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TRICHOGRAMMA AND ITS INFLUENCE ON THE NUMBER OF CABBAGE MOTH IN SOUTH KAZAKHSTAN REGION

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This article describes the application of the biological method which will take an important place in the integrated system of plant protection in the Republic of Kazakhstan. In comparison with chemical, it does not require large energy costs, does not lead to contamination of agricultural products and the environment, does not violate the ecological balance. Currently, special attention is paid to the development of environmentally friendly methods of plant protection, namely the biological method. This article provides a description of Trichogramma, the natural enemies of cabbage in South Kazakhstan region. Treatment with Trichogramma cabbage. The entomophage is of great economic importance and independently suppresses the propagation of the pest of cabbage is the cabbage moth. Ecological links of insects were studied in the cabbage field biocenosis. Observations were carried out against pests of cabbage in South Kazakhstan region such as the cabbage cutworms (*Barathra brassicae* L.), cabbage white (*Pieris brassicae* L.), cabbage moth (*Plutella maculipennis* Curt.), cabbage aphid (*Brevicoryne brassicae* L.), cabbage flea beetles.

Keywords: entomophagous pests, biocenosis, the pupal stage, colonization

Economic efficiency and prospects for the introduction of biological methods of plant protection in the agricultural formations of South Kazakhstan region lead to a decrease in losses and obtain a larger volume of high-quality crops.

The greatest interest in biological methods of plant protection in the Republic of Kazakhstan is associated with the trends of General greening of the environment, effective use of natural resources, concern for the health of the nation. Despite the progress made in the field of crop protection, according to FAO (food and agriculture organization of the United Nations), pests and diseases kill about 30% of the crop each year. Only on vegetable culture there are hundreds of pests. Of them are particularly dangerous scoop, aphid, whitefly. For example, in South Kazakhstan due to the cotton aphid is killed 40-50% of crops and whiteflies and mites putiny eat 15-20% [1].

Due to the sharp temperature difference characteristic of South Kazakhstan region, fruit trees, vegetable crops are attacked by aphids. The traditional culture of growing vegetables and gardening formed on the territory of South Kazakhstan region is based on the methods of agriculture using local fertilizers. To date, the area of application of biological plant protection has increased, resulting in improved crop quality and increase its volumes. However, it should be noted that the biological method of plant protection contributes to the conservation of biological balance and the restoration of biological diversity.

One of the main methods of biological plant protection method is to preserve and

improve the efficiency of entomophages and beneficial microorganisms. The enrichment of agricultural lands beneficial organisms is also widely used in plant protection. This action is carried out by means of methods of seasonal colonization, resettlement and acclimatization of useful organisms by means of application of industrial forms of biological preparations.

Identification of useful biological agents is an integral part of the integrated plant protection system, which involves: control of the phytosanitary state of the environment, a set of agricultural activities, including the cultivation of pest-resistant varieties, the use of environmentally friendly bioagents [2].

An important area of observation of populations of harmful organisms is the detection of insect diseases. These data allow us to accurately predict the viability of populations and to choose the right protection measures to be effective in this situation.

Currently, special attention is paid to the development of environmentally friendly methods of plant protection, namely biological method. The biological method of pest control is based on the use of living organisms and their products.

Thus, it should be noted that the prospects for the use of biological methods in rural areas of Kazakhstan have been steadily increasing in connection with the tasks, and the results of developments in the application of biological plant protection products indicate the prospects of their use in programs of integrated management of a number of pests, aimed at the restoration and maintenance of the biocenotic equilibrium in agroecosystems.

As experience has shown, the use of biological plant protection method is much more effective and cheaper than chemical protection and it can be used not only in the cultivation of cotton, but also vegetables and fruits. In the past, Kazakhstan used a lot organochlorine drugs grade DDT is a hexa-chlor drugs, medications, chlorinated diene terpenes and chlorinated insecticides. Material cumulation was observed, i.e. accumulation of toxic substance in the organism as a result of repeated treatments. The ability to material cumulation characterized by many drugs from the group of organochlorine compounds and mercury preparations.

Over the past 20 years, the use of pesticides in agriculture has decreased dramatically. But the problem of so-called “historical” pollution still remains acute. The fact is that hexachlor and dust both lay and continue to lie where agricultural products were grown – on arable land and even in greenhouses. In those days, we ourselves produced these preparations for the destruction of agricultural pests [3].

The use of pesticides is demanded by the commercial interest of industrial agricultural production, which is focused on simple indicators such as resistance and the size of the crop, its storage and resistance to transportation. But not considered significant decline in such qualities of the products obtained as the trace element composition, the usefulness and safety of consumers. The destruction of biocenoses in pesticide use areas has also become a global problem.

Toxicological residues of pesticides in food products of animal and plant origin and their derivatives metabolites exceeded several times the permissible norms. Toxic chemicals bring instant effect, but they can give a good effect only once, then there is an addiction to pesticides, that is, the second and third time the pests already react poorly to them. When spraying, by the way, they get only 5% of the drug, the rest – in the soil.

Biological agents and biological products are not aimed at the complete destruction of pests, but rather to regulate their number. Each species of living organisms has its own diseases and enemies, which we use in the biological protection of plants. Note: when we talk about diseases of insects, only those that are not harmful to non-target fauna.

Biological approaches, at first glance, are not as effective as chemical “weapons”, but their effect is long and natural for nature. Earlier, for example, on cotton fields of Maktaaral

district of South Kazakhstan region there were hundreds of bio-factories, but after the collapse of the Union they were forced to move to pesticides. Firstly, it is cheaper, secondly, there is a momentary effect. However, every year we have to increase the dose and frequency of treatments with chemicals. Today, cotton producers have to carry out 8-9 treatments to achieve the effect. This, of course, can not like the residents of the area.

The Institute’s scientists are asked by farmers and residents of the region to stop the use of pesticides. It is appropriate to say that about 200 million tenge is allocated annually from the state budget for the chemical control of only one pest – cotton scoop. But these targeted costs no longer achieve the desired results, as chemical insecticides have little effect on the pest.

In the future, this biological method will take an important place in the integrated plant protection system, as compared with the chemical it does not require large energy costs, does not lead to contamination of agricultural products and the environment, does not violate the ecological balance.

Since 2013 began to work on the Republican program for subsidizing of biological agents – beneficial insects. We have set a course for the revival of bio-factories, for the development of bacterial, viral and fungal drugs, and, of course, useful insects.

Now the question of the quality of bioagents, which are mainly imported from Uzbekistan, is acute, although in the South of Kazakhstan there are already a number of their own biofabrics.

In Uzbekistan, toxic chemicals are practically prohibited-they rely on bioagents. Therefore, together with its collective and state farms, the Republic has preserved bio-factories. In addition to cotton, there are grown silkworms, for which pesticides are extremely harmful. The bio-mills they have officially 1250. Russia produces more than one hundred of biologics.

A colleague from the Arab Emirates, Professor Khalid Bahri, demonstrated at the conference a laboratory, through which scientists not only identify pests at the gene level, but also expose all the data on a publicly available website – so that the world, buying products from the UAE, knows about pests, weeds and plant diseases, which, once in a favorable climatic environment, I think we should follow the example of our colleagues and get the same laboratory to successfully fight quarantine facilities.

The main task is to develop recommendations and an integrated system for the control of harmful organisms.

In scientific research Institute of protection and quarantine of plants of Maktaaral district of South Kazakhstan there is a Biofactory for the production of insects-entomophages. Laboratory of biological methods of plants in 2015-2017 work was carried out to identify enemies, their impact on pests of cabbage and on the use of the most important of them in the development of integrated methods of protection of cabbage against pests.

Species composition of harmful and useful insects inhabiting the anthropogenic ecosystems and agricultural crops are discussed in several papers [4]. It is established that their number in nature is governed by 40 kinds of primary and secondary entomophages.

In Kazakhstan, the species composition of entomophagous and their role and regulation of pest population of cabbage has not been studied.

This article presents data on the species composition and agrobiocenosis cabbage fields, relationships, phytophages and entomophages, highlights issues of colonization of *Trichogramma* and conservation of beneficial fauna on cabbage fields.

Each year observations were carried out on a stationary phase of cabbage by weekly surveys from the beginning of the growing season and before harvest 90 cabbage plants late cabbage.

Cabbage is the main vegetable culture, cultivated in all climatic zones of Kazakhstan. White cabbage is valued as a food and feed crop, widely cultivated in all regions of Kazakhstan, is a product of mass consumption. Food has the head – apical enlarged bud.

Cabbage is a source of carbohydrates, proteins, mineral salts (calcium, potassium, phosphorus, iron), vitamins C, PP, B group, carotene, organic acids and other valuable substances.

The largest areas are occupied by cabbage in Akmola, East Kazakhstan, Almaty, Zhambyl, Kostanay, Pavlodar and South Kazakhstan regions [5].

Wide distribution of it is promoted by high productivity, good keeping quality, resistance to low temperatures, transportability.

In specialized vegetable farms of cabbage, a cost – effective culture: using the cover film, different ways of growing plants (without potting and potting), different dates of transplanting and sowing seed in the open ground, the organization of secure storage of cabbage in

fresh form during autumn winter and spring you can create a year-round supply of the population of this valuable products.

In the southern regions of Kazakhstan, early maturing cabbage varieties are grown in a seedling way to obtain a very early and early harvest.

Maktaral farmers, who collected the first harvest in April last year, provided cabbage to several regions of the Republic and Russia. However, Maktaral farmers also grow Dutch cabbage “Pandion”, the weight of which does not exceed 1-1.5 kg. This product is in demand among Russians and Europeans.

It should be noted that last year in Maktaaral district vegetables were grown on 3877 hectares, on average, from 231.3 quintals 89 689 tons of products were collected. Of these, more than 50 thousand tons – cabbage.

From specialized pests of cabbage in South Kazakhstan region are cabbage cutworms (*Barathra brassicae* L.), cabbage white (*Pieris brassicae* L.), cabbage moth (*Plutella macilipennis* Curt.), cabbage aphid (*Brevicoryne brassicae* L.), cabbage flea beetles.

All of these types can give mass outbreaks. In South Kazakhstan region in 2015, there had been a mass reproduction of the cabbage white, in 2016 – cabbage moth.

We made observations of the cabbage moth. Cabbage moth prefers the vegetable cabbage and its relatives of the cabbage family. Gardeners don't like its law – it can completely deprive the crop.

Dates of departure of butterflies cabbage moth in the spring of pupa due to weather conditions, but as a rule, it is the beginning of may. The spring generation of cabbage moth is mainly not numerous. Butterflies soon after departure mate and lay eggs one by one or in small groups on the leaves of cabbage weeds, and then on the cultivated vegetation. After the revival of the caterpillars gnaw mines in the tissues of the leaves, and after 2-3 days crawl to the surface and eat on the underside of the leaves. They gnaw out small areas of leaf tissue and leave the cuticle. The damage looks like Windows covered with a transparent film. The greatest number of caterpillars of cabbage moth on cabbage appears in July-August. The most dangerous damage that cause caterpillars in the phase of formation of “hearts” of cabbage.

We have investigated that older caterpillars sometimes move from the leaf area to the middle parts of the plants, sometimes damaging the growth point, the crown is not formed. For the season develops

3-4 generations of the pest. Dates of departure of butterflies cabbage moth in the spring due to weather conditions, but usually it is the beginning of May. The spring generation of cabbage moth is mainly not numerous. Butterflies soon after departure mate and lay eggs one by one or in small groups on the leaves of cabbage weeds, and then on the cultivated vegetation. After the revival of the caterpillars gnaw mines in the tissues of the leaves, and after 2-3 days crawl to the surface and eat on the underside of the leaves. They gnaw out small areas of leaf tissue and leave the cuticle. The damage looks like windows covered with a transparent film. The greatest number of caterpillars of cabbage moth on cabbage appears in July-August. The most dangerous damage that cause caterpillars in the phase of formation of "hearts" of cabbage. Older caterpillars sometimes moving from the region of leaves on middle parts of the plants, sometimes damaging the growing point, the crown is not formed. For the season develops 3-4 generations of the pest.

Does the pest in fields and gardens completely unattractive, like all moths. The color of wings are gray-brown. On the wings there is a bright picture. The size of the wings does not exceed 8 mm, and the rear fenders are different from the front by the presence of fringe.

The coloring of the butterfly is perfect in order to be completely invisible on the plants. Flying mole is bad, and so far from the place of supply is not flies. As a rule, she spends her entire life in the area where hatched from the pupae. The butterfly emerges in April-June. It feeds on plant SAP, which is a parasite. The butterfly flies in the evening, during the day she hides.

We have investigated that the butterfly lays its eggs on the leaves, attaching them on the underside. Small eggs – 0.4 mm, green. Lay butterfly eggs is about 10-20 days in the spring. After 3 days of egg out of the caterpillar is green with a length of 12 mm. the Caterpillars dwell on the leaves. After two weeks of the caterpillars formed a chrysalis, and after 2 weeks the pupae emerge the butterfly. The whole cycle is 35 days. So a season can bring out the 6 offspring of the moth. That is why this pest is considered to be so dangerous – since April-the month mol devastates the gardens [6].

Overwinter pupae of butterflies and the butterflies in the weeds and the remains of garden plants of the cabbage family. Therefore, the responses must include the cleaning phase in the fall of all plant residues.

Most damage to garden plants damage the moth, and its larvae – the caterpillars. They feed on the leaves of plants. In result, the plants don't just lose the look. Cabbage, moth damaged, poorly stored and quickly deteriorates.

Heaviest moth attacks plants in the hottest time of the summer. Damaged leaves lose their ability to proper metabolism and prone to burns from the sun. Also the caterpillars eat the ovaries and buds. They damage the crops, significantly reducing it.

Occurring oviposition, caterpillars and pupae of cabbage butterflies, cabbage moths and moth of cruciferous bugs were collected from nearby cabbage plants in the amount of at least 50-100 copies, were transferred to the insectarium, in cages, watched the development. The percentage of infestation by parasites of caterpillars of Lepidoptera was determined by autopsy.

However, the next year after the mass breeding of some species drops sharply, and pests do not cause significant economic damage to the cabbage crop.

This happens largely as the result of useful activity of parasites and predators, which in the agrobiocenosis of the cabbage field are effective regulators of the population of many harmful types.

We have studied the types of trichograms common in South Kazakhstan region. These are very small insects up to half a millimeter long. The peculiarity of these insects is that their larvae develop only inside the eggs of other insects. For procreation, the females living for up to five days, the entire period of his life looking for the eggs of insects pests. Each female can lay up to 40 eggs. The period of development from egg to adult insect in trichograms is about 20 days. The research Institute produces trichograms in the form of packets with eggs of grain moth infected by this insect. Such a package usually contains up to fifty thousand individuals and it is stored in the refrigerator so that the trichograms do not fly prematurely. 1-2 days before the release of the package is placed in a warm place to adult insects began to lay eggs. For release use a simple device—a half-liter jar with finely chopped paper poured inside (1-2 cm) and the contents of the packages, the Bank is covered with gauze and put on infected crops. Each Bank should account for no more than 200 square meters of field. The rate of production of trichograms is taken into account from the average number of eggs of pests in the cultivated field.

Effectiveness of *Trichogramma* in the fight against Cabbage moth

| Options | Inspection of plants, pieces | Found the egg-bed sites, pieces | Them eggs, pieces | Infected <i>Trichogramma</i> , pieces | The percentage of infection | Inspected the heads before cleaning, pieces | Damaged, piece | The percentage of damage |
|--|------------------------------|---------------------------------|-------------------|---------------------------------------|-----------------------------|---|----------------|--------------------------|
| Dark <i>Trichogramma</i> 0.5 g/ha – <i>Trichogramma evanescens</i> Westw. | | 5 | 125 | 100 | 70 | 95 | 12 | 7 |
| Male yellow <i>Trichogramma</i> , 0.5 g/ha – <i>Trichogramma euproctidis</i> Gir. | | 4 | 95 | 50 | 58 | 95 | 31 | 15 |
| Devil male yellow <i>Trichogramma</i> , 0.5 g/ha - <i>Trichogramma embryophagum</i> Htg. | | 4 | 60 | 17 | 24 | 95 | 49 | 24 |
| Control | 90 | 6 | 161 | 0 | 0 | 95 | 60 | 30 |

We recommend that with an average contamination of 100 eggs per square meter to produce 50 thousand insects per hectare, reducing or increasing consumption depending on the actual calculation of the number of pests. Recently, methods of mechanized distribution of trichograms on the field have been developed: spraying of infected eggs with water or wet sawdust, scattering of paper capsules with trichograms Packed in them. In the field eggs of the cabbage moth infect the following types of trichogramma – Dark *Trichogramma* (*Trichogramma evanescens* Westw.), Male yellow *Trichogramma* (*Trichogramma euproctidis* Gir.), Devil male yellow *Trichogramma* (*Trichogramma embryophagum* Htg.). *Trichogramma* developing inside infected eggs of insect pests. A parasitic way of life are only the larvae and adult insects feed on nectar and dew. Affected *Trichogramma* eggs after a few days turn brown.

Through research in the laboratory of biological control, we have experience in breeding and use in the fight against cabbage moth forms *Trichogramma* (2016).

Against cabbage moths produced *Trichogramma*: 0.5 g per 1 ha (90 thousand individuals per 1 ha). Removing control from experienced plot was 60 m. The Area of cabbage – 40 ha, each variant of 8 hectares. The Production was

held on 25 June during the mass oviposition of the cabbage moth. Three days after release were accounted for by infected eggs (table).

As can be seen from the table data form of *Trichogramma* (*Trichogramma evanescens* Westw) has infected 70% of the eggs of the cabbage moth, thereby reducing the damage of the cabbages to 7%; in the control the damage was 30%.

Trichogramma (*Trichogramma evanescens* Westw) is quite effective in reducing the number of this pest in the seasonal colonization.

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INVESTIGATION GaTe-CaTe SYSTEM

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The GaTe-CaTe system is analyzed and its phase diagram is sketched. It is defined that phase diagram of the system is quasi-binary and it is characterized with the production of CaGaTe_2 , melts incongruently at 860°C based on primary components. It is found that solid solution exists in restricted space. Based on the microstructure analysis it is evident that at room temperature 2.5 mol% CaTe dissolves in GaTe, while based on CaTe chemical compound the area of solid solution is 2.0 mol% GaTe. Based on x-ray phase analysis CaGaTe_2 compound's crystal type is found and its cell properties are calculated. The CaGaTe_2 crystallizes in the tetragonal crystal system with the cell parameters: $a = 7,31\text{\AA}$; $c = 6,75\text{\AA}$, $Z = 3$, $c_{\text{pik}} = 4,82 \cdot 10^3 \text{ kg/m}^3$; $c_{\text{rent.}} = 4,88 \cdot 10^3 \text{ kg/m}^3$ spatial group $-I_4/mms$.

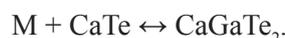
Keywords: eutectic, quasi-binary, incongruity, micro hardness, solid solution

Calcium chalcogenides and the triple phases obtained on their basis are related to promising substances for the development of luminescent and photoelectrical materials. Solid solutions of calcium and gallium chalcogenides exhibit luminescent properties of practical interest [3-8]. In the interaction of alkaline earth metal chalcogenides with gallium chalcogenides, threecomponent compounds and solid solutions are formed, which must preserve the properties of the initial binary compounds, and at the same time have more pronounced complex properties.

