастотной составляющей ультразвука (действует только высокочастотный ультразвук). *** без воздействия ультразвука, использование механического стряхивала - 80 встряхиваний/мин.*

В табл. 5 приведены влияние времени воздействия УЗ на степень очистки поваренной соли. Как следует из табл. 5 время воздействия УЗ должно быть 30-40 с. При времени воздействия УЗ менее 30 с. степень очистки поваренной соли уменьшается. Увеличение времени воздействия УЗ более 40 с. приводит к уменьшению степени очистки поваренной соли.

Таблица 5. Влияние времени воздействия ультразвука на степень очистки поваренной соли

Время воздействияУЗ, с	Степень очистки поваренной соли, %		
	Мышьяк	Медь	Кадмий
25	85	89	88
30,0	90	97	91
35,0	91	98	92
40,0	92	98	92
45,0	83	86	87

Частота высокочастотного УЗ 3,0 МГц. Интенсивность высокочастотного УЗ 1,5 Вт/см^2. Частота низкочастотного УЗ 22,0 кГц. Интенсивность низкочастотного УЗ 1,5 Вт/см^2. Концентрация гидроксида магния - 4 ммоль/л, концентрация карбоната кальция - 1 ммоль/ л.

В табл. 6 приведены влияние количества коллектора гидроксида магния и карбоната кальция на степень очистки поваренной соли. Как следует из табл. 6 количество гидроксида магния должна быть не менее 4 ммоль/л, а гидроксида кальция 1 - 2 ммоль / л.

Таблица 6. Влияние количества коллектора на степень очистки поваренной соли

Количество коллектора, ммоль/л	Степень очистки поваренной соли, %		
	Мышьяк	Медь	Кадмий
Гидроксид магния (Соосаждение только на гидроксиде магния)			
1,0	18	24	21
2,0	25	32	30
3,0	38	45	43
4,0	45	57	54
4,5	56	65	61
5,0	56	65	61
6,0	56	65	61
Гидроксид магния (При этом количество карбоната кальция – 0,5 ммоль/л)			
1,0	21	24	21
2,0	35	32	30
3,0	57	45	43
4,0	75	57	54
4,5	87	85	82
5,0	87	85	82
6,0	87	85	82
Гидроксид магния (При этом количество карбоната кальция – 1,0 ммоль/л)			
1,0	38	47	44
2,0	65	75	78
3,0	87	89	89
4,0	90	97	91
4,5	90	97	92
5,0	90	97	92
6,0	90	97	92
Гидроксид магния (При этом количество карбоната кальция – 2,0 ммоль/л)			
1,0	42	55	54
2,0	68	78	80
3,0	89	89	89
4,0	92	96	93
4,5	92	96	93
5,0	92	96	93
6,0	92	96	93
Гидроксид магния (При этом количество карбоната кальция – 2,5 ммоль/л)			
1,0	19	21	25
2,0	34	45	44
3,0	68	63	69
4,0	87	90	82
4,5	87	90	81
5,0	87	90	81
6,0	87	90	81
Гидроксид кальция (Соосаждение только на гидроксиде кальция)			
1,0	3	8	7
2,0	6	12	11
3,0	12	25	29
4,0	18	38	54
4,5	18	43	54
5,0	19	43	58
6,0	19	43	58

Частота высокочастотного УЗ 3,0 МГц. Интенсивность высокочастотного УЗ 1,5 Вт/см^2. Частота низкочастотного УЗ 22,0 кГц. Интенсивность низкочастотного УЗ 1,5 Вт/см^2. Время воздействия УЗ 30с.

В табл. 7 приведено сравнение способов очистки поваренной соли от примесей мышьяка, кадмия и меди: соосаждением на коллекторе гидроксиде магния -карбонате кальция с

интенсификацией двухчастотным ультразвуком(предлагаемый способ), соосаждением на коллекторе гидроксиде магния с интенсификацией ультразвуком низкой частоты [5]. Из табл. 7 следует, что в предлагаемом способе степень очистки концентрированных растворов поваренной соли (≥ 280 г/л) выше, чем в способе согласно [5]. Так, предлагаемый способ обеспечивает достаточную степень очистки поваренной соли ≥ 90% для мышьяка до концентрации раствора поваренной соли - 280 г/л (степень очистки 90%), для меди – до 300 г / л (степень очистки 90%), для кадмия - до 280 г / л (степень очистки 91%). А способ по [5] обеспечивает достаточную степень очистки поваренной соли ≥ 90% для мышьяка до концентрации раствора поваренной соли - 140 г/л (степень очистки 99%), для меди до - 180 г/л (степень очистки 95%), для кадмия до - 180 г / л (степень очистки 93%).