The synthesis of the system of the GaTe-CaTe alloys consists of GaTe and CaTe components, which are synthesized at around $850-900^\circ\text{C}$ in a quartz ampoule that has 0.13333p air sucked from it. The process of the synthesis is done in two stages: In the first stage the mixture is heated up to 900°C and maintained the same temperature for twenty four hours. In the second stage temperature is raised from 900 to 1000°C and synthesized for two hours [1, 2]. The alloys which are rich of GaTe compound are tending to show dark brown color and the alloys which are rich of CaTe compound tend to show dark ash color. The alloys which are rich of GaTe compound are resistant to air and water. They tend to well dissolve in mineral solvents. On the other hand the alloys which are rich of CaTe compound are resistant to air while they can absorb moisture from air and changing their appearance in process.

To homogenize the system of GaTe-CaTe alloys is maintained during 500 hours at 650°C temperature which thermally processes the alloys. Then the system GaTe-CaTe alloys is analyzed by physical and chemical methods of analysis and phase diagrams are plotted. The system GaTe-CaTe is the quasi-binary crop of Ca-Ga-Te three way systems, and it is characterized by using peristaltic compound and

limited dilution of components. In this system components make a three way compound CaGaTe_2 in ratio of 1:1 and melts incongruently at 860°C .



The GaTe-CaTe system was studied by differential thermal analysis (DTA), X-ray diffraction (XRD), micro structural analysis, density measurements, and micro hardness tests. DTA curves were obtained at a heating rate of $8^\circ\text{C}/\text{min}$ on a NTR-73 low-regency thermal analyzer. Diffraction patterns were collected on a D₂PHASER X-ray diffract meter with CuK_α radiation. Micro hardness values were determined on a Thixomet Smart Drive micro hardness tester at indentation loads chosen after micro hardness measurements for each of the phases present. The microstructure of the alloys was investigated by MIM-8 microscope. Glory sections of the alloys were etched with a 1:2 mixture of concentrated HNO_3 and H_2O_2 . The DTA, microstructural analysis, XRD, micro hardness and density data were used to map out the T-X phase diagram of the GaTe-CaTe system (Fig. 1).

Based on gallium monotellurid dilution of CaTe is 2.5 mol%. The solid percentage of CaTe olution is not detected, the solid part of the solution GaTe is 2.0 mol%.

Microstructure analysis revealed that, GaTe based dilution at room temperature is 2.5% mol CaTe, at 750°C approximately 9 mol% CaTe.

Based on CaTe compound solid matter cannot be detected that is why solid matter is considered approximately as 2,0 mol% and its border is represented as jerky lines. CaGaTe_2 compound makes eutectics with gallium monotellurid and its coordinates is 20% mol CaTe its melting point is 750°C . Tamman triangle should be assembled in order to find the exact location of eutectics. To find the existence of CaGaTe_2 compound x-ray phase analysis was made.

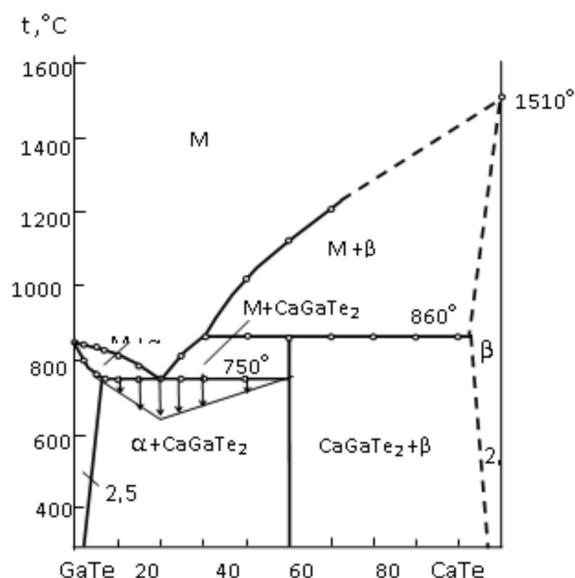


Fig. 1. Phase diagram of the GaTe-CaTe sect

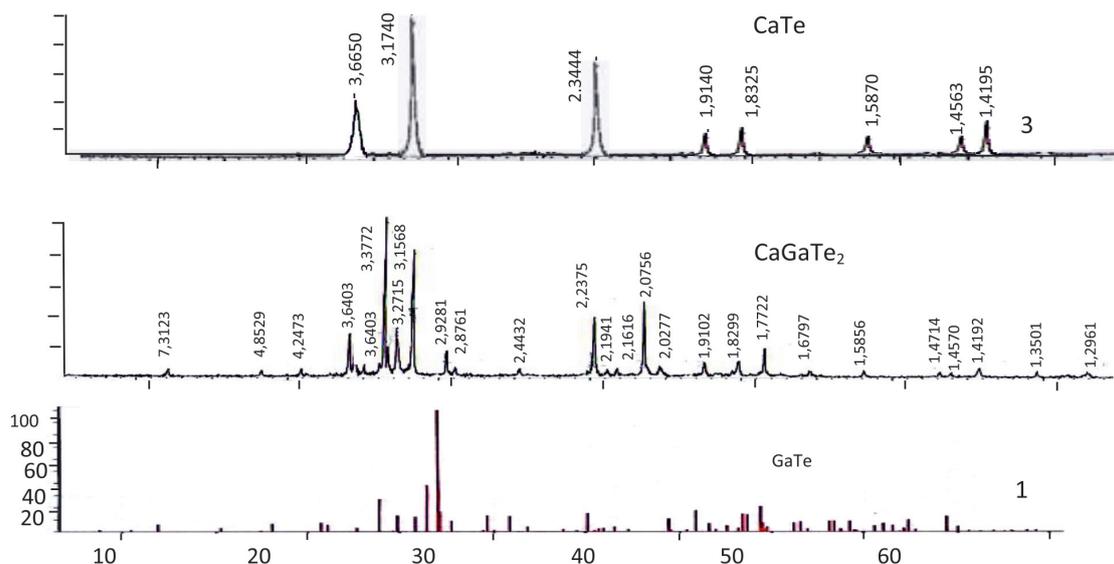


Fig. 2. X-ray diffraction patterns for GaTe-CaTe alloys containing: 1 – GaTe, 2 – CaGaTe₂, 3 – CaTe

According to the results of x-ray phase analysis calculated distance between planes and diffraction maximum's intensity are being compared to CaGaTe₂ compound and primary components. (Fig. 2) As seen from figure 2 in the diffractogram of CaGaTe₂ compound determined diffraction maximums differ from primary components based on the difference between planes and intensity.

This proves that, inside of GaTe-CaTe system new three way compound CaGaTe₂ is pro-

duced. CaGaTe₂ compound's x-ray results are shown in table I.

It is defined that, CaGaTe₂ is crystallized in tetragonal syngony and its cell properties are $a = 7.31$, $c = 6.75$; $Z = 3$; $p_{\text{pikn}} = 4.82 \text{ g/cm}^3$; $p_{\text{prent}} = 4.92 \text{ g/cm}^3$.

During the measurement of micro strength in the system, it tends to show three different values. From six hundred to seven hundred MPa values represent the alpha solid solution which is obtained from Gate compound,

(1500-1550) MPa values represent the strength of CaGaTe_2 compound, while (1800-1860) values of micro strength represent beta solid solution which is made from CaTe compound. GaTe-CaTe system's liquids is made from alpha solid solution's slope when the liquid is released in the first crystallization process, and beta solid solution's slope in monotype equilibrium. The mixture of alpha – phase and CaGaTe_2 compounds crystallize in double eutectics point, its composition is 20 mol% CaTe at 750 °C. In between 2.5-50 mol% CaTe concentration interval downwards the solidus line two phase alloys ($\alpha + \text{CaGaTe}_2$) and at 50-98 mol% CaTe concentration interval two phase alloys ($\beta + \text{CaGaTe}_2$) precipitate.

Thus, The GaTe-CaTe system is analyzed and its phase diagram is sketched. It is defined that phase diagram of the system is quasi-binary and it is characterized with the production of CaGaTe_2 . CaGaTe_2 melts incongruently at

860 °C. According to the primary components it is found that solid solution exists in restricted space. The microstructure analysis revealed that at room temperature 2.5 mol% CaTe dissolves in GaTe while, based on CaTe chemical compound the area of solid solution is 2.0 mol% GaTe . According to the X-ray analysis the crystal type of CaGaTe_2 compound was found and its cage properties are calculated.

10³/T, K Single crystals of the CaGaTe_2 compound were first grown by chemical vapour transport, with I_2 as a transport agent, but such crystals were unsuitable for physical property measurements, so we prepared single crystals of the CaGaTe_2 compound by the Bridgman-Stock Barger method. These single crystals were used in electrical measurements. Fig. 3 shows the Arrhenius plot of electrical conductivity for the CaGaTe_2 compound. The data demonstrates intrinsic conduction with activation energy $\Delta E = 1,12\text{eV}$.

Table 1

The interlunar spacing-s (dÅ), hkl indices, and relative peakintensities in the XRD pattern of the CaGaTe_2

| № | I | 2θ | d _{exp.} | d _{count.} | 1/d _{exp.} ² | 1/d _{count.} ² | hkl |
|----|------|--------|-------------------|---------------------|----------------------------------|------------------------------------|-----|
| 1 | 3,5 | 12,094 | 7,3123 | 7,3123 | 0,0187 | 0,0187 | 100 |
| 2 | 3,6 | 18,266 | 4,8529 | 4,9752 | 0,0425 | 0,0404 | 101 |
| 3 | 4,1 | 20,898 | 4,2473 | 4,1416 | 0,0554 | 0,0583 | 111 |
| 4 | 26,2 | 24,432 | 3,6403 | 3,6564 | 0,0755 | 0,0748 | 200 |
| 6 | 100 | 26,369 | 3,3772 | 3,3748 | 0,0877 | 0,0878 | 002 |
| 6 | 29,7 | 27,237 | 3,2715 | 3,2686 | 0,0934 | 0,0936 | 212 |
| 7 | 78,5 | 28,248 | 3,1568 | 3,0642 | 0,1035 | 0,1065 | 102 |
| 8 | 15,5 | 30,505 | 2,9280 | 2,9424 | 0,1166 | 0,1155 | 211 |
| 9 | 5,7 | 31,070 | 2,8761 | 2,8375 | 0,1209 | 0,1242 | 112 |
| 10 | 1,7 | 36,755 | 2,4432 | 2,4368 | 0,1675 | 0,1684 | 300 |
| 11 | 37,7 | 40,274 | 2,2375 | 2,2502 | 0,1997 | 0,1975 | 003 |
| 12 | 2,5 | 41,108 | 2,1940 | 2,1874 | 0,2077 | 0,2090 | 311 |
| 13 | 3,7 | 41,752 | 2,1616 | 2,1507 | 0,2140 | 0,2162 | 103 |
| 14 | 48,6 | 43,571 | 2,0756 | 2,0677 | 0,2321 | 0,2339 | 113 |
| 15 | 5,3 | 44,654 | 2,0277 | 2,0274 | 0,2432 | 0,2433 | 320 |
| 16 | 9,0 | 47,564 | 1,9102 | 1,9163 | 0,2740 | 0,2723 | 203 |
| 17 | 9,2 | 49,790 | 1,8299 | 1,8276 | 0,2986 | 0,2994 | 400 |
| 18 | 16,3 | 51,528 | 1,7722 | 1,7730 | 0,3184 | 0,3181 | 410 |
| 19 | 2,6 | 54,597 | 1,6797 | 1,6874 | 0,3544 | 0,3512 | 004 |
| 20 | 4,1 | 58,131 | 1,5856 | 1,5887 | 0,3977 | 0,3962 | 421 |
| 21 | 1,6 | 63,136 | 1,4714 | 1,4711 | 0,4619 | 0,4621 | 422 |
| 22 | 1,8 | 63,835 | 1,4570 | 1,4621 | 0,4711 | 0,4678 | 500 |
| 23 | 6,1 | 65,747 | 1,4191 | 1,4186 | 0,4966 | 0,4969 | 403 |
| 24 | 3,5 | 69,575 | 1,3501 | 1,3500 | 0,5486 | 0,5487 | 005 |
| 25 | 3,3 | 72,929 | 1,2961 | 1,2929 | 0,5953 | 0,5988 | 440 |

Table 2

Results of DTA, micro hardness and density data for alloys GaTe-CaTe system

| composition, mol% | | thermal effects of heating, °C | density, q/sm ³ | micro hardness, MPa | | | |
|---------------------------------|------|-----------------------------------|-------------------------------|---------------------|-----------------------------------|-----------------------------------|-------|
| Ga ₂ Te ₃ | CaTe | | | α | CaGa ₄ Te ₇ | CaGa ₂ Te ₄ | CaTe |
| | | | | P = 0,20 N | | P = 0,15 N | |
| 100 | 0,0 | 812 | 5,57 | 2370 | - | - | - |
| 98 | 2,0 | 720,790 | 5,57 | 2430 | - | - | - |
| 95 | 5,0 | 650,770 | 5,58 | 2450 | - | - | - |
| 93 | 7,0 | 630,750 | 5,60 | 2480 | - | - | - |
| 90 | 10 | 580,725 | 5,61 | 2500 | - | - | - |
| 85 | 15 | 580,685 | 5,57 | - | - | - | - |
| 80 | 20 | 580 | 5,46 | Evtek. | Evtek. | - | - |
| 75 | 30 | 580,610 | 5,40 | - | 2150 | - | - |
| 70 | 30 | 580,680 | 5,37 | - | 2150 | 2200 | - |
| 66,6 | 33,3 | 680,760 | 5,35 | - | 2150 | 2200 | - |
| 60 | 40 | 680,800 | 5,20 | - | 2150 | 2200 | - |
| 55 | 45 | 690,850 | 5,06 | - | - | 2200 | - |
| 50 | 50 | 870 | 4,90 | - | - | 2200 | - |
| 45 | 55 | 735,830 | 4,80 | - | - | - | - |
| 40 | 60 | 730 | 4,76 | - | - | Evtek. | Evtek |
| 30 | 30 | 730,960 | 4,70 | - | - | - | 1800 |
| 20 | 80 | 730,1150 | 4,66 | - | - | - | 1800 |
| 10 | 90 | 730,1335 | 4,50 | - | - | - | 1800 |
| 0,0 | 100 | 1510 | 4,35 | - | - | - | 1800 |

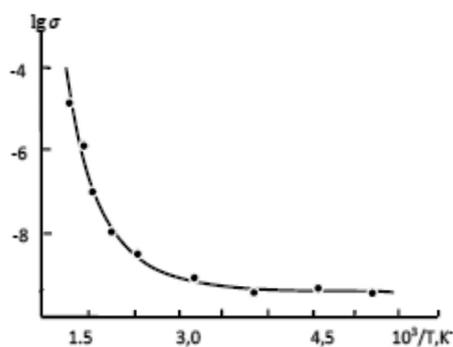
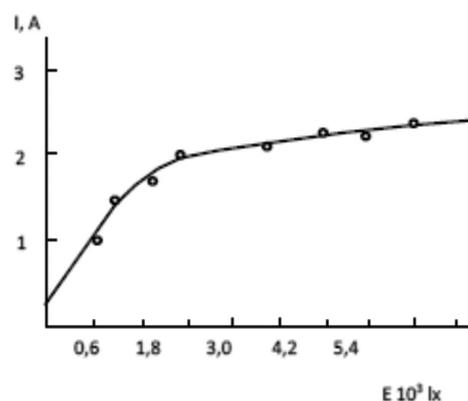
Fig. 3. Arrhenius plot of electrical conductivity for CaGaTe₂Fig. 4 Current-light curve of CaGaTe₂

Fig. 4 presents a room-temperature current light curve of a CaGaTe₂ single crystal at an applied voltage of 100 V. at low light intensity, there is only one type of recombination level between quasi-Fermi levels, which has identical capture cross sections for electrons and

holes. Another type of level is too deep to be regarded as a recombination level.

The triple compounds CaGaSe₂, CaGaTe₂, and solid solutions based on them exhibit intensely luminescent properties. When 0.01-0.05 mole% of the rare-earth elements

(Eu, Ce, Gd, Th, Sm, Nd) are added to the CaGaSe₂, CaGaTe₂ alloy and solid solutions based on them, the luminescence efficiency increases by a factor of 5-3. The spectra of photoluminescent crystals CaGaSe₂, CaGaTe₂ taken during the excitation of the crystal by laser radiation of medium power of excitation of the crystal by laser radiation of average power 0.8 W.

The long-wave edge of the photoluminescence spectrum of the CaGaTe₂ crystal is formed by annihilation of excitons. The energy of the exciton peak is 1.34 eV. The radiation intensity of exciton radiative recombination varies quadratically with the intensity of the exciting laser radiation. Taking into account that the photon energy of laser radiation is 1.167 eV, then it can be assumed that the excitation of nonequilibrium electrons occurs due to two absorption photons. The observed peaks in the photoluminescence spectra in the high-energy region attest to the reliability of this assumption.

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ECOLOGICAL CONDITION OF THE AREAS CONTAMINATED WITH OIL AND OIL PRODUCTS ON THE ABSHERON PENINSULA

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Pollution of the environment leads to degradation of all natural systems vital for the life. Such problems in Azerbaijan are distinguished with their complexity and diversity. In particular, contamination of some areas on the Absheron Peninsula with oil and oil products causes big environmental concern and makes necessary to focus on this problem. Given these issues, the paper studies ecological condition of the areas contaminated with oil and oil products on the Absheron Peninsula, which were grouped for the degree of destruction of their natural environment, based on the conducted environmental monitoring over the soil cover. The research is concluded with recommendations on improving the ecological situation in the region.

Keywords: Absheron, oil industry, pollution, ecology, reclamation

The Absheron Peninsula is located in the east of the Republic of Azerbaijan, the southeastern end of the Greater Caucasus, and on the west coast of the Caspian Sea (Fig. 1). The peninsula is the most economically and socially developed region in the country. The majority of chemistry, petrochemical and oil refinery facilities are concentrated here. About 80% of oil and gas production, and 1/3 part of the electricity generated in the country is accounted by this peninsula where the State Region Power Stations of “Shimal” and “Ahmadli” as well as four power stations more are located.

The development of the oil industry on the Absheron Peninsula had a positive impact on resettlement of population. Development of the oil industry at early twentieth century led to

the elevation of level of productive forces followed by the high flow of workforce to the city of Baku. Rapid development of oil-producing areas around the city led to the origination of new residential areas near the settlements of Sabunchu, Balakhani, Ramana, Zabrat, Surakhani, Binagadi and Bibiheybat. Later, the rapid development of urbanization and urban planning entailed the establishment of the city of Sumgait and 20 new settlements, as well as transformation of 40 villages into urban settlements. Presently, presence of Baku city, and also the cities of Sumgait and Khirdalan has a positive impact on the economic development of the region. However, the mentioned factors have been responsible for arising of number of environmental problems in the region.



Fig. 1. Absheron Peninsula

Materials and research methods

The ecological condition of polluted areas was assessed as a result of monitoring conducted in the study areas related to the exploitation of oil fields on the Absheron Peninsula.

Based on the published literature, the depths and percentage ratios of oil-contaminated layers were determined.

Toxic trace elements were identified in the composition of oil-contaminated rocks. Some radiometric measurements data were also used for the study.

Research results and discussion

The main environmental problems experienced by Azerbaijan in modern times have been related to the long-term oil and gas production led on the Absheron peninsula (Fig. 2), the Caspian Sea and the coastal areas to meet the energy needs of the former Soviet Union without considering the ecological requirements and consequences. Relatedly, the main causes of environmental problems in the area were: contamination of soil with wastes of oil extraction; origination of artificial lakes and ponds polluted with oil due to the lack of wastewater management for many years; and concentration of wastes of oil refining facilities.

Absheron's oil industry makes its contribution to the development of the world economy. The oil of Absheron contains lower portion of

sulfur, paraffin, resin and cox, and this factor indicates to higher quality of oil, and makes the refinery process cheaper as well. 39 million tons of oil has been produced in the country in 2017, according to official data.

In general, the ecological condition on the Absheron Peninsula has been deteriorated (Fig. 3) during the period of more than 150 years as a result of the development of oil industry. Recent studies confirm that the total area of oil-polluted areas is 10.6 thousand ha, while all the areas contaminated due to human activity make up 33 thousand ha.

“Complex Action Plan for 2006-2010 on Improvement of Ecological Situation in the Republic of Azerbaijan” was approved with the Decree of the President of the Republic of Azerbaijan dated to September 28, 2006 in order to improve the environmental situation. Under the Complex Action Plan it is envisaged to undertake appropriate measures as part of the works on the reconstruction of outdated communication facilities and establish new infrastructure [2]. Meantime, taking into consideration the limited financial resources, the Azerbaijani government prefers the step by step restoration of the infrastructure of the region and tends to assign the state budget and also resources of State Oil Fund to important projects on socio-economic development such as extension of communication networks, reconstruction and increase of capacity of the power generation facilities.

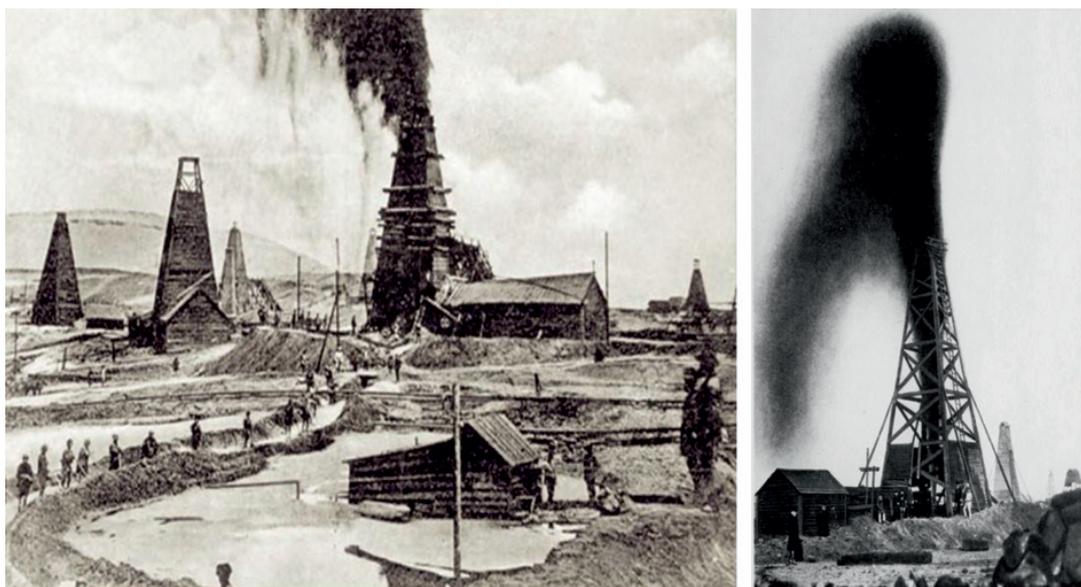


Fig. 2. Oilfields on the Absheron Peninsula (Until 1920)



Fig. 3. Environmental problems associated with the oil industry

Extremely high levels of chemicals present due to oil contamination have a negative impact on vegetation, and may cause various diseases among population. Microelements that are soaked in soils have physiological and biochemical effect after penetrating a human body. Eventually, pathological diseases can occur. This is because vital functions of the organisms are influenced by the environment that may contain rich or poor amount of macro- and microelements in a specific area.

Experts estimate that the depth of the layer, contaminated by oil and oil products on the Absheron Peninsula, reaches 2,0-2,5 m. The content of oil products in the soil is up to 26% [7]. Moreover, it should be noted that soils are degraded not only because of oil and oil products. The soils are subject to technogenic impact associated with socioeconomic activities that are typical for the entire area of the peninsula.

As is known, the degree of contamination with oil and oil products can be moderate (when the humus layer contains less than 6% of oil) or heavy (when the humus layer contains more than 6% of oil). Moderate contamination can be eliminated by activating the self-regulation process through using aerotechnical methods, whereas heavy pollution is preventable through using special measures that activate hydrocarbon processes

While the lakes of the Absheron Peninsula make up only 0.5% of the country's territory, the total volume of water collected in these lakes equal 40 km³. These lakes are subject to high pollution by both organic and chemical wastes, in particular oil and oil products. In Absheron, wastewaters discharged from refineries as well as oil and gas production facilities have generated ponds with area of 7-8 thousand ha in total. [6]. These lakes are responsible for

such adverse processes as degradation and salinization of the soils, flooding of surrounding lands due to rise of water level, and also release of hydrocarbons and other harmful substances into the atmosphere as a result of evaporation. To eliminate this situation, most of the marshy areas and wastewater ponds in the coastal areas of Bilgah, Buzovna, Mardakan, Pirshaghi, Nardaran, Novkhani and Sumgait have been dried in accordance with the “National Strategy and Action Plan for the Conservation and Sustainable Use of Biodiversity in the Republic of Azerbaijan”, and the ecological balance has been restored [1].

Pollutants present in the composition of lands of Absheron are filtered to as far as almost the groundwater table. Since in some cases the degree of contamination is higher than the soil buffer properties, hydrocarbon compounds may penetrate into groundwater [4]. Ground waters on the peninsula are mineralized to varying degrees depending on the chemical composition of the rocks, the depth of the rocks, the relief and the distance from the sea.

The normal background radiation typical for the oilfield waters of the Absheron Peninsula makes up $9 \mu\text{/hour}$ in the Caspian Sea and $18 \mu\text{/hour}$ in the areas of tectonic infraction. However, some contaminated areas with background radiation at $500\text{-}600 \mu\text{/hour}$ is recorded close to oil producing fields in the penin-

sula [6]. Oil production results in not only the contamination of fertile soils with oily pollutants and oilfield waters, but also the mechanical disturbances, destructions and degradation of the lands. Eventually, the areas of oilfields are not contaminated in the form of massifs but in the form of spots of different dimension. Technogenic complexity on the soil cover occurs as well [3]. Dissemination of such contamination should be prevented through the implementation of reclamation measures in those areas.

To assess the ecological situation on the Absheron Peninsula relevant to contamination with oil and oil products, identifying the degree of degradation of the natural environment is needed. In this research we used the data of environmental monitoring carried out with respect to soils, contaminated with oil and oil products (Fig. 4). The grouping was conducted as follows:

1) Conditionally cleaner areas where the natural condition has not been violated: Khirdalan, H.Z. Taghiyev, Yeni Yashma, Guzdek, Shikhlar, and Fatmayi.

2) Relatively clean areas with insignificant disturbed natural condition: Gobustan, Dubandi, and Zira.

3) Areas of crisis where natural condition has been dedegreed seriously: Balakhani, Sabunchu, Ramana, Zabrat, Garadagh, Lokbatan, and Sangachal.



Fig. 4. Studies conducted to improve the ecological situation of the Absheron peninsula

4) Catastrophic hotspots where natural conditions are significantly changed: Binagadi, Pirshaghi, Kara-Heybat, Masazir and etc.

The carried out research shows that the composition of the pollutants is variable by the oilfields, and can be observed differently in a same area. In the above mentioned areas, toxic microelements such as copper (Cu), zinc (Zn), lead (Pb), molybdenum (Mo), vanadium (V) and boron (B) and others have been observed. These microelements may pose a serious threat to the natural environment and human body when their concentrations are too high.

Radiometric measurements and relevant studies in regard to some areas and points on the Absheron Peninsula were conducted under various expeditions led by the Azerbaijan National Academy of Sciences and the Academy of Sciences of the former Soviet Union. Currently, such measurements are being carried out regularly in some areas. The observations conducted by the relevant entities of the Azerbaijan National Academy of Sciences show that the natural background radiation on the Absheron Peninsula varies about 6 μ /hour. Here, the minimum and the maximum values are 3 μ /hour and 25 μ /hour respectively. This is compliant with accepted radiation safety norms [5].

Conclusions

In order to improve the ecological situation on the Absheron Peninsula related to contamination with oil and oil products, conduction of land reclamation is needed. The duration and degree of contamination, as well as the physical, chemical and hydrophysical properties of soils must be taken into account when leading reclamation. The measurements may be mechanical, biological, chemical, thermal or biotechnological depending on the degree of contamination.

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ECONOMY EDUCATION COURSES'S ROLE IN PROMOTION OF STUDENT'S ABC OF FINANCE (RYBINSK BRANCHE OF RANEPА)

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There's analyzed some problems of promotion student's ABC of finance. There's any research of students and teachers in Rybinsk branche of RANEPА. Than, it's tested some students of the branche, that's find out a fragmented knowledges in the mail economy and financial problems. Students say that they have not nessecary knowlegesin financial sphere during their training. So, 12% of respondents say, that can't get a profitable credits in bank, 8% have any overdue credits. 34% of men and 32% of women want to study financial institute's action. Out of gender specific, students can not to create financial reserve for 3-4 monthes, can not difference real financial act from fraud scheme. For another thing, it's find that the main problem for economy study is absence any PhD in economy science in the Rybinsk branche.

Keywords: financial aducation, ABC of finance, finantialstrategies of students, economy socialization

Topicality of research

Mass media often say about modernization's of economy necessary, about development of small and middle business, about growth of education quality. Our research some documents (inside and outside) shows that universities can't to make some important functions, for example, there're some problems with economy socialization.

Position experts say that the most part of students're pathernalists and have not any financial skills, knowledges, which necessary in dynamic situation. [2, 6, 7, 17, 18, 19]

We agree with the opinion of sociologies, that system of education can't to adapt with demands of modern economy [10, 11, 14, 15, 16].

These, we try to analyze how universities can to provide economy education in modern situation.

Empiric base of research

In 2014-2015 it was made the research of students of Rybinsk branch of Russian academy of nation economy and state service of President of Russian Federation. (RANEPА).

The sample's with quotation. The sample population is n=226. The variables of quotation are sex, stage of education, age.

The research of professors and teachers for analyzing the level of financial skills and knowledges of students . n=5.

It's made secondary analyze of data:

– Federal service of statistic

– The results of WCIOM and Institute of sociology RAS research (Moskow)

Than, it's made content-analyze of regional and municipal media which shows problems of financial education of students in 2018

Methodological base of research

Methodological base of research is theory of D. Coulman, [3] macdonaldization

of society of G. Ritzer, [8] concept of post-material values of R. Inglehurt [5] and some research of J.M. Keynes, S.A. Baburkin, O.V. Eparkhina, A.V. Limarev, S.L. Talanov [1, 4, 6, 7, 9, 10, 13, 20].

Author's anticipation

1. The most part of students have a light knowledges in economy and financial sphere.

2. Men have a better knowledges in economy and finance than a women.

3. The most part of women can't control their payments and that's why they often have a debts with friends.

4. Out of gender specific students can't to create financial reserves for 3-4 month and can't difference real financial act from fraud scheme.

5. Teachers can't use in their work by economical courses any possibility for financial education growth.

6. The main problem in economical courses is absence of any PhD in economy science.

7. A small part of students prefer to be hired worker but not to be a businessmen.

The results of research

At first we as a researchers interested in opinion of students about their financial education. 56% men and 67% women says that their knowledges in financial sphere are well and only 17% men and 14% women says that their knowledges in financial sphere are working. When their age growth students are less optimistic in their opinion about their financial education.

In spite of a small part of students who says that have f nice knowledges in financial sphere, 45% of men and 51% of women wants to make better their knowledges in credit sphere.

In our research we suggest the student to test yourself in economics. The result of test

shows that the worst knowledges students have about methods of economics and function of economics. Then, only 17% of men and 19% women know about the main thesis of mercantilism and physiocratic theories. 42% of men and 21% women know about economical theory of K. Marks. Only 12% men and 10% women can difference conceptual thesis the main economical trends – neoclassical, neokeynesian, monetarism. The respondents knowledges in production sphere far more higher than in history of economy theory development. So, 54% men and 47% women have a good knowledges about material and nonmaterial produce. 49% men and 72% women know about indexes of development of produce forces.

37% men and 52% women know about objective laws of growth needs.

The research shows that students know far more better economical topics that suggested in social science course than the topic which students studied in Rybinsk branch of RANEP. So, the most part of men – 89% and 92% of women have a good knowledges about economy system.

65% of men and 72% of women know about problem of optimal choice and about curve of production possibility.

Men (75%) far more better know about type of property than women (38%).

Women (78%) far more better know about type of markets and about offer and demand than men (57%).

The research show that 7% of women and 14% of men have a business. This group of students have far more serious and deep knowledges in economy and financial sphere. As a part, this group of students far more better know the main types of market and problems of monopoly and business struggle.

Then, students-businessmen know the theory of consumers behavior, know very well about “substitution effect” and “salary effect” in a curve of demand.

Students who have not their own business, have a poor knowledges about business as a factor of production. This group of students say in their feedback-forms that the development of country and economy depends not only with small and middle business. In their opinion, the big business only can be locomotive of economy. They say that government must have a maximum control of economy because it escape social disparity, unemployment, some other negative facts.

Out of gender specific, students have a high level of knowledges about the growth of economy and the types of this growth. Students

know about factors of the economy growth and influence of STD on the economy growth.

The students have a high level of knowledges about cycles of economy development. All of students know about economy cycle and about phases of the cycle.

The problems of types of crisis (long wave of N.L. Kondratiev) are difficult for students. But they have a good knowledge about specific of Russian crisis of 90y.

Students in their tests show a fragmented knowledges about the role of state in economical process. They have a light knowledges about tools of state government.

Students know very well about money system and currency. It show a high grade of tests.

87% of men and 94% women know very well about the main models of money demand, about machine of money market, about demand and offer influence in money market on GDP.

It's a pity, but students have very bad knowledges in credit sphere and in budget and tax policy of state. They know the function of Central Bank only. Only two students know about curve of Laffert.

Students have a light knowledges about inflation and antiinflation politics. 56% men and 67% of women have no any information about the reasons and about forms of inflation. They have knowledges about inflation effects and the only one student know about the curve of Phillips and about grades of inflation (monetarism, Keynesian theory).

Students says that they get very small information about social politics of state in market condition, about main channels of money salary. Nest show that 3 students only know about Gini ratio and about logic law of Pareto.

The topic “unemployment” and “state politics of employment” were studied very well by students. So, 87% of men and 63% of women know about unemployment and about the types of employment. 68% men and 72% women know about Ouken law. All of students have any knowledges about employment and unemployment regulation by the state.

Students have a light knowledges about topically problems of integration Russian economy in the world economy, haven't knowledges about international trade and international monetary politics.

As a positive moment we can make a point that students know about currency and convertible currency.

Students explain that all the economy literature in library of Ribinsk branch is regular renovate. In the same time, students explain in their feedback-forms that they don't get

necessary financial knowledges during the study process in branch. So, 12% of respondents says that can't get a profitable credit in banks. 8% explain that have a debt for credit.

34% of men and 32% of women want to study the work of financial institutes.

76% of women say that they can't to control their payments and that's why they often have a debts with friends before salary. 34% of men say that permanent have a debts with friends or family because have not any financial reserves.

The most part of students (78%) prefer to be hired worker but not to be a businessmen. 7 respondents explain than they have been a businessmen, but they killed their business because administrative barriers and non-transparency of some procedures. They became a hired worker. In their opinion, our state declare a support of small and middle business, but never support it really.

Teachers in their deep interview explain that they try to give necessary level of knowledges, skills and experience in economy and financial sphere, but the time is not enough to study some competences. Than, they say that a small salary force to have another work in other universities. They have no time to raise their professional level in economy and financial spheres.

Care-taker of director of branch RANEP N.I.Rogov in his interview say: "branch active finding finance to raising of level of knowledges of teachers in universities in Nizhny Novgorod, Moscow, Yaroslavl. Than, we invite the best teachers of Yaroslavl State pedagogical University named by K.D. Ushinsky for public lections."

We have a test with students of Orlov branch of RANEP in 2017 again (Rybinsk branch was connected with Orlov branch)

Here we present some results of this test . Economic theory was tested. 46% of men and 39% of women show a good knowledges about economic theory. 67% of men and 78% of women have a clear knowledges about the structure of economic theory. The same knowledge 're shown about methods of economic science. So, 92% of men and 88% of women know about the most important cognition skills and about lows of thinking (induction, deduction, analysis, synthesis).

Unfortunately, only 64% of men and 47% of women know all the functions of economic science. The responses about history of economic theory are far more worse. Only 16% of men and 19% of women know about thesis of mercantilism and phisocratic theory. 24% of men and 27% of women know about English classical school.

Magnificent knowledges students show about specifics of K.Marks's economy theory . But only 42% of men and 29% of women can distinguish conceptual thesis of main economic schools. 76% of men and 59% of women know about material and nonmaterial production.

Serious knowledges students show about the indicators of production force development. 78% of men and 91% of women know about economical production and economical effectiveness. 79% of men and 83% of women know a low of need's growth .

Serious knowledge students show about economical resources too. The students know about economical systems far more better. All the students of the branch know specifics of traditional , administrative and market-driver economical system.

But unfortunately, only 17% of men and 26% of women know about a curve of production capacity and it's methodological significance.

65% of men and 79% of women have a good knowledges about types and forms of property.

Analyses of responses again show the topics which's captured by students very well. One of these topic's "Low of demand and offer". Probably, this topic's captured by students in their school or during preparation for UGE.

All the students show a good knowledges about essence and functions of money. Students've a light capture with matherial about market and types of business struggle.

Students have a clear knowledges about positive and negative aspects of monopoly. 45% of men and 43% of women know about consumer equilibrium. 32% of men and 15% of women know about specifics of demand's and offer's creating in resource market. Only 9% of men and 6% of women know about equilibrium in finance market.

Research of the teachers show that they use new types of lection in their branch:

- Visual lection;
- Problem lection;
- Double lection;
- Lection with a planning errors;
- Lection press-conference.

As the teachers say, students on a distance course have an interest about some topics: "trade wars between UE and Russia", "economical cooperation Russia with China", "Russia and WTO". Students take an active part in science practical conferences and have some articles with the results of research.

We research publications in RINC-base, citations, Hirsh Index of PhD and candidates

from Orlov branch of RANEPa and we fix that some of teachers have a stable publications in journals from Web of Science, Scopus. Besides of the big number of science articles, teachers've a monographies, methodical books very often.

In 2017 we've research in Orlov branch of RANEPa. Students of the branch say that:

- Have a pleasure in lessons (82%);
- Have an active and goaled work with necessary and other literature (65%);
- Have an activity in seminars and practical lessons (69%);
- Have a skills in informatics technologies (90%).

We ask respondents to fix how active students use modern technique and information technologies of learning in education process. As a stunents in our research say, these were used very often in learning process:

- Multimedia for presentation (98%);
- Computer programs for tests(86%);
- E-books (74%);
- Interactive desks and simulation (47%);
- Learning films (59%).

The results of test s and research says that the branch have all the conditions for effective education process.

Management of the branch, teachers say that, unfortunately, the main problem for study of economical part is absence of any PhD in economy science.

It's.interesting for us in this research what's the role of the state in mixed economy system, for our respondent's opinion. 56% men and 71% girls suppose that the reach people must pay more tax that middle class people and far more that poor people. That's why this part of respondents offer to use progressive scale of tax. 87% men and 90% girls say that's necessary to make far more hard amenability for corruption. 91%men and 94% girls answser that the state must to increase costs for cosial goals: medicine and education. All the respondents wants to increase minimum of salary in country untill the real level of living. For another thing 76% men and 79% girls offer to increase minimum bundle of foods. 85% girls offer to increase prenatal allowance and every month aid for children untill 1,5 years old. The results of research show that the most part of student youghth have a pathernalistic position.