Таблица 7. Сравнение способов очистки поваренной соли: соосаждением на коллекторе гидроксиде магния -карбонате кальция с интенсификацией двухчастотным ультразвуком, соосаждением на коллекторе гидроксиде магния с интенсификацией ультразвуком низкой частоты

Концентрация поваренной соли, г/л	Сдержание примесей до очистки до очистки, мкг	Предлагаемый способ		Способ [5]	
		Содержание примесей после очистки, мкг	Степень очистки, %	Содержание примесей после очистки, мкг	Степень очистки, %
Мышьяк					
140,00	4,48	0,044	99	0,045	99
180,00	5,76	0,173	97	0,864	85
200,00	6,40	0,320	95	1,344	79
250,00	8,00	0,480	94	5,440	32
280,00	8,96	0,900	90	7,884	12
300,00	9,60	1,632	83	8,832	8
320,00	10,24	3,584	65	9,830	4
Медь					
140,00	54,6	0,546	99	0,547	99
180,00	70,2	0,702	99	3,510	95
200,00	78,0	0,780	99	8,580	89
250,00	97,5	1,950	98	44,850	54
280,00	109,2	3,276	97	73,230	33
300,00	117,0	11,700	90	93,600	21
320,00	124,8	29,952	76	109,824	12
Кадмий					
140,00	3,36	0,034	99	0,067	98
180,00	4,32	0,043	99	0,302	93
200,00	4,80	0,048	99	0,864	82
250,00	6,00	0,180	97	3,120	52
280,00	6,72	0,605	91	4,771	29
300,00	7,20	1,080	85	5,832	19
320,00	7,68	2,534	67	6,912	10

Приведены усредненные результаты шести опытов. Для очистки использовали поваренную соль, содержащую (мас. %): мышьяка - 0,032 мкг/г (ПДК – 1,0 мкг/г); кадмия - 0,024 мкг/г (ПДК – 0,1 мкг/г); меди - 0,39 мкг/г (ПДК- 3,0 мкг/г);

Conclusion

Таким образом, экспериментально установлено, что при очистке концентрированных растворов поваренной соли ≥280 г/л, использование в качестве коллектора смеси гидроксида магния и карбоната кальция, при количестве гидроксида магния не менее 4 ммоль/л, а гидроксида кальция 1 - 2 ммоль/л с интенсификацией воздействием ультразвука частотой 18 - 53 кГц, интенсивностью 1,0 - 2,5 Вт/см^2 и ультразвука частотой 2-4 МГц интенсивностью 0,75 - 1,25 Вт/см^2 в течение 30-45 с позволяет повысить степень очистки концентрированных растворов поваренной соли с 12-33 % до 90-97 %.

References:

1. Goloperov, I. V., Belova, E. A., Baklanov, A. N., & Baklanova, L. V. (2017). Solving the problems of safety in the production of iodied salt. *ISJ Theoretical & Applied Science, 04 (48)*: 70-75.
2. Baklanov, A. N., Baklanova, L. V., & Golik, V. B. (1988). Problemy ochistki povarennoy soli ot primesey toksichnykh i bioaktivnykh elementov. *Trudy VNIIsol', 35, № 6*: 112-118.
3. Furman, A. A., Bel'dy, M. P., & Sokolov, I. D. (1989). Povarennaya sol'. Proizvodstvo i primeneniye v khimicheskoy promyshlennosti. (p.272). Moscow: Khimiya.
4. Baklanov, A. N., & Avdeyenko, A. P. (2009). Sposob ochistki khlorida natriya. Patent Ukrainy na poleznuyu model' № 45693. - Opubl. 15.11.2009. *Byul. № 22*.
5. Chmilenko, F. A., Chuyko, V. T., Baklanov, A. N., & Baklanova, L. V. (1990). Sposob ochistki rastvorov povarennoy soli ot primesey tyazholykh metallov. A. s. SSSR №1611863, SSSR. Opubl. 07.12.90. *Byul. №45*.
6. Margulis, M. A. (1986). *Zvukokhimicheskiye reaktsii i sonolyuminestsentsiya*. (p.288). Moscow: Khimiya.
7. Yurchenko, O. I., Baklanov, A. N., Belova, E. A., Kalinenko, O. S., & Baklanova, L. V. (2015). Ultrasound to intensify of food dry mineralization by the oxidants in vapor form. *ISJ Theoretical & Applied Science 07 (27)*: 122-129.
8. Yurchenko, O. I., Kalinenko, O. S., Baklanov, A. N., Belova, E. A., & Baklanova, L. V. (2016). Ultrasound in the determination of lead, copper and cadmium in the sugar and products on its basis. *ISJ Theoretical & Applied Science, 01 (33)*: 158-163.
9. Baklanova, L. V., Belova, E. A., & Baklanov, A. N. (2018). Improving the safety of the salt. Content determination various forms of chrom. *ISJ Theoretical & Applied Science, 04 (60)*: 43-49.
10. Baklanov, A. N., Avdeenko, A. P., Chmilenko, F. A., & Baklanova, L. V. (2011). *Analiticheskaya khimiya povarennoy soli i rassolov.* (p.284). Kramatorsk: DGMA.
11. (2010). GOST 26930-86. Syr'ye i produkty pishchevyye. Metod opredeleniya mysh'yaka. (p.6). Moscow: Standartinform.

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