Conclusion

The research show that the most part of students have a light knowledges in financial and economy sphere.

It's necessary for raising of financial and economical ABC:

– From time to time to raise ABC for teachers in financial and economical sphere. It's necessary to have a finance for their study on courses and in the main universities of Moscow and Sankt-Petersburg

– To foresee any finance for student's academy mobility in the main universities of Russia and Europe

– To organize free entrance to international bases of citation (Web of Science, Scopus) for teachers and students in library. It's necessary to find a finance for it.

– To invite the famous economists and financial specialists from MSU and HSE for lections.

– To make a science-practical conferences for main financial and economic problems

– To invite the practice-economists and financial specialists from financial institutes of region and city for economics lecture. It's necessary to have an attached finance.

– To print attached brochures where to describe detailed how to get consumer credit, mortgage ect., how to difference fraud scheme, where to get a help in this case

– From time to time to product topically video for raising financial ABC.

It's necessary to invite bank-experts to the university for lections. Every student group must have some lections about:

- bank cards and it's security;
- credit problems: guarantee of payment and collectors;
- autocredit;
- microfinance service;
- cash disnenser and defrauders;
- personal finance planning;
- family planning;
- family income and costs planning;
- creating of longterm savings;
- search and using of necessary finance information;
- rational choice of financial service;
- finance service's consumers rights;
- markers of finance defrautering;
- risks in finance service market;
- obliges of taxpayers;
- pawnshop: sale of nondemanded property;
- right buying;
- mortgage credit service;
- what's necessary to know for auto buying;
- finance preparing to the pension life.

If it's possible all these lections must be printed as a broshure in a standart book format. It's necessary to print it every year by the big number of copies. Broshures must be given all the students, teachers, prospective students in "open door days".

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HOW LARGE BUSINESSES CONVERT VOLATILITY IN EMERGING MARKETS INTO OPPORTUNITY

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The article describes with what challenges international companies face with when they do business in emerging markets. The author reveals 7 strategies which can be used by global corporations to effectively combat evolving challenges and maximize value from doing business in developing countries. The article touches important aspects of operations including portfolio analysis, pricing strategies, foreign exchange risk management and organizational changes. The key objective that the author pursued was to demonstrate that regardless of severance of the financial crisis there are always ways to minimize losses and mitigate risks. Throughout the text, the author provides personal perspective based on his own professional experience and knowledge. Below strategies can be applied during high inflation, exchange rates volatility and during decline in purchasing power of consumers. The article will be interesting for those who deal with corporate finance, strategies, financial analysis, emerging markets and crisis management. Everybody who study financial management can find interesting approaches in the article based on first hands experience.

Keywords: emerging markets, strategy, international business, consumer goods, financial crisis

In fact, the rapid pace of change and unpredictability in volatile markets make it harder for any company to plan and commit on top line as well as bottom line figures. However, in case with international companies, once volume and profit forecasts are submitted to headquarters, it has to be delivered upon HQ's expectations, otherwise the creditability of local management might be seriously doubted. As a result, the question "What shall we do today in order to deliver tomorrow even if a storm arises?" is on top of the agenda among business leaders in emerging markets. The article describes 7 strategies that, when implemented properly, may help consumer product goods companies to be better prepared for uncertainties and capture growing opportunities in the world's most dynamic economies.

Strengthen portfolio via down-market brands

In the parts of the world where buying power of consumers is constantly decreasing due to growing inflation, companies need to have a balanced portfolio in order to win in a down trading ecosystem. In my experience, I witnessed how quickly consumers are able to switch from premium brands to low-tier ones leaving smaller chances for superior products to succeed. Therefore, to convert a threat into opportunity, launch of a down-market brand can be a solution. Firstly, having a down-market brand in the portfolio, the company protects its market share by capturing its existing customers who have started to move down due to personal budget constraints. Secondly, it allows to target a different customer type that was out of radar before, thus generating ex-

tra sales. Selling more volume leads to higher market share; high market share means bigger scale, cost advantages, greater market power and larger cash flow.

Indeed, to have a down-market brand in the portfolio is necessary but that alone isn't sufficient. Stephen Wunker in his article "5 Ways to Reach Down-Market Consumers Without Harming Your Brand" mentioned that marketers and financial managers should work together to develop the right marketing mix for a newly introduced offer [2]. The brand should be properly distinguished from core product line in terms of pricing, promotion, distribution and merchandising. In fact, placing differently priced offerings next to each other on the same shelf creates confusion among shoppers and pushes them to choose the brand which stays in the middle. One way to avoid this is by selling premium and low-tier brands in separate trade channels or at least merchandise them differently.

Optimize portfolio to eliminate gaps and embrace opportunities

While down-market brands improves company's sales and market share during times when people are stretched in budget, when consumer confidence increases premium and super premium offers will be keys to high profitability margins. Therefore, when building a portfolio strategy, it is important to keep in mind that any crisis is temporarily and eventually consumers' affordability will improve, creating demand for aspirational brands. Then the question arises: "How to build the balanced portfolio that embraces opportunity?" A good start is to analyze existing brand board in order

to detect gaps and missing prospects. “Does the current product line satisfies needs of target consumer segments?” “Does it provide offer for growing segment?” “Does the assortment look overlapping?” “Does the portfolio clearly communicate value of each brand to customers?” – all these questions would apparently evolve when the company decides to increase the portfolio’s value by making strategic decisions on the restructuring, acquisition, divestiture or launch of brands.

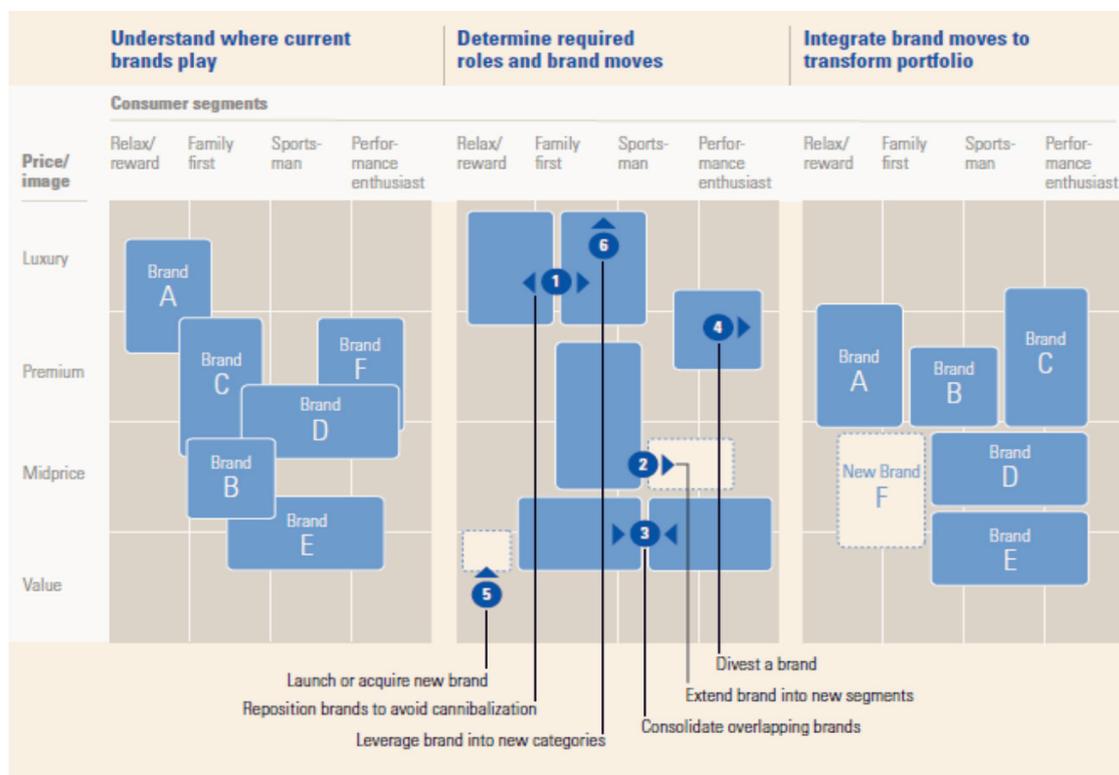
Exhibit 1 shows how companies, based on McKinsey’s analysis in the article “*Making Brand Portfolios Work*”, can restructure their brand portfolios in different ways, which are often interconnected – if one brand is repositioned, another can be extended into a new category [3]. The ultimate goal is to enhance the portfolio by positioning brands distinctively, eliminating inefficiencies (e.g. overlapping) and monetizing potential growing opportunity.

Setting the portfolio strategy is never easy – it requires resources, is costly and risky. However, in dynamic markets, where economic environment and consumers’ needs changes

rapidly, companies have to put brand-portfolio management in perspective in order to be a step ahead of the competition.

Drive pricing momentum wisely

Based on my experience I know that during economic crisis consumption patterns significantly change. Particularly, people start to consume less, switch to store brands and become very responsive to discounts, special offers and promotions. As a result, decline in demand make large companies decrease volume forecast what negatively affect their revenue. In this case, the power of pricing comes into play, compensating decline in sales and delivering top line numbers. However, development and execution of effective pricing programs, that will generate positive returns, requires a deep understanding of buying behavior of consumers, particularly in emerging markets. For instance, in developing countries people tend to shop frequently at open-air market stands or small neighborhood grocery stores while their peers from developed markets enjoy superior customer service at modern trade [1].



Potential restructuring of portfolio [3]

If executives decide to drive pricing aggressively, than a sharp increase in prices would shock consumers making them switch from global brands to store brands or local ones, sacrificing quality for saving a family budget. Therefore, the question arises: “How to drive pricing during recession with minimum hurt for consumers?” The answer is – via bridging plans.

Bridging plans are sets of activities developed to transit consumers smoothly from one price point to another. Those activities may contain one to many actions depending on company’s capabilities and market environment. One of the simplest in terms of execution is gradual pricing. For example, a company has lost 20% of sales due to 20% decline in volume and wants to restore the sales via pricing. In order to do so, with all things being equal, it has to increase prices by 25% ($1/0.8-1$) which is a significant jump and may lead to further reduction of volume. Alternatively, immediate price up of 25% can be divided into 3 or 4 steps – 10% increase at first followed by 5%, 5% and 3% increase respectively. In fact, gradual pricing builds effective communication with consumers, because it allows to monitor how demand reacts on new price points, learn from real-life experience and make timely corrections if needed; while in case with immediate pricing the cost to revoke the decision can be very high. In addition to gradual pricing, investment into temporary promotions is a good solution to retain loyal customers. For instance, “Buy four get one for free” or “Special discount on bulk sizes” – all these allow households to build long-term stock at discount staying loyal to a brand.

Hedge foreign exchange risk to minimize pressure on profitability

Since 2008 many global companies are facing the fact that it is a particularly tricky time to do business in emerging markets due to currencies’ exchange rates volatility. In fact, a series of events – credit crisis, falling oil prices, geopolitical tensions and reduction of foreign investments into developing economies – all these led to significant devaluation of local currencies putting a pressure on international companies’ profits. For instance, Russian ruble in Sept 2008 was trading at ~25.5 per dollar; ten years later, in Sept. 2018, it was trading at 67 rubles per dollar meaning that in order to report the same revenue in dollars in Sept. 2018 as in 2008 it requires to collect 2.6times more rubles than a decade ago [4]. Therefore, proactive FX hedging is vitally necessary to avoid

sizable transactional and translational losses in income statement.

First of all, reduction of expenses in foreign currency helps to decrease transactional losses. For example, an international company does business in Russia consequently it collects revenue in rubbles but its’ expenses aren’t necessarily all in local currency – suppliers of materials, advertising agencies, key business partners and etc. – some of them might ask to pay them for service performed in hard currency (e.g US dollar). In this case, having contract obligations with partners in USD, the company exposes itself to inescapable losses when the ruble decreases in value. Therefore, to avoid transactional losses, a global producer should exploit its negotiation skills to minimize expenses in hard currency. Those negotiations can be tough so the management has to be ready for pushbacks. I remember it took us a while to assess the bargaining power of suppliers before we could make a progress in negotiations and respectively hedge FX risk.

Another tool to manage currency risk is to use FX forward contracts that allow to purchase or sell currency at predetermined exchange rate and at a certain date in the future. The major advantage of this option is predictability, which means a company will be able to build a precise forecast thus protect itself from ups or downs in exchange market. However, “forwards” are financial instruments that have to be monitored and managed very careful; therefore it requires specific expertise and skills. Moreover, if a spot exchange rate changes unfavorably versus forward rate the company will incur losses and in this case the hedging via forward contracts would hurt not help. Nevertheless, existing instability on FX market make it critical for companies to proactively build capabilities that are strong enough to stand the test of volatility.

Take contingency planning seriously and keep it up-to-date

What if your biggest customer goes bankrupt and stops paying you tomorrow? What if your distributor stops operations today because of XYZ reasons? What if...? – these are questions to think about because there are millions of negative events that might happen at any time, especially the high risk of failures during the recession. Therefore, business leaders have to be proactively prepared for unknowns and, when undesirable situation occurs, protect the business from catastrophic consequences. To do so, companies should

develop Business Contingency Plan (BCP); a course of actions that the organization would take if an unexpected negative event happens. Ideally, BCP should contain a list of all potential threats that can undermine the organization's reputation, financial health or ability to stay in business, providing specific instructions on how to combat those threats when a crisis hits.

For global companies BCP is high priority and management pay a lot of attention to keep it relevant and updated all the time. Specifically, it is vitally important to have a solid BCP if you operate in unstable markets where political, economic and social environment changes very fast and consequences of those changes may hurt day-to-day business activities. For example, I know a case when a distributor, which was the biggest customer, suddenly stopped its operations meaning that the producer urgently had to find solutions on how to revive sales. In this case, the senior executives referred to BCP and followed the guidelines that recommended switching from outsourced to in-house distribution until a new partner (distributor) could be found. Hence, using corporate cars and available human resources the company could build its own product delivery capabilities thus could manage the temporarily crisis.

Unfortunately, based on my observations small and medium firms underestimate the importance of contingency planning – they either keep it for the sake of having it in folders or don't have it at all. My personal position is that BCP serves the role of a life jacket for business – it can stay in the emergency cabinet forever or when an accident happens can save the enterprise. You may never use it but is necessary to have and keep up-to-date.

Prepare a list of choices before you have to make them

Sometimes, due to the recession, the pressure on profitability can be very strong and management has to make tough choices in order to achieve financial goals of the company. If cost-cutting programs are inevitable it is better to proactively analyze the budgets and decide which expenditures bring insignificant value to the business.

In my career, I had a chance to lead cost optimization projects where I precisely analyzed investments into marketing programs, estimated effectiveness of those and provided recommendations to management regarding which activities contribute to business's objectives and which ones don't. I only focused

on brand and trade expenditures because these were the biggest expenses in overall marketing budget. The analysis showed that the company spends money on two types of activities: 1. Ad-hoc projects that require onetime investment; 2. Ongoing promotions that require constant cash outflow within the year. If the first were cascaded from HQ as "must have", effectiveness of ongoing promotions could be easily challenged. As a result, I found out that some incentives pushed volume very well, others highly contributed to profitability margins, a few did both – increased profit and units sold – but several of them delivered neither profitability nor volume. Having this analysis, the team could decide whether it is better to stop doing ineffective marketing campaigns and re-invest funds into more promising opportunities; or release these budgets to increase net earnings. In any case, we achieved a flexibility that we could leverage for resource allocation purposes to improve business metrics.

Drive ownership culture in the organization from the top to bottom

When every single employee wakes up every morning and asks himself "How can I improve the business performance of the company I'm working for?" then any crisis shouldn't be an issue at all. When a person treats company's assets as his own and makes decisions in the best interest of business, he demonstrates high ownership and entrepreneurial mindset that eventually brings tangible benefits for the organization in the long run. Therefore, the goal is to build a sustainable ecosystem where, regardless of seniority, every employee constantly looks for ideas to eliminate inefficiencies in the value chain, save money for the company, and, eventually, strengthen the business. The only way that top managers can integrate the ownership culture into company's DNA is by leading by example. It is wrong to ask your team not to do things that you're doing or vice versa. For instance, I worked in the culture where top managers, for business trips, flew with economy class and stayed at friend's houses instead of hotels. They didn't have to do it, but they were willing to save budgets in order to reinvest them for returns. As a result, every person in the organization was led by example, and eventually, cost savings initiatives have become part of a daily routine. Only by cascading the culture from top to bottom are the senior managers able to motivate their teams to do the right things for business; but, first, they have to become role models.

Conclusion

Large companies constantly face uncertainties in developing countries and there is no a single recipe on how to overcome headwinds. Challenges vary significantly and always arise at the wrong time. To enable the business to compete in increasingly fast-paced markets large businesses should take an incremental approach to the development of their crisis management capabilities.

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SOFTWARE SOLUTIONS FOR INSURANCE COMPANIES OVERVIEW

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This article gives a general overview of insurance domain and describes the current situation on the information technologies market in the insurance area. The article also explains the reasons for its growth and potential in this area. The paper additionally explains the causes and consequences of the influence of IT technologies on different industries and particularly insurance companies. An overview of user's expectations and preferences of a modern software product is given as well. The authors have chosen the eight most popular products of the solutions for insurance agents. A detailed analysis of those solutions is given in terms of the target audience, the number of potential users of the system, pricing policies, supported platforms and the availability of training materials and support. The authors tried to derive the main technological criteria that are required for a successful company nowadays. The authors have also made a conclusion regarding the popular solutions in this market.

Keywords: insurance domain, information systems, applied solutions, software analysis

According to the American Heritage Concise Dictionary, insurance is a contract that protects the insured from loss. An insurance company guarantees payment to the insured for an unforeseen event in return for the payment of premiums [4]. Insurance protects your interests in case of trouble. Anything can happen: fire, flood, theft, accident, injury in sports, sudden illness. Of course, we must believe in the best, but it is equally important to be able to prevent risks. You can choose insurance voluntarily, but there are types of insurance that you are required to have by law.

Insurance technologies is a relatively new industry. Nevertheless, the growth rate makes it possible to call it one of the most active segments of the market. Even despite the 34% decline in 2017, the number of transactions in the field of insurance technologies nevertheless increased by 25%. As for the abnormal growth in 2015, it was caused mainly by unusually expensive Chinese transactions, including an

investment of \$ 1 billion in one of the largest insurance startups Zhong An.

Modern IT-industry becomes an integral part of a variety of industries – from the mining industry to food production. The insurance sector was no exception to this rule. The more actively computer technologies develop, the higher level they demonstrate, the more effort customers need to make to be aware of the changes and current IT trends. On the other hand, practice shows that the successful introduction of modern IT-solutions contributes to improving the productivity of enterprises, helps to optimize business processes [1].

To have a better understanding of the current situation on the insurance software market, let us compare some of the top rated solutions. Below we have chosen 8 software products and assessed them by the most crucial parameters. The materials are taken from [5].

First, let us consider what the target audience is, the results are represented in the Table 1.

Table 1

The target audience

| | Who Uses This Software? | Target Customer Size (Users) |
|-----------------------------|---|------------------------------|
| AccuAgency | Independent insurance agents looking for a software partner. We offer agency management, personal auto comparative rater, websites and web marketing. | 1 – 499 |
| Compulife Quote Software | Individual life insurance agents and life insurance agencies | 1000+ |
| EZLynx | Independent insurance agents seeking to expand their agency's productivity and streamline workflows. | 1-1000+ |
| ISI Enterprise | ISI Enterprise is ideal for Property and Casualty insurers writing 0 – 500 m in premium. | 10 – 1000+ |
| C2MS Insurance ERP Software | Brokers, Scheme Managers, MGAs, Insurers, Claims Handlers | 10 – 1000+ |

| | | End Table 1 |
|--------------------------------|---|------------------------------|
| | Who Uses This Software? | Target Customer Size (Users) |
| CompuOffice Software LifeGuide | Financial institutions, brokers, advisors, agents, actuaries and lawyers. | 10 – 1000+ |
| iPipeline LifePipe | N/A | N/A |
| QQ Solutions QQ WebRater | N/A | 10 – 1000+ |

Another parameter is pricing policies, which are represented in the Table 2 below.

Table 2

Pricing

| | Starting Price | Free trial | Free version |
|--------------------------------|--------------------|------------|--------------|
| AccuAgency | \$65.00/month/user | Yes | No |
| Compulife Quote Software | \$180.00/year/user | Yes | Yes |
| EZLynx | N/A | Yes | No |
| ISI Enterprise | N/A | No | No |
| C2MS Insurance ERP Software | N/A | Yes | No |
| CompuOffice Software LifeGuide | N/A | No | No |
| iPipeline LifePipe | N/A | N/A | N/A |
| QQ Solutions QQ WebRater | \$38.00/month | N/A | N/A |

In addition, of course the most important parameter is the feature set and the list of supported platforms. Let us review them in the Table 3.

Table 3

Feature set and supported platforms

| | Platform | Features |
|--------------------------|---|---|
| AccuAgency | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● Carrier Upload ● Comparative Insurance Rating ● Multi-State |
| Compulife Quote Software | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● Comparative Insurance Rating ● For Life Insurance ● Multi-State ● Multiple Line Rating |
| EZLynx | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● Broker / Agent Portal ● Carrier Upload ● Commercial Lines ● Comparative Insurance Rating ● Customer Portal ● For Casualty Insurance ● For Personal Insurance ● Multi-State ● Multiple Line Rating |

| End Table 3 | | |
|--------------------------------|---|---|
| | Platform | Features |
| ISI Enterprise | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● Broker / Agent Portal ● Carrier Upload ● Commercial Lines ● Comparative Insurance Rating ● Customer Portal ● For Casualty Insurance ● For Personal Insurance ● Multi-State ● Multiple Line Rating |
| C2MS Insurance ERP Software | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● Broker / Agent Portal ● Carrier Upload ● Commercial Lines ● Comparative Insurance Rating ● Customer Portal ● For Casualty Insurance ● For Health / Medical Insurance ● For Life Insurance ● For Personal Insurance ● Multi-State ● Multiple Line Rating |
| CompuOffice Software LifeGuide | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● Broker / Agent Portal ● Comparative Insurance Rating ● For Casualty Insurance ● For Health / Medical Insurance ● For Life Insurance ● Multiple Line Rating |
| iPipeline LifePipe | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● For Life Insurance |
| QQ Solutions QQ WebRater | Web/Installed  Mobile  | <ul style="list-style-type: none"> ● Broker / Agent Portal ● Carrier Upload ● Commercial Lines ● Comparative Insurance Rating ● Customer Portal ● For Casualty Insurance |

And the last but not least parameter is available training materials and support which is represented in Table 4.

Training materials and support

Table 4

| | Support | Training |
|------------|--|---|
| AccuAgency | <ul style="list-style-type: none"> ● Business Hours ● Online | <ul style="list-style-type: none"> ● In Person ● Live Online ● Documentation |

| End Table 4 | | |
|--------------------------------|---|---|
| | Support | Training |
| Compulife Quote Software | <ul style="list-style-type: none"> ● Business Hours | <ul style="list-style-type: none"> ● In Person |
| EZLynx | <ul style="list-style-type: none"> ● Business Hours ● Online | <ul style="list-style-type: none"> ● Webinars ● Documentation |
| ISI Enterprise | <ul style="list-style-type: none"> ● Business Hours ● Online | <ul style="list-style-type: none"> ● In Person ● Live Online ● Webinars ● Documentation |
| C2MS Insurance ERP Software | <ul style="list-style-type: none"> ● Business Hours ● Online | <ul style="list-style-type: none"> ● Live Online ● Documentation |
| CompuOffice Software LifeGuide | <ul style="list-style-type: none"> ● Business Hours | <ul style="list-style-type: none"> ● Live Online ● Webinars ● Documentation |
| iPipeline LifePipe | N/A | N/A |
| QQ Solutions QQ WebRater | <ul style="list-style-type: none"> ● 24/7 (Live Rep) ● Business Hours ● Online | N/A |

To summarize let us list what particularly goes into a cutting-edge platform for the technology-savvy insurance company. It depends on the specific client, but there are a few things that they have in common.

Cloud-Based Architecture is a technology that has already taken hold across the insurance industry is cloud computing. Hosting insurance software solutions in remote data centers, rather than on local servers at the insurance offices, benefits both insurers and their clients in several ways:

1. *Cost effective.* Maintaining local servers represents a high consumption of resources for both basic installation and current maintenance and repair. By placing these costs in a separate data center, insurance companies can save money and offer lower prices.

2. *Scalability.* Another advantage of a remote data center is easy scaling. Dedicated hosting providers can allocate more or less server space as needed through a simple phone call.

3. *Unified Updates* – since the software is located in one remote location, update management moves to the second block. Anyone who accesses cloud software will have the same experience and work with the same version.

4. *Remote control.* At its core, cloud software is available and supported from anywhere in the world. The current development of insurance software can be easily outsourced to remote workers, which is the reason for significant cost savings for both wages and travel expenses.

5. *Customer-centric experience* – a cloud system can provide end users, insured, secure

access to systems via the Internet. This allows insurers to offer a convenient online portal for managing their own customer data, accessing information and even filing claims. A cloud-based architecture also enables greater efficiency in the insurer's work.

Many insurers, even those who delve into the large-scale updates needed to stay ahead in the modern market, lose sight of the simple fact of life – mobile captures the world. In 2018, research showed that the use of mobile devices surpassed the use of PCs on the Internet [3]. The average consumer is simply no longer interested in sitting at his desk to shop, surf, or pay bills. Or even to meet their insurance needs.

An application or at least a mobile-friendly website is no longer a must for an insurance company. Everything customers want to do on the Internet, they have to do from their phones and tablets [2].

Taking into consideration all above mobile support is missing in all of the reviewed solutions. That means that a mobile solution for this area will be highly demanded.

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THEORETICAL ASPECTS OF PERSONNEL MANAGEMENT RESEARCH

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Personnel management remains an innovative direction in economic science. Improving the system of personnel management to date is included in the priority strategic goals of development of personnel policy in various spheres of economic activities. Especially sharply this question costs to the state institutions, as at the moment there is a modernization of the civil service system. Adaptation of this aspect for the Institute of public service, which, in turn, is very specific, requires a special approach to the study of the system of work with personnel in a public institution. This is due to the relevance of the topic. Personnel management in the civil service plays a Central role in the personnel management system. Most countries have established public service systems that seek to promote merit, viewing this approach as the best way to effectively deliver public services in the digital economy. In particular, the ideal of public service includes the protection of public servants from arbitrary decisions regarding employment and dismissal, as well as payments that contribute to good governance and the performance of public and municipal employees. Modern difficulties in the management of personnel of the authorities are due, firstly, to the complexity of management work in the state and municipal service; secondly, the fact that the staff is the most complex object of management in the state structure; third, the fact that the system of values of employees is changing, which is associated with the tightening of economic restrictions; fourth, the fact that as a result of the growth of the number of personnel, its more effective development and rational use is required. Under these conditions, there is a change in the paradigm of personnel management of public authorities. The system of personnel management goals is changing; the system of interaction between the subject and the object of management is becoming more complicated. The processes taking place in the personnel management system of state bodies require a clearer definition of functions, their analysis and enrichment. With regard to the field of personnel management of the public service, it can be considered that the functions are specialized activities of the public authority, its personnel service in relation to the tasks solved in the process of personnel management.

Keywords: public services, public service, personnel management, civil servant, public institutions, management functions, effective development

Personnel management remains an innovative direction in economic science. Improving the system of personnel management to date is included in the priority strategic goals of development of personnel policy in various spheres of economic activities. Especially sharply this question costs to the state institutions, as at the moment there is a modernization of the civil service system. Adaptation of this aspect for the Institute of public service, which, in turn, is very specific, requires a special approach to the study of the system of work with personnel in a public institution. This is due to the relevance of the topic. Personnel management in the civil service plays a Central role in the personnel management system. Most countries have established public service systems that seek to promote merit, viewing this approach as the best way to effectively deliver public services in the digital economy. In particular, the ideal of public service includes the protection of public servants from arbitrary decisions regarding employment and dismissal, as well as payments that contribute to good governance and the performance of public and municipal employees [2, p. 26]. Modern difficulties in the management of personnel of the authorities are due, firstly, to the complexity of management work in the state and municipal service; secondly, the fact that the staff is the most complex object of management in the state structure; third, the fact that the system of values

of employees is changing, which is associated with the tightening of economic restrictions; fourth, the fact that as a result of the growth of the number of personnel, its more effective development and rational use is required. Under these conditions, there is a change in the paradigm of personnel management of public authorities. The system of personnel management goals is changing; the system of interaction between the subject and the object of management is becoming more complicated. The processes taking place in the personnel management system of state bodies require a clearer definition of functions, their analysis and enrichment [6, p. 64]. With regard to the field of personnel management of the public service, it can be considered that the functions are specialized activities of the public authority, its personnel service in relation to the tasks solved in the process of personnel management (table).

It is legitimate to single out universal functions, suitable for any process of personnel management of the organization, and specific functions of personnel services of state bodies, their managerial impact on the staff. Universal functions reflect the essence of the management process as a whole, while specific ones are a working tool for the implementation of common universal functions. The specific functions that provide personnel management in the system of state bodies include (Fig. 1).

Decomposition of personnel management functions

| Personnel management functions | |
|--------------------------------|---|
| Prediction | 1) the need to provide the organization with the required training and qualifications; 2) development of the system of training, retraining and advanced training of the organization; 4) measures to implement personnel policy in the organization |
| Regulation | 1) execution of personnel programs and programs for the development of labor and professional resources; 2) the process of formation of the infrastructure of the human resources management system of the organization; 3) ensuring the laws and other regulations on the organization and functioning of the organization |
| Coordination | 1) activities of the personnel services of the organization on the organization, functioning, development and implementation of personnel policy, formation and rational use of labor, personnel and professional potential; 2) development of draft legal and organizational documents on the organization |
| Analysis | 1) the state of human and professional potential of the organization; 2) practice of application of the current legislation and normative support of personnel policy in the organization; 3) compliance of the organizational structure of the organization with its goals and objectives |
| Control | 1) execution and application of legislation on personnel policy; 2) use of human and professional potential of the organization |
| Labor motivation | 1) formation and application of motivation systems, evaluation of their effectiveness and development of proposals to improve the mechanisms of motivation of staff in the organization |

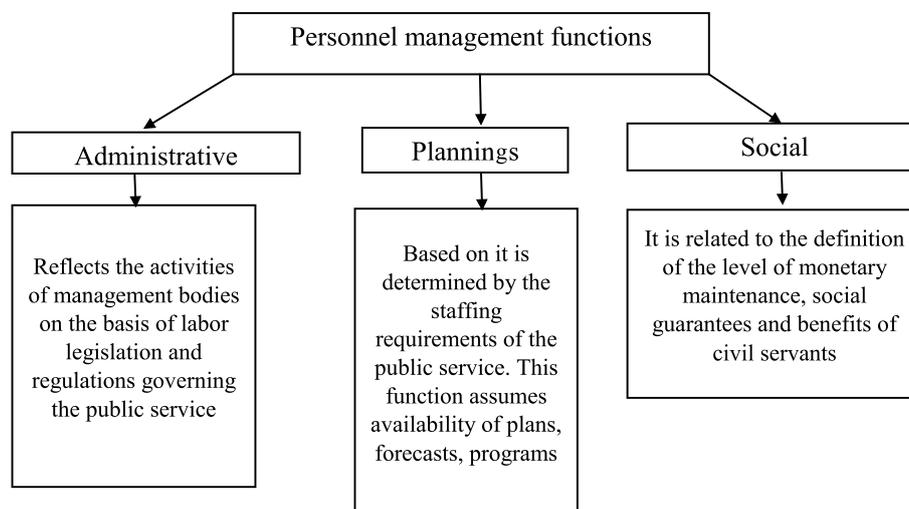


Fig. 1. Personnel management Functions

In the context of the modernization of the civil service, the responsibility of personnel services for the formation of highly qualified apparatus of power and management, effective use of the personnel potential of state bodies increases.

Personnel services of state bodies should have a higher status and be able to influence the formation of the structure of the apparatus, the

States, to make proposals to the leadership of the authorities to improve the activities of the apparatus and the service of civil servants. In the personnel services of state bodies should be the most experienced specialists in the field of public service and human resources [1, p. 316]. Their quality shall conform to the requirements of the time (Fig. 2).

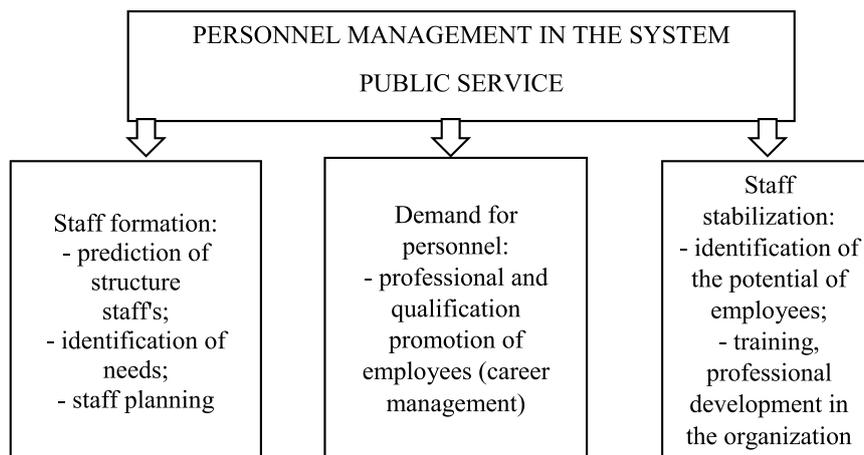


Fig. 2. Results of public service personnel management

Currently, the process of personnel management in public institutions is undergoing significant changes. This is due to a number of factors, including the following:

- there is an increase in the complexity of administrative work in the state and municipal service;
- ongoing political and economic reforms in the society change and complicate the system of values of employees;
- the requirements for the rational and efficient use of the personnel of the state institution are increasing due to the increase in the number of employees of the public administration system.

All these factors contribute to the change in the concept of personnel management in a public institution: the system of interaction between the object and the subject of management of a public institution becomes more complex, and the system of goals of personnel management of a public institution changes [1, 2]. One of the main directions of reforming the system of public service of the Russian Federation is the introduction of effective technologies and innovative methods of personnel work [5, p. 49]. As the main tasks related to the sphere of personnel management in the civil service, the following were defined: streamlining and specification of the powers of civil servants, which should be fixed in the official regulations; introduction of effective technologies and modern methods of personnel work aimed at improving professional competence, motivation of civil servants and ensuring conditions for increasing the effectiveness of their professional performance; re-

duction of excessive number of civil servants with simultaneous attraction on public service of the most qualified specialists and creation of adequate material incentives depending on volume and results of work of public servants; formation and implementation of programs of training for public service and professional development of public servants; development of system of additional professional education of public servants; introduction of modern mechanisms of stimulation of public servants. In the course of the reform, some personnel technologies in the civil service system have been improved, for example, qualification requirements for civil servants in the field of digital technologies have been specified, mechanisms for the replacement of civil service positions on the basis of appointment from the personnel reserve have been developed, a mechanism for the rotation of civil servants has been developed, programs and individual plans for the professional development of civil servants have been introduced [4, p. 284]. Improving the technology of selection and selection of personnel for the civil service will significantly improve the quality and efficiency of the selection of civil servants, will contribute to the formation of high human resources of public authorities. The improvement of the technology of civil servants 'assessment provides for the introduction of a system of integrated assessment, which involves the addition of the existing technology of civil servants' certification by the procedures of public assessment of the quality of public services, as well as the evaluation of the effectiveness and efficiency of civil servants (Fig. 3).

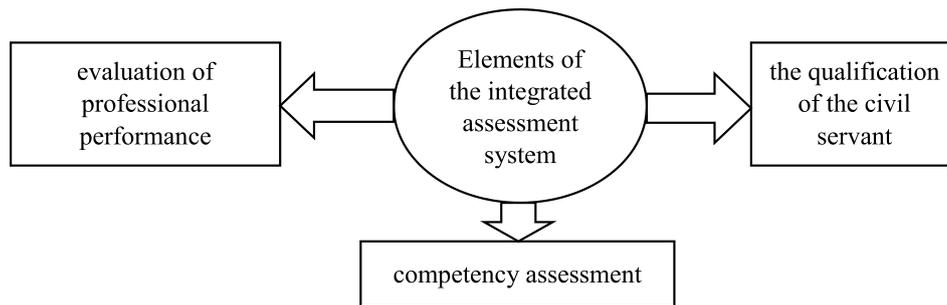


Fig. 3. Comprehensive assessment of personnel in the public service

The main purpose of personnel management in the public service is to provide the public authorities with the necessary management personnel, support and development at a high level of his skills, professionalism and competence, the creation of a system of evaluation, motivation, incentives and other necessary conditions for effective, efficient and quality work of managers. The objectives of management of senior personnel in the public service are aimed at the effective use of the potential of managers, and their achievements – to contribute to the improvement of staffing of public authorities.

In the context of the formation of the digital economy of Russia, the responsibility of personnel services for the creation of a highly professional apparatus of power and management, the rational implementation of the personnel potential of state bodies.

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SACRED GEOGRAPHY OF EAST KAZAKHSTAN

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The article gives the definition of “sacred geography and sacredness”. The article is presented the material on the creation of the register of sacred objects located within East Kazakhstan. By the head of state of Kazakhstan assigned a task – implementation of the project “Spiritual shrines of Kazakhstan” or “Sacred geography of Kazakhstan”. The President noted that sacred geography is a framework of national identity. The spiritual heritage of our ancestors is a priceless gift and a real treasure that has come down to us from ancient times. During the expeditions and field research, the members of the working group collected material about the sacred objects of East Kazakhstan, compiled preliminary lists of sacred places. It includes 50 objects. In this article the characteristic of some objects each of which is unique is given: the Northern branch of the great silk road, Historical and archaeological complex “Shilikti”, Mausoleum “Yrgyzbay Aulie”, memorial “Stronger than death”.

Keywords: sacredness, sacred geography, sacred landscape, sacral place, cultural sacred of Kazakhstan, the unique natural objects

The concept of “sacred geography” was formed relatively recently. In April 2017, the article of the head of state of Kazakhstan “Look into the future” was published: modernization of public consciousness, one of the priority issue for the society was the creation of the project “Spiritual Shrines of Kazakhstan”, or “Sacred Geography of Kazakhstan”. In the “Dictionary of Russian” of S.I.Ozhegov, the notion of “sacramental” which means: sacred, cherished [7].

Sacredness is a set of notions of quality space at ancients. Every people have sacral place, sign historical or morphological points that honor and preserve.

“Sacral place” is area of nature, cities, settlements, burial mounds, necropolises, shrines, petroglyphic drawings and historical landscapes, as well as religious, sacred places where have built iconic or religious buildings: crosses, dolmens, megaliths, etc., revered by a certain ethnic or religious community of people. Sacral objects have an ancient history and play the main role in religious and mythological views of any people, forms cultural or “sacred landscape” around themselves and it is the subject of searching of sacred geography.

According to L.S. Marsadolov “Sacred landscape” is a part of the natural environment inspired by God (the Creator), which is involved in sacred, ideological and cult human activity [6]. Issues of sacred geography of Kazakhstan, in particular of East Kazakhstan, have not yet received the necessary development and coverage in the monographic literature periodicals. The essence of the project “Sacred geography of Kazakhstan” is to create a single field of a single chain of cultural and geographical shrines of Kazakhstan.

In particular, the ancient complexes of East Kazakhstan, unique natural objects, the monuments of natural-historical landscape and many other places – all of them will be included to the general cultural geographical sacred zones of Kazakhstan. In article we are presented the material of master’s research on creation of register sacred objects, which are in borders of East Kazakhstan. It includes 50 objects, which are presented in table.

Cultic architectural monuments, as a rule, better preserved to nowadays and more revered have special popularity.

The main volume of historical and cultural heritage are archeological sites, they cover the enormous chronological period: from a deep antiquity, the Stone Age, to the late middle Ages. Another variety of spiritual heritage is the objects of nature, the sacralization of which goes back to the ancient times. Some of them declared sacred, having become the objects of pilgrimage tourism. At the same time the known sacral objects that entered to historical and archaeological science, appear new religious monuments and the sacral places.

Architectural monuments of historical, scientific and artistic significance also become objects of pilgrimage. A description of some of the objects, each one is unique below: Northern branch of the Great Silk Road, Historical archeological complex “Shilikti”, the mausoleum Yrgyzbai Aulie, The memorial “Stronger than death”.

The Great Silk road is a single transcontinental route that since the II century BC has become a bridge between Europe and Asia, connecting the West and the East. Two several of civilizations with completely special cultural traditions, religious beliefs, scientific and technical achievements have met here.

Preview register of sacral place of East Kazakhstan

| Sacralization ranks | The objects of the register of sacral place |
|---|---|
| 1. Especially honored monuments of natural heritage | 1. Belukha mountain (Altai) 2. Konyr-Aulie cave |
| 2. Archeological and architectural monuments | 3. Historical-archeological complex Berel, 4. Historical-archeological complex Shilikti, 5. Fortress-monastery "Ablaykit" |
| 3. Religious and cult objects being places of worship | 6. Memorial complex "Abai-Shakarim", 7. The mausoleum Yrgyzbai Aulie, 8. The mausoleum Enlik-Kebek, 9. The mausoleum Kozy –Korpesh Bayan Sulu, 10. Spring "Sacred spring", |
| 4. Sacral places related to historical persons | 11. House museum of Abai, 12. House museum of F.M. Dostoevsky, 13. The mausoleum of Dulat Babatayuly, 14. The mausoleum of Zholabay bi, 15. The mausoleum of Shakhantay Zhaugashuly batyr, 16. The mausoleum of Tany bi Tlemisuly, 17. The mausoleum of Omar Smagululy, 18. The mausoleum of Boranbay bi Kalkamanuly, 19. The mausoleum of Aulie Bekturgan, 20. Mosque of Tynybay Kaykenov, 21. Grave of Kengirbay bi, 22. Place of grave Askarbay aulie Shokantayuly 23. Place of grave Shaki bi Tasybayuly, 24. Place of grave Zhyngozha Bazarkululy batyr |
| 5. Sacral places related to historical and political events | 25. The museum Alash arystary, 26. Medrese Akhmed Riza, 27. School of Abdikerim Erezhepov, 28. School medrese Eskitam. |
| 6. A Unique natural objects | 29. Salty mud "Aschybasy", 30. Natural boundary "Kiin-Kerish", 31. Zaysan lake, 32. Lakes of Balance, 33. Rakhmanovskoe lake, 34. Mys Shekelmes, 35. Playuschie adyry, 36. Alakol lake 37. Markakol lake |
| 7. Natural-historical landscape monuments | 38. Paleobotanical monument of nature "Ashutas", 39. Neolithic sanctuary complex "Ak-Baur", 40. Tarkhan geological section, 41. Boritastagan mountain, 42. Petroglyphs of the natural boundary of Moynak, 43. Natural boundary Okey, 44. The great Silk Road on the Altay, 45. The Mine Kokkol River, 46. The Austrian road |
| 8. Symbols of national memory and civil heroism | 47. The memorial "Stronger than death", 48. Complex of Kushikbay Kanayuly batyr, 49. Barak Batyr monument, 50. Kabanbay Batyr monument |

The Great Silk Road is a unique historical monument of human civilization that for many centuries played a primary role in the development of the economy and culture of countries and peoples included in the zone of its powerful attraction as a trade caravan route. The longest section of the Silk Road is the Steppe one. It crossed the territory of Central Asia and Kazakhstan and functioned until the XIV century, reached its peak in the VIII-XII centuries by formation of a powerful Empire – the Turkic khanate. One of the branches of the Steppe way, passed from the Black Sea to the shores of the Don, then into the lands of the Sarmatians in the southern Urals to the Irtysh River and further to the Altay, the country of argipei, who inhabited the High Irtysh and Zaisan Lake [2].

Two main directions of movement of caravans passed through the territory of modern East Kazakhstan: the first from the northern provinces of China, through West Mongolia, through the Ukok Plateau and further along to the valley of Bukhtarma and middle stream of the Irtysh River and the second along to the Black Irtysh, Prizaysanskaya Basin to the shores of the Alakol Lake and Balkhash Lake. Later, these routes were intensively used for delivery of goods from China to Siberia, transportation of cattle from Mongolia, extraction and dispatch of metals, primarily gold, copper, tin and lead from Altay to Europe.

The ancient Greek historian and geographer Herodotus, who lived in the 5th century BC, knew nothing about the lands lying east of the Caspian Sea, but he mentions the tribes of Isidon, Agripei and Fissagets living there. The gold and other metals were delivered to the Greek colonists of Pontus of Ekvinsky and further to the countries of Europe exactly from there. Therefore, the Northern branch of the Silk Road has received the name “Golden”. Over time, the routes have undergone changes, as it was required by the political situation [9].

The Northern “Golden” branch of the Great Silk Road is an ancient caravan route connected the Central Asian Regions of Mongolia and China with the Irtysh, and following further to the West and South to the most significant markets of antiquity. Today this direction has remained within the Katon-Karagaysky State National Natural Park (KKSNNP). A unique complex with a rare combination of natural landscapes, diverse plant and animal life, rich history and unique culture: monuments of history, archeology, architecture, urban planning and monumental art has been preserved on its territory [4].

Currently, it is the Northern branches of the Silk Road are included to the priority goal

of the state program of the Republic of Kazakhstan on the revival of the historical centers of the Great Silk Road. According to the specified priorities areas and the basic centers of priority exploitation, among them the Upper Bukhtarminskiy area including the Katon-Karagay village, the Berel village, and the resort Rakhmanovskiye springs, the area of the Markakol Lake is defined [6].

Historical analysis and deciphering of the Northern Branch of the Great Silk Road is of great cultural, historical, natural and aesthetic value of universal importance.

There are a number of magnificent natural and historic sites in the park. Some of them may have international status: Belukha Mountain, Kokkol waterfall, thermal springs Rakhmanovskiye Klyuchi, Kokkol high mountain mine, Berel excavations, Austrian road, the Northern branch of the Great Silk Road and others. All these objects are identified as a separate perspective units for recreational development of Katon-Karagay SNNP (State National Natural Park). Some of them are successfully developed for cultural tourism, some objects, having equal opportunities with other recreational objects, used as amateur tourism. There are very picturesque landscapes within Ukok plateau, where the glittering mass of the plexus of mountain Kuitun (Tabyn Bogdo Olo) rises in the South. There are a large number of ancient graves of different age and origin along the road. The Northern branch of the Great Silk Road has all chances to stimulate the involvement of objects of research in national and regional tourism [2].

Evidence of this was forum “One belt, one road” past in Beijing (May 2017), which has formed a new geo-economic paradigm and will give a new stimulus to the development of mutually beneficial contacts on the new Silk road. Even those countries are of interest to the project whose territories were not in the way of the famous trade route. The universality and obvious benefit of the idea made it global [5]. Today the Great Silk Road is of great interest to the world community, first of all, it is preserved rich monuments of history and culture, which have an important international significance. The consequence of this is the deep integration and international cooperation of the countries located along the traffic artery.

The Great Silk Road began to function in the II century before Our Era. As for the term ‘The Great Silk Road’, it was originally introduced into scientific usage by German researcher F. Richthofen in his major work “China” in the 1870s [8].

Shilikty mound

Shilikty burial ground is located in the valley of Zaysan district of East Kazakhstan region. The valley, stretching 80 km long and 30 km wide, is surrounded by mountains from three sides: in the South and West – Tarbagatay, in the East – Sauyr, in the North – Manyrak.

The valley is characterized by its favorable climatic conditions: summer is cool, winter-warm and snowless. Therefore, since the Bronze Age these lands were densely populated by early agricultural and pastoral tribes.

There are 100 mounds in the valley. Mazar Zeinuly – built by Bayazit Saipayev is not far away. Multi-colored hill Ashutas is located in the valley of Black Irtysh, near Zaysan.

In the 40 – 60-ies of the last century Leningrad scientist Sergey Sergeevich Chernikov, who worked on the excavation of one of the large mounds Shilikty valley, made the assumption that it was one of the Sako-Scythian structures.

He even published a book “The Mystery of the Golden mound”. Most of the items found then are kept in the Hermitage; some gold items are in the vaults of the Central state Museum of Kazakhstan [1].

Kazakh scientists consider that in many ways this monument can be attributed to the VIII – IX century before Our Era, that the dumping is created by more than two thousand seven hundred years ago. Radiocarbon analysis of the wood saw cut of the tomb made by Kiev scientists V. Skripkin and N. Kovalyuk confirms this dating. The bones found in the burial could belong to an aristocratic person.

The findings of the scientist confirm many facts. For example, the special status of the burial emphasizes the fact that a single person was buried in such a huge mound. His high position is also indicated by the fact that the man was buried in a Golden vestment.

Moreover, shilikty governor was not dressed in a specially prepared for funerals ritual clothing – usually these things are sewn in a hurry and are fragile, represent a kind of property.

Shilikty ruler’s gold jewelry was designed for everyday life. The main underground corridor of the tomb was littered with stones, but had a secret double, which the robbers did not suspect; the ruler wore this entirely embroidered with gold plaques clothes during his lifetime. In addition, among the gold items a five-pointed star was found, symbolizing power. But most of all scientists were struck by miniatures, barely visible through a magnifying glass.

Particular attention was drawn to a tiny Golden Cup-shaped pendant with a size of just 1 millimeter. Ear was soldered to it diameter of 0.5 millimeter. It is difficult to imagine that they are made by steppe nomads many centuries ago!

Almost all the jewelry plots from the mound, except for a five-pointed star and corrugated tubes describe the animals of the local fauna and are made in the early sakoscythian animal style. For example, Golden argali or a plaque, notionally named “Mask leopard”. It is made up of the heads of two mountain goats and, if you look at it from the side, resembles a Golden eagle soaring in the sky. Fragments of wooden boards with images of deer became more amazing finding- if not sensational.

The Mausoleum Yrgyzbai auliye

The mausoleum of Yrgyzbay-ata in Tarbagatai district of East Kazakhstan region is located on the North side of the Tarbagatai ridge, on the road from the village of Aksuat in Kaldikty. It is adorned with decorative stone trim. The underside is made of green granite. This palette gives a magnificent view to the monument. There is a bedroom for four people, as well as Lenzat’s tomb, Tarpanbai’s son, and ten other people on the Eastern side of the mausoleum.

Yrgyzbay was well known holy man in the East of Kazakhstan, his clan –Nayman-karakerey-kyrzhy. He was famous for having cured Abay Kunanbay’s father. He was a Mullah, but had medicinal skills, was able to work and treat by medicinal herbs, without having a medical education. He did not take money for a treatment, and when people offered as a sign of gratitude, replied: “Give to orphan or a widow, I have my own duties”.

In 1920-ies an old man Shynybai had a vision in which Yrgyzbay said, “Hey, Shynybai, cattle is grazing on my grave, raise my cemetery, and Allah will reward you”. Hearing this, the old man did his best to put the grave in order. Perhaps because of this, Shinabai’s off spring became more successful.

There is a good expression in the Kazakh language: “Ask God, pray from saints”. There are many examples of how people who prayed at night at St. Kyrgyzbai, could have their dreams come true, life became better.

According to the stories, before his death Yrgyzbay Doskanuly stated: “The soil here is given to me. Do not move my remains to Kindikti, but bury me on a light yellow ridge”. And pointed out to his ridge in which he was buried. And he left this admonition: “Put the

remains in the chest. Don't build a cemetery. The construction of the cemetery is the duty of the future generation".

The mausoleum of Yrgyzbay-ata is located in the South-Western part of the complex, consisting of burial structures and outbuildings. The kitchen and the room for ritual sleep, which functioned in the 90s of the twentieth century, is located to the North-East of the mausoleum.

Due to the sharply increased number of pilgrims, the complex continues to expand to this day.

Monument "Stronger Than Death"

The monument, erected in memory of the victims of the Semipalatinsk nuclear test site and called "Stronger than death", was opened in August 2001 in Semipalatinsk. It is located a few kilometers from the city center, in the Polkovnichi Island [3].

The monument is a 25m wall, cast from precast-monolithic reinforced concrete, lined with polished granite blocks and slabs of black Semipalatinsk granite "gabbro".

The shape of an atomic cloud is cut on a monument. At the base of this is a white marble sculpture of a woman, who hides her baby with her body. It is a symbol of maternal love, able to protect the child from all troubles. Professor R. Yergalieva said at the opening of the monument: "Mother giving life, saving her child in a desperate rush, is embodied as a symbol of life, a symbol of the continuation of the human race, in spite of all the hardships and disasters, in this monument".

The author of the monument is Shota Valikhanov, famous Kazakh architect, writer, playwright, artist, and author of the coat of arms of the Republic of Kazakhstan, many

monuments and buildings, winner of the National Award of the Republic of Kazakhstan.

The monument "Stronger than Death" is very important for the people of Kazakhstan, as it symbolizes all the victims and losses as a consequence of nuclear tests in the period from 1949 to 1963.

V. Katsev wrote: "The Republic of Kazakhstan is the second power in the world after Japan, which suffered from nuclear weapons. The reflection of this theme in the monumental art of Kazakhstan is a matter of honor for architects and artists". This monument carries a history through which people can believe that stronger than death – only is life [3].

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IMMUNOPHENOTYPING AND FREQUENCY THE PREVALENCE AMONG PATIENTS CHILDREN ACUTE LYMPHOBLASTIC LEUKEMIA

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The article presents the results of immunophenotyping (IPT) studies by dint of method of flowing cytofluorimetry on frequency the detection in patients of children acute lymphoblastic leukemia (B-lymphoblastic leukemia/lymphoma (B-ALL/ lymphoma) and T-lymphoblastic leukemia/lymphoma (T-ALL / lymphoma) In the Kyrgyz Republic, B-ALL/lymphoma is detected in 83% of cases, compared with T-ALL/lymphoma in 17% of cases. In differential diagnosis elicitation variants of the immunophenotype B-ALL: pro B-ALL (BI) in 5% of cases, B-common (BII) – 91% of cases, pre-B-ALL (BIII) -0% of cases, B-ALL (BIV) – 4% of cases and T-ALL: pro T-ALL (TI) – 0% of cases, pre-TALL (TII) in 69% of cases, cortical (TIII) in 29% of cases, T-ALL (TIV) in 8% of cases. Detection among patients children kirgiz nationality in 11% of cases of T-lymphoblastic leukemia/lymphoma and 63% cases of B-lymphoblastic leukemia/lymphoma and in 6% cases of T-lymphoblastic leukemia/lymphoma among patients of children residents of the Russian-speaking population of the Kyrgyz Republic (Kirgizia) and in 20% of cases B-lymphoblastic leukemia/lymphoma. According to our results, B-ALL/lymphoma and T-ALL/lymphoma is detected among patients children of kirgiz nationality and among patients children of residents of the Russian-speaking population of the Kyrgyz Republic (Kirgizia) and in compared to the female, prevails among the children male. The conduct IPT study by dint of method of flowing cytofluorimetry make it possible to determine the variant of the immunophenotype linearity and, when correctly diagnosed and timely select polychemotherapy (PChT), and if there is an HLA-identical healthy donor, spend transplant a closely related, unrelated bone marrow. To date, bone marrow transplantation for acute leukemia gives the best results in particular in children.

Keywords: immunophenotyping, flowing cytofluorimetry, acute lymphoblastic leukemia, children's, kirgiz nationality

Currently, disease acute leukemia worries of all, occurs and in developing and in developed countries, and is detected in people of all races, and among the adult population, so and among children's age.

Acute leukemia – is acute malignant disease of the blood system, with defeats at the level of deterministic genus-parent stem cells or early cellular predecessor, characterized by the availability of blast cells in the bone marrow puncture or in peripheral blood from 20% and more.

As noted by the authors [4], when making a diagnosis of acute leukemia, cytogenetic, cytochemical, morphological studies remain a powerful tool in clinical practice, but for a detailed study of bone marrow cells, by method flowing cytofluorimetry and at the correct collection material, undoubtedly have great advantages.

In justification of immunophenotype diagnosis using the method of flow cytofluorimetry in acute leukemia it is necessary to appreciate the features of the immunophenotype characteristics of tumor cells and determine the directionality of B and T, and exclude myeloid and rare variants of unclear linearity.

Well-known, and today, relate to B-cell markers at the B-lymphoblastic leukemia CD19, CD79a (cyCD79a), CD22 (cyCD22), CD10, CD20. But the phenotypes of CD19+,

CD10+ in acute B-lymphoblastic leukemia is the most prevalent. And this variant of leukemia called “common”.

In acute lymphoblastic leukemia (T-lymphoblastic leukemia/lymphoma), tumor cells have a phenotype similar with T-linear predecessor. By early markers at T-ALL relate CD99, CD34, CD1a, TdT (Terminal deoxynucleotidyl Transferase), cyCD3, CD7.

For diagnosis, it is first necessary to take into account and appreciate cytoplasmic expression of CD3, which is the only linear-specific antigen of the T-line.

For determine the linear affiliation of tumor cells, antibody kits are used, on the recommended by the Euroflow Consortium [8], the European Leukemia Network [6], the international consensus Bethesda [9], and also used for differential diagnosis classification the EGIL [5] and classification the World Health Organization (WHO) [7].

At staging a diagnosis and determining the variant of tumor cell linearity, us clinicians need to make the right choice of polychemotherapy.

For targeted treatment of the oncohematological diseases in patients children and adults, and for achieve a good result from the performed polychemotherapy (PChT), it is necessary to spend out immunophenotyping on system HLA-main complex histocompatibility.

Spending a closely related, unrelated bone marrow transplantation lets at the availability of healthy HLA-identical donor [2; 3] or placental blood [1]. Transplantation hematopoietic stem cells bone marrow gives the best results for increased survival in the treatment of oncohematologic diseases.

The aim of our study is to determine frequency the prevalence and early diagnosis analysis of the immunophenotype of tumor cell linearity at acute lymphoblastic leukemia in patients children of the Kyrgyz Republic(Kirgizia).

Materials and research methods

The research group from November 2016 to December 2018 have entered with acute lymphoblastic leukemia – 70 patients of children (female – 25, male – 45), all citizens of the Kyrgyz Republic (Kirgizia), at the age of 1,5 years to 16 years, of them kirgiz nationality – 52 (female – 22, male – 30), and residents of the Russian-speaking population of the Kyrgyz Republic(mixed nation and different nationalities) – 18 patients of children (female – 3, male – 15) who were undergoing research in the department of pediatric oncology of the National Center for Oncology and Hematology of the Ministry of Health of the Kyrgyz Republic (Kirgizia) and in the Department of Pediatric Hematology of the Osh Interregional Clinical Children’s Hospital in Osh, in St. Petersburg consulted doctors hematologists Eurasian Center of Oncohematology, Immunology and Therapy.

Method immunophenotyping by dint of flowing cytofluorimetry conducted the first time and research was conducted in city Bishkek Kyrgyz Republic (Kirgizia) [4].

Method by dint of flowing cytofluorimetry

The material for the study is the bone marrow. Patients made puncture of the sternum. For obtain a qualitative authentic result, the obtained analysis should not be with impurity blood and not destroyed the cells during the test-sample preparation to immunophenotyping. Immunophenotyping of leukemia (blast) cells performed on a flow cytofluometer Cytomics FC500 (Beckman Coulter, USA) using monoclonal antibodies Beckman Coulter.

Statistical processing of the results included the analysis of standard criteria X2-square, which was used to assess the significance of differences in the occurrence of certain characteristics between the control group and the test group. Determination of the “p”, the corresponding value found. X2-square performed considering one degree of freedom.

All mathematical calculations and statistical analysis of the overall study was performed using a personal computer using the package application programs for spreadsheets – Microsoft – Excel M version 7.0, for Windows 95, for Windows-based 2010, Statistica-5.

Research results and discussion

During our research, the diagnosis of acute lymphoblastic leukemia was established on the basis of common clinical data and complex laboratory-diagnostic indicators.

Comparative characteristics of the frequency of occurrence of immunophenotype variants B-ALL and T-ALL in the Kyrgyz Republic (on the classification of the European group of the immunological characteristics of acute leukemia/EGIL) [5]

| B-ALL n = 58 | | T-ALL n = 12 | |
|------------------|-----|-----------------|-----|
| pro B-ALL(BI) | 5% | pro T-ALL(TI) | 0% |
| B-common (BII)* | 91% | pre T-ALL(TII)* | 67% |
| pre B-ALL (BIII) | 0% | cortical (TIII) | 25% |
| B-ALL(BIV) | 4% | T-ALL(TIV) | 8% |

Note: *p < 0,001.

As can be seen from the presented table, in the Kyrgyz Republic (Kirgizia) on the frequency prevalence is found B-ALL: B-ALL (BI) in 5% of cases, B-common (BII) in 91% of cases, pre-B-ALL (BIII) in 0% of cases, B-ALL (BIV) in 4% of cases and T-ALL: pro T-ALL (TI) in 0% of cases, pre-T-ALL (TII) in 67% of cases, cortical (TIII) in 25% of cases, T-ALL (TIV) in 8% of cases. In terms of significance, B-common (BII) and pre-T-ALL (TII) have statistically highly significant differences, where p < 0.001.

As seen from Fig. 1, the prevalence of acute lymphoblastic leukemia in the Kyrgyz Republic (Kirgizia) is the prevalence among patient’s children in 83% of cases of B-lymphoblastic leukemia/ lymphoma(B-ALL/ lymphoma) and T-lymphoblastic leukemia/ lymphoma(T-ALL/lymphoma) in 17% of cases.

According to the data presented in Fig. 2, T-lymphoblastic leukemia/lymphoma is detected among patient’s female children in 12% of cases and B-lymphoblastic leukemia/lymphoma in 88% of cases, and in patient’s male children T-lymphoblastic leukemia/lymphoma in 20% of cases and 80% of cases of B- lymphoblastic leukemia/lymphoma. B-lymphoblastic leukemia/lymphoma a most prevalence and among patients children male and female.

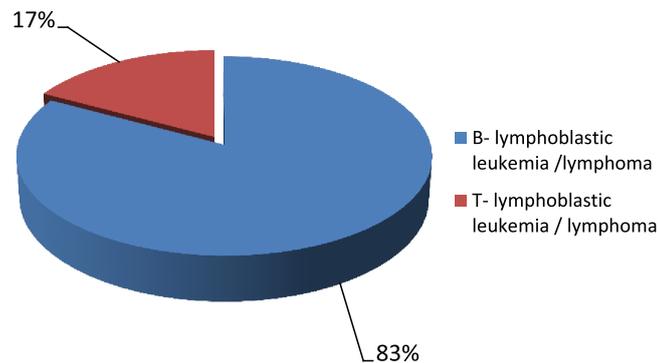


Fig. 1. The prevalence in the Kyrgyz Republic among children of acute lymphoblastic leukemia B-lymphoblastic leukemia/lymphoma(B-ALL/lymphoma)and T-lymphoblastic leukemia/lymphoma (T-ALL/lymphoma)

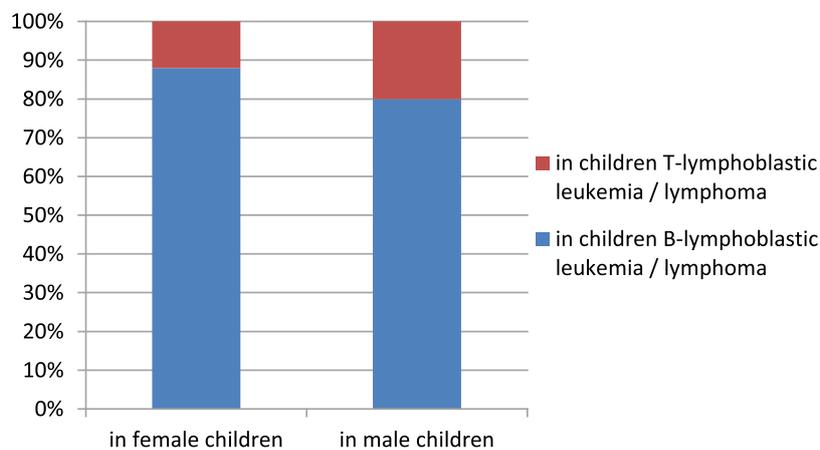


Fig. 2. Prevalence of acute lymphoblastic leukemia B-lymphoblastic leukemia/lymphoma and T-lymphoblastic leukemia/lymphoma among patients children female and male in the Kyrgyz Republic(Kirgizia)

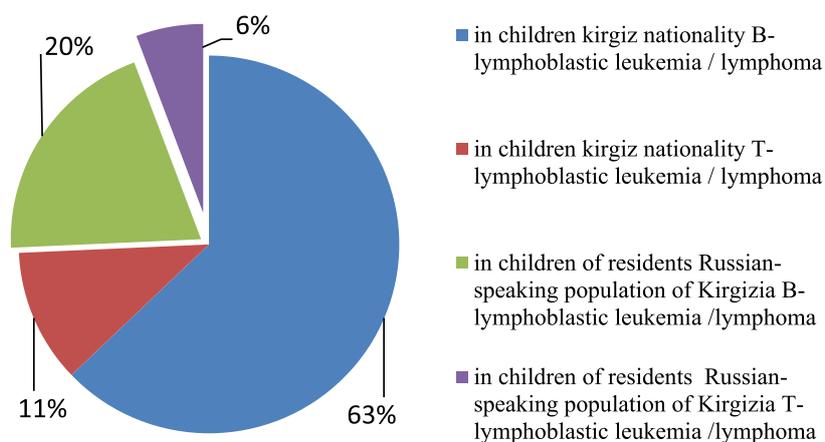


Fig. 3. Comparative characteristics frequency of the prevalence of B-ALL/lymphoma and T-ALL/lymphoma among children of kirgiz nationality and residents of the Russian-speaking population of the Kyrgyz Republic (Kirgizia)

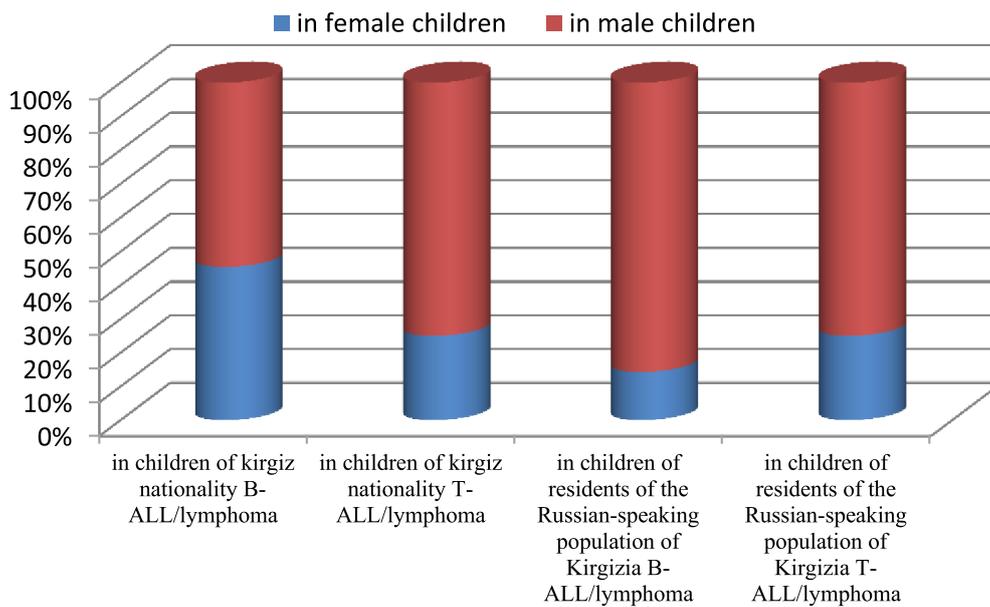


Fig. 4. Frequency the prevalence of acute lymphoblastic leukemia among children of kirgiz nationality and residents of the Russian-speaking population of the Kyrgyz Republic (Kirgizia)

As be seen from Fig. 3, the prevalence of T-lymphoblastic leukemia/lymphoma among patient's children of kirgiz nationality in 11% of cases and in 63% of cases of B-lymphoblastic leukemia/lymphoma, and among patients children residents of the Russian-speaking population of the Kyrgyz Republic (mixed nation and different nationalities Kirgizia)- in 6% of T-lymphoblastic leukemia/lymphoma and B-lymphoblastic leukemia/lymphoma in 20% of cases.

According to the results of Figure 4, detected in patients children kirgiz nationality among female of B-ALL/lymphoma in 33% and among patients male in 67% of cases and T-ALL/ lymphoma among female in 13% of cases and among male in 87% of cases. And among patients children residents of the Russian-speaking population of the Kyrgyz Republic (Kirgizia) B-ALL/ lymphoma in female children in 6% and among children male in 94% of cases and T-ALL/ lymphoma among children female in 12% of cases and among children male in 88% of cases.

Thus, on the frequency of prevalence among patients children in the Kyrgyz Republic (Kirgizia) with acute lymphoblastic leukemia is more often detected B-lymphoblastic leukemia/lymphoma on the compared with T-lymphoblastic leukemia/lymphoma.

In acute lymphoblastic leukemia (B-lymphoblastic leukemia/lymphoma and T-lymphoblastic leukemia/lymphoma), in the main targeted process using flowing cytofluorimetry to establish the B and T linear direction of tumor cells.

phoblastic leukemia/lymphoma), in the main targeted process using flowing cytofluorimetry to establish the B and T linear direction of tumor cells.

For elicitation the features of the course and frequency of the prevalence of acute leukemia among patients children in the Kyrgyz Republic (Kirgizia), is necessary further research, which makes it possible for the timely selection of therapy and targeted treatment when planning an unrelated, closely related bone marrow transplant.

Conclusion

1. Research bone marrow in patient's children with acute lymphoblastic leukemia method by dint of flowing cytofluorimetry.
2. Screening study for determine the linear directing of tumor cells.
3. Identify immunological variant of acute lymphoblastic leukemia.
4. Immunophenotyping by dint of flowing cytofluorimetry makes it possible to elicitation the characteristic T and B linear immunophenotype of tumor cell and timely selects effective program chemotherapy.

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INFORMATION AND COMMUNICATION TECHNOLOGIES AS A TOOL FOR SOCIAL SUPPORT AND DEVELOPMENT OF SCHOOL STUDENTS WITH DYSLEXIA IN THE UNITED KINGDOM

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People diagnosed with dyslexia find it difficult to convey their on paper. In most cases, the problem is not that the dyslexic person cannot find a solution, but that s/he arrives at too many possible solutions and finds it difficult to pick one of them. This article discusses the use of information and communication technology (ICT) as a tool for social support and development of school students with dyslexia in the UK in order to help them fulfill their potential capabilities. Children and young people with dyslexia are given the opportunity to effectively use these technologies in the acquisition of knowledge and skills in school. These technologies can help them overcome the obstacles and challenges they face throughout their lives. A key point for many users of ICT is the development of an adequate learning environment with the necessary software tools. Their correct use can lead to real change and help dyslexic students to overcome the obstacles they face in the learning process. In conclusion, it should be pointed out that, helping to create equal conditions for all learners, ICT provide users suffering from dyslexia with a real sense of independence and achievement.

Keywords: dyslexia, information and communication technologies, school students

Specific disorders of the learning ability (or SDLA) is the term used in Bulgaria to describe children's difficulties in mastering literacy (reading, writing, arithmetic). In the United Kingdom, the most commonly used word is "dyslexia". Another term used is "specific learning differences", which is an umbrella term for children and adults with dyslexia, dyspraxia, dyscalculia, and hyperactivity and/or attention deficit (ADHD).

Dyslexia is neurological in origin and is a combination of difficulties and abilities. The difficulties are usually related to reading, writing and arithmetic, poor short-term and working memory, problems with sequencing, information processing speed, visual and auditory perception, motor movement and spoken language. The abilities are linked to creative thinking, intuition, excellent spatial awareness, drawing skills and artistic talent.

In the United Kingdom, the practice of bringing awareness of this condition to society, parents and teachers, as well as the development of teaching programs and methods for it, have come a long way, but just like integration itself, it is an ongoing process. In recent years, enormous progress has been reported in the UK in the identification of dyslexia and provision of timely assistance to dyslexic persons in order to help them fulfill their potential capabilities (N. Brunswick 2010; A. Fawcett, 2001; J. Rose, 2009). Computers and their use as an educational tool have changed the way children learn (Dyslexia: A guide for parents and teachers, 2008). Information and communication technologies (ICT) are widely used by children in school and at home. In addition to games and entertainment, for many of them

they have become an essential tool for access to information and communication, especially in the use of web-based technologies. Children and young people with dyslexia are given the opportunity to effectively use these technologies in the acquisition of knowledge and skills in school. Many features of ICT can help them overcome the obstacles and challenges they face throughout their lives.

The aim of this article is to describe the current technological capabilities and how they are used to support persons with dyslexia. Some of the programs that will be discussed are not translated into Bulgarian (eg, software for converting speech into text). They are efficient and do not require special technical skills. They can also be applied almost anywhere. One only needs to understand the task and know the functionality and limitations of the software.

Research results and discussion

Benefits of information and communication technologies

- using the "text-to-speech technology" a piece of information can be read more easily and more accurately;
- easy editing of written information through the use of common means, such as copying, opening or closing, pasting or returning most of the words for text processing;
- additional tools such as word banks with speech support or texts can help in writing tasks;
- opportunity to solidify the acquired knowledge through multiple repetitions;
- stimulating and motivating effect;
- training that does not rely on penalty;
- opportunity to cater for individual needs.

Over time, children begin to gain confidence in using ICT and become more demanding in solving a number of tasks related to grammar, which are complex to them.

For ICT to be more useful and effective, periodic review by experts in the field is required to identify what works well and what does not. These advantages are not always obvious, so teachers and parents should be aware of how to help and find appropriate means, programs and options to utilize the full capacity of ICT. This will allow the technology to meet the individual needs of children and young people with dyslexia.

While “high-tech” solutions look attractive and represent the best of technology, the effectiveness of existing tools and methods cannot be denied. It is recognized that small changes in the programs can have a huge impact on dyslexic persons. The Dyslexia Friendly Schools pack for BDA (British Dyslexia Association) supplemented with ICT contains examples of such solutions in a school setting.

Most schools in the UK use ICT in their curricula. The national curriculum ensures the development of basic skills in the field of ICT as a continuous process at all stages of student training. Their additional advantages support dyslexic persons and encourage them to pursue a mobile and independent life.

Customization of the learning environment

A key point for many users of ICT is the development an adequate learning environment with the necessary software tools. Screen adaptation is particularly useful for reducing visual stress often observed in dyslexic persons. Most computer systems and many individual programs offer a range of choices: background color, font type, font colour and size, line spacing, etc. Text editors offer additional options for line spacing and margins so that the text on the screen can be read more comfortably. Software products have been developed that enable dyslexic persons to save all information for future use with a single click of the mouse. Many of these products also offer other useful features such as text-to-speech conversion. Such examples are *Claro Read* and *Dolphin Easy Tutor*. Users can take advantage of a color overlay (filter) when reading a book or text on paper. The inclusion of a screen with a virtual colored overlay helps the user to follow any text above or below, or between the lines. Such examples are *Virtual Reading Ruler* and *Readable*.

Access to text and information

Software for “text-to-speech” conversion performs a very simple function – if the user

has an electronic document in his/her computer, it will read the text aloud. Among the programs that can help persons with dyslexia, these are the most useful ones because they allow access to unlimited information orally. This reduces the time and eliminates the effort required to read the text.

Using the computer as a reader, the user can focus on the meaning and understanding of the text.

There are many options for using this software in converting text to speech: reading of websites; reading of electronic documents; spell checking; reference to the pronunciation of individual words or phrases; reading e-mail and chat messages.

The texts used in the “text-to-speech” program allow users to see and hear the text simultaneously when necessary. Some users may require that the entire text be read aloud, while others only need single words or phrases. The latest programs offer the choice of synthesized voices. Some of them indicate words that could easily be mistaken as homonyms (their/they’re/ there), offering helpful explanations. The latest versions of programs such as Adobe Reader have built-in speech functions.

For the reader, important options to check are:

- whether the text is read out and highlighted simultaneously;
- whether there is a choice of voices, speed and format.

Many programs allow these “text-to-speech” converted texts to be an integral part of the computer environment not only facilitating visual formatting, but also offering assistance and support for reading and writing. Example: *Claro Read*, *TextHelp* and *Easy Tutor*. Users at school or at home can use a special word processing program. Such examples are *Clicker Write* in Clicker 4/5, *Textease* or *Inspiration*. Any selected text from any web page can be copied and entered into the program and then read aloud as a word, phrase, sentence or whole paragraph.

A brief reference should also be made to speech to text conversion software that transforms the speech into written symbols (I. Smythe, 2009). Although there is no version in Bulgarian, such programs can be useful for people with dyslexia who use English, providing that their accent is not too strong.

Many persons with dyslexia repeat the same mistakes many times. This problem can be solved easily as Microsoft Word and other similar programs have a function for automatic error correction (Ch. Singleton, R. Wood, 2009).

Planning of the writing and presentation of text or information

The most common text editor, Microsoft Word, has a relatively good lexical corrector, which, however, is guided by the assumption that the user knows which the right alternative is. The program will not suggest the correct answer. Editors that are more sophisticated put the most suitable words at the top of the list of suggestions. They are sold as part of the text-to-speech and speech-to-text conversion software.

The programs allow users to plan visually the use of text and graphics, which is often a preferred learning style for dyslexic people. Visual plans can be converted with a single pressing of a key into linear text to be used for further writing, or entered into the preferred word processor.

Screen reader word banks are often used by young children and adult users who require special and customized word lists. Some word banks include images or symbols as well as text for easy recognition and understanding. Such examples are **Clicker 5**, **Wordbar** and **Textease**.

Many dyslexic persons may prefer on-screen text predictors for the main speech options in order to make an informed choice of words that they may need to use, and to speed up the process of writing.

Many people find it difficult to convey their ideas on paper. In most cases, the problem is not that the person with dyslexia cannot find the right solution, but that s/he comes up with too many solutions and finds it difficult to choose one of them.

For those who have used such tools and still need further assistance, voice recognition programs can bring the solution, for example with the help of Dragon software [www.dyslexic.com].

Improving of specific skills

A large variety of programs that can assist in the acquisition of specific skills in literacy, calculation and retention of information are available. The choice of software to purchase

for any young person, where the aim is to increase his/her skills, requires careful consideration of the range of content, the ability of the student and the teacher, the ease of use, speech support and financial value.

Some of the latest programs intended to support reading skills allow the user access to talking books and options for text customization through color-coded highlighting. The use of MP3 players is helpful in mastering new technologies (T. Miles, D. Ditchfield, 2008). Most often these are used for listening to music, digital recorded texts, facts and information, or for recording science facts, etc.

ICT appear in many formats. One of them is the reading pen that scans texts then reads them aloud. It is a quick and easy storage solution for individual words and phrases, especially for longer texts. Portable writing support, offering processing of documents in almost any environment, can be a saviour for many young persons with dyslexia.

Conclusion

It is believed that ICT will continue to improve, develop and change. Their proper use can lead to real change and help school students with dyslexia to overcome obstacles to learning, today and in the future.

In conclusion, it should be pointed out that ICT provide users suffering from dyslexia with a real sense of independence and achievement, helping to create equal conditions for all learners.

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ROLE OF SELF-PURIFICATION IN VAISHNAVISM

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The present study investigates the problems that adherents of Vaishnavism face, in particular, necessity of purification, as an important part of cultivation oneself. It is an explanation of the main steps of religious practice, that is called *bhakti* yoga (loving devotion). Characterization of the different levels of practitioners, that should choose different intermediate goals, before they can reach the highest aim of practice, is given. Attention is focused on the initial phase of worshiping, when the most important task for believers is a cleaning of the heart. Task to depurate oneself from the unfavorable for progress in practice, from *anarthas* (destroying tendentious in hearts, such as sins, sorrows, misconceptions, and others); and developing the right qualities (like, humility, patience, respect of others, etc.). Based on the materials of Vedic scriptures, the methods of self-purification and different processes of worshiping for beginners are introduced; and importance of purification oneself for followers are described.

Keywords: Vaishnavism, self-purification, anartha, devotional service, Bhagavat-Gita

When we speak about the way of achievement the highest aim of personal life for followers of Vaishnavism, we can notice that self-purification becomes a very important part for individual spiritual practice. What a way of self-purification is and why it is so important for practitioners of Gaudia Vaishnavism, I would like to discuss in present text.

Purification from anarthas in Vaishnavism

Vaishnavism (*Vaishnava dharma*) is one of the four major traditions within Hinduism along with Shaivism, Shaktism, and Smartism. Vaishnavism characterized by devotion to the god Vishnu and his incarnations (*avatāras*). Devotee of Vishnu is called *Vaiṣṇava*. For Vaishnavas, absolute reality (*brahman*) is manifested in Vishnu, who in turn is incarnated in Rama, Krishna, and other *avatāras*. Through his avatars, Vishnu defends traditional righteousness in keeping with the moral law (*dharma*). The various sects of worshippers of Vishnu pray to Him in different ways. One of the goal of religious devotion (*bhakti*) to Vishnu is liberation (*mokṣa*) from the cycle of birth and death (*saṃsāra*). Most Vaishnavas see the highest aim of their spiritual practice as servicing to Vishnu (Krishna) and establishing different types of loving relationship with Him in eternity.

One of the most famous teachers from Gaudia Vaishnavism (sect of Vaishnavism founded by Chaitanya Mahaprabhu (1486 – 1534) in India) *Śrīla Viśvanātha Cakravartīpāda* (1626 – 1708) in his book "*Mādhurya kādambinī*" – "The Bank of Nectar-showing Clouds" – explains aims of spiritual practice for Vaishnavas from simple to the highest one. "*Mādhurya kādambinī*" was written as a commentary for the text "*Bhakti-rasāmṛta-sindhu*" of saint, poet, philosopher of

the Gaudiya Vaishnava tradition – *Śrīla Rūpa Gosvāmī* (1493 – 1564). Who is known as the most senior of the six Goswamis of Vrindavan associated with Caitanya Mahaprabhu (as followers believe, a hidden avatar (incarnation) of Lord Krishna).

There is a quotation from this text in Sanskrit:

“*ādau śraddhā tataḥ sādhusaṅgo 'tha bhajanakriyā tato 'narthanivṛttiḥ syāttato niṣṭhā rucistataḥ athāsaktis tato bhāvas tataḥ premābhyudañcati sādhakānām ayam premnaḥ prādurbhāve bhavet kramaḥ*”.

Translation: “First one attains *śraddhā*, then one gradually passes through the stages of *sādhu-saṅga*, *bhajana-kriyā*, *anartha-nivṛtti*, *niṣṭhā*, *ruci*, *āsakti*, *bhāva*, and finally *prema*. In this way, *prema* gradually manifests in the devotee’s heart”.

In other words: “First of all there is faith, then one associates with devotees, then one begins to engage in *bhajana*, then one gets rid of bad habits, becomes fixed, gets taste, becomes attached (to *Kṛṣṇa*), then *bhāva* awakens and then *prema*. This is how the gradual growth of *prema* of the devotee takes place.”

It means that the aims of religious practice may be classified into following types (from beginner to the highest level):

1. *śraddha* – firm faith, trusting to teachings of *sādhus* (teachers of spiritual knowledge), faith to *śāstras* (spiritual texts); faith that this spiritual practice will lead the follower (devotee) to his aim.

This is a first step of spiritual practice for beginners: faith that arises after listening teachers. And it is not just information that one can

listen, but knowledge along with inspiration to practice that comes from other person, who already put this knowledge into practice, got a result and share his enthusiasm, conviction with others. (As devotees say, any knowledge, and especially knowledge about God, can be transformed only from heart to heart, as it is not just a sum of theoretical information, but sharing own inspiration to practice, inspiration to follow religious way). We can find information that *śraddha* emerges in one's heart because of *sukṛti* – auspicious activity, connected with service to God, which one conducted during his previous lives; but *Śrīla Rūpa Gosvāmī* explained that really only association with devotees (and their mercy) can cause the appearance of *śraddhā*, and any fruitive activity, cultivation of spiritual knowledge, or renunciation, never can help [1].

2. *sādhu saṅga* – being in association with *sādhu*, with other devotees who are already following this spiritual practice; association of pure devotees.

It means that for cultivating religious faith, for support, and for inspiration to continue own practice, devotee should try to be in association with other practitioners, should study from teachers how to practice a devotional service (*bhajana kriyā*).

3. *bhajana kriyā* – serving to the Deity together with devotees; practice of *bhakti* (devotional service to a personal God). It includes different types of activities, such as listening, chanting, taking part in religious ceremonies, and others, connecting with different way of servicing to the Lord Krishna, both inside and outside of temple. More about duty of devotees is possible to find in the work “Teachings of Lord Caitanya” (chapter 12 “The Devotee”) [2].

4. *anartha nivr̥tti* – cleaning, purifying hearts from *anarthas* (destroying tendentious in hearts); cessation of unwanted elements unfavorable to the practice of *bhakti*; removal of impurities. This is a kind of inner work for practitioner. It is noticing impure things in own heart: sins (pride, greed, lust, anger, etc.), sorrows, misconceptions, and so on, and trying to eliminate them.

5. *niṣṭha* – steadiness of one faith. It is condition when material obstacles start to have less influence to the practitioner, and he becomes firmly established in his regular devotional practice (*sādhana*) without deviations.

6. *ruci* – taste (enjoyment) that comes from devotional service and makes one attached to practice it. It is condition when attachment arises.

7. *āsakti* – natural attachment to God and His service. Here attachment flourishes and becomes emotional dependence to please Krishna – to rich perfect love to God.

8. *bhāva* – excellence, superiority; liberation from worldly existence; ecstatic love to God; permanent attachment to God. It is sincere *sādhana* of devotee with idea to please Krishna that finally makes one's heart worthy, because of God's mercy, to appear rays of *prema*.

9. *prema* – divine love; the highest form of love; the highest aim of human life. This is intense *bhāva* that “melts” heart of devotee, and fills him with intense affectionate attachment. It is the “infinite bliss that arises from attaining self-realization is an infinitesimal drop in the ocean of bhakti's happiness” [3].

At the beginning of *bhajana kriyā* meditation to Krishna is momentary and mixed with mundane topics. At *niṣṭhā* stage stable meditation to God very rare interrupted by other topics. When *ruci* comes meditation to Holy Name becomes unbreakable, last very long, and become free from mundane thoughts. At *āsakti* stage meditation becomes very deep. In *bhāva* stage, after starting meditation, God appears in visions in devotee's heart. In *prema* these visions become detailed and the true vision of Krishna takes place [4].

And, as was mentioned at point 5, a way to reach gradually all of these aims (and even the highest one – *prema-bhakti*) is called *sadhāna bhakti* (devotional service); a practitioner of *sādhana-bhakti* is called *sādhaka*.

In text “*Caitanya-sikshamrita*” *Bhaktivinoda Thākura* gives explanations of two types of *sadhāna-bhakti* that are *vaidhī-sādhana-bhakti* (*vaidhī-bhakti*) and *rāgānuga-sādhana-bhakti* (*rāgānuga-bhakti*; *rāga-bhakti*) [5].

Rāga – attachment; here it is attachment in ecstatic love of God; it is longing for a specific service to God. *Rāga-bhakti* is a devotional service in transcendental rapture; it is state of *sādhana-bhakti* when one's practice of devotional service to Krishna becomes spontaneous and he does it in the mood of one of Krishna's eternal associates in Vraja (Vraja is a name of one spiritual place, outside of this material world, where Krishna and His devotees enjoy different type of loving relationship).

This spontaneous desire to serve Krishna presupposing very deep loving attachment to Him that is very rare to meet; such devotional service does not need any rules and regulations, because everything that such *rāgātmika bhakta* do conditioned only by his pure love to God. *Rāgātmika bhakta* is a devotee of God, who is remaining in the spontaneous devotional

mood. This special mood originally is inherited to the Krishna's associates in spiritual world, and can vary according to their transcendental attachment.

That is why scriptures are concentrated on description of *vaidhī-sādhana-bhakti* – devotional service that is rooted in scriptural injunctions and that can be explained.

According to *Bhagavad-gītā* (3.35) [6], to have a success or progress in practice, follower (*sādhaka*) should understand well his own qualifications (*adhikārḥ* “position, dignity, rank”), own level, and choose aims and practice according to that level.

Śrīla Rūpa Gosvāmī in *Bhakti-rasāmṛta-sindhu* (1.2.16) mentioned three types of right candidates for *vaidhī-sādhana-bhakti*: *kaniṣṭha* (beginner level of practitioner), *madhyama* (intermediate level), and *uttama* (high level) [3].

1. *kaniṣṭha adhikārī* (someone, who did not reach yet level of *niṣṭha* (strong faith), whose faith is weak) – according to *Śrīmad-Bhāgavatam* (*Bhāgavata Purāṇa*) (11.2.47), this is a beginner practitioner who more easily can see God in Deity in a temple and worship It. He has received the *hari-nāma* initiation (first initiation – beginning of spiritual life) from the spiritual master and tries to chant the holy name of God (see “The Nectar of Instruction”, text 5). Usually he has no belief that God has power to exist outside of temple. He is attracted by material wealth and diminishes position of God. He erroneously considers himself as more pious and religious one, and easily notices defects in other followers; and can think that others prevent him from his practice; usually doesn't associate a lot with others. His faith is rudimentary, weak, and easily can be destroyed. Knowledge about philosophy and practice is superficial. But even such beginner practitioner has a faith that he needs nothing else than Krishna (and such his faith is enough that he will be qualified for *vaidhī-sādhana-bhakti*) and if he will continue to follow rules and regulations of Deity worship, he gradually can eliminate his misunderstandings, purify himself from wrong desires, and at the end have a chance to become a pure devotee.

2. *madhyama adhikārī* – it is the intermediate stage. Such practitioner sees God as the cause of all causes and offers love to Him. He got a spiritual initiation (second initiation) from spiritual master and was fully engaged by him to the devotional service to God. His realization of the all-pervading feature of the Supreme Lord is imperfect. He is a sincere friend of other devotees; he can distinguish different position of devotees and associate with them

according their levels. He tries to dedicate everything in his practice for servicing to God; he knows that everything belongs to God, but he still can be disconcerted by association with atheistic people. His faith is strong; conviction in rightfulness of his way is deep. Knowledge about philosophy and practice is good, but sometimes is not enough to win in philosophical dispute.

3. *uttama adhikārī* – it is a highest level of devotees. Such practitioner is very advanced in his practice. He does not blaspheme others, his heart is clean from imperfections, he can see God everywhere (for example, in hearts of all living beings). He believes that if he has any respect of others for any his qualities and success, all of this he got only because of mercy of Krishna, as he sees own imperfections very clearly and observes his position as much lower than position of other practitioners. His is very humble. His faith is very deep and firm. His knowledge is enough to preach, to be a winner in philosophical dispute, to convince others of his statement. Such person can be a *guru*, a spiritual teacher, for others [7; 8].

It is possible to say that from first aim *śraddha* to third *bhajana kriyā* (or to beginning of *anartha nivṛtti*) – it is level of *kaniṣṭha adhikārī*; from *anartha nivṛtti* to *ruṅi* – it is level of *madhyama adhikārī*; and from *āsakti* to *prema* – it is level of *uttama adhikārī*. But we should understand that this subdivision is very approximately and different followers can have their own specific features. Person can be qualified enough to practice one type of *sādhana-bhakti* and reach level of *madhyama adhikārī*, and at the same time he can be a beginner (*kaniṣṭha*) in other type of practice.

So different level of devotees has different aims of practice, and to reach next aim, they should already have special qualification – they already should reach some level, should have some base for starting practicing.

1) For those whose qualification is *sādhana saṅga* (that means that he already reached this level and he permanently dwells in association with devotees), his aim is *anartha nivṛtti*, and his practice is *bhajana kriyā*. That means that with other devotees he should practice nine forms of devotional service (see *Śrīmad-Bhāgavatam*, 7.5.23-24) [8].

2) For those who during long time practiced different type of servicing to God together with other devotees, and who purified himself enough from *anarthas* (I will show later that from some *anarthas* practitioner can be purified relatively quickly, and other form of *anarthas* will stay with him even in level of *bhāva*), and

who reached level of *anartha nivṛtti*, his aim will be *ruci*, and his practice will be *niṣṭha*. It means that such person should try to cultivate in his relationship with others humility, patience, respect and independence from other's evaluation of him (rather they respect him or not), he should try to respect everyone.

This explanation is given in *Śrī Caitanya-caritāmṛta* (*Antya-līlā. Antya 20: The Śikṣāṣṭaka Prayers, verses 21*):

“*trṇād api sunīcena
taror iva sahiṣṇunā
amāninā mānadena
kīrtanīyaḥ sadā hariḥ*”

Translation: “One who thinks himself lower than the grass, who is more tolerant than a tree, and who does not expect personal honor but is always prepared to give all respect to others can very easily always chant the holy name of the Lord.” [9]

3) For that one, whose qualifications is *ruci*, aim will be *bhāva* (and later *prema*), and his practice will be *āsakti* (attachment to the Lord). To be in a level of *ruci* means that devotee never becomes tired from hearing and chanting the holy name. It is a level when one enjoys form, qualities of Lord Krishna, and discussing stories about His life. It is level when one realizes sweetness of devotional service. And at the next stage of *āsakti* practitioner's mind spontaneously become attracted to everything that connects with Krishna, and he acts spontaneously (that's why to understand this level is possible only after reaching it). Here devotee dedicates all his life time to spontaneous servicing to Krishna, and all recommendations for him can be described in next way (“The Nectar of Instruction”, text 8):

“*tannāmarūpacaritādisukīrtanānu
smṛtyoḥ krameṇa rasanāmanasī niyojya
tiṣṭhan vraje tadanurāgijanānugāmī
kālam nayed akhilam ity upadeśasāram*”

Translation: “The essence of all advice is that one should utilize one's full time – twenty-four hours a day – in nicely chanting and remembering the Lord's divine name, transcendental form, qualities and eternal pastimes, thereby gradually engaging one's tongue and mind. In this way one should reside in Vraja (*Goloka Vṛndāvana-dhāma*) and serve *Kṛṣṇa* under the guidance of devotees. One should follow in the footsteps of the Lord's beloved devotees, who are deeply attached to His devotional service.” [7]

Both types of devotional service (*vaidhī-sādhana-bhakti* and *rāgānuga-sādhana-bhakti*) lead practitioner to the manifesting of two symptoms:

1) *kleśaghni* – reducing or destroying of material sufferings;

2) *śubhadā* – bestowing of all auspiciousness.

Bhagavad-gītā (7.16) describes four kinds of pious men who follow *sādhana-bhakti*: “... the distressed, the desirer of wealth, the inquisitive, and he who is searching for knowledge of the Absolute”. Even though such people come to God because of different reasons, and they are not pure devotees, all of them are qualified to practice *vaidhī-sādhana-bhakti*, and slowly their faith (*śraddha*) and their practice will purify them from imperfections and will help to become a pure devotee, who's “service is without aspiration and without desire for material profit” [6]. *Bhakti-rasāmṛta-sindhu* (1.1.11) gives next definition of pure devotional service:

“*anyābhilāṣitāsūnyam
jñānakarmādyanāvṛtam
ānukūlyena kṛṣṇānu
śīlanam bhaktir uttamā*”

Translation: “One should render transcendental loving service to the Supreme Lord *Kṛṣṇa* favorably and without desire for material profit or gain through fruitive activities or philosophical speculation. That is called pure devotional service” [3].

As we can see, devotional service purifies person from his negative qualities and helps to develop positive qualities; destroy ignorance and suffering. At the same time, there are some reasons that prevent one from developing his *sādhana-bhakti* and becoming a pure devotee. They are called *anarthas* (that were mentioned at point 4 “*anartha nivṛtti*”). It is that imperfections of inner self that can influence to devotional practice and prevent one from developing strong faith (*śraddha*) and at the end reaching level of the divine love (*prema*).

There are four types of *anarthas* that explained in *Mādhurya kādambinī* that are *duṣkṛtoṭtha*, *sukṛtoṭtha*, *bhakyutṭha*, and *aparādhotṭha* (divided according the reasons of their appearance).

First two of them come from person's desire to enjoy life in his material body. Five types of *kleśas* give rise in person a desire to act, and such his acts (sinful activity and pious activity) cause attachment to enjoy results that come from such acts. *Duṣkṛtoṭtha* – *anartha*

that arises from attachment to suffering (or enjoying from such types of suffering), that comes as a result of sinful activity; and *sukṛtottha* – *anartha* that arises from attachment to pleasure, that comes as a result of pious activity. Both of them have same root for arising – desire to enjoy.

1) *duṣkṛtottha* – *anartha*s that arose because of previous sinful activity. In *Mādhurya kādambinī* they are mentioned as five *kleśas*, namely: *āvidyā*, *asmitā*, *rāga*, *dveśa*, and *abhiniveśa* [4] (this explanations of *kleśas* we can find in *Yoga Sūtras of Patañjali*, (chapter II, sutras 3-8) [10]. The five *kleśas* are five reasons that give rise of person's afflictions:

1.1 *āvidyā* – ignorance about the true nature of things. It has four types:

a) Regarding that which is transient as eternal (for example, consider this material world as eternal).

b) Mistaking the impure for pure (for example, our body we consider as a clean, as in reality it is impure: as it comes from impure place (mother's womb); holding up by impure way (to be alive our body needs to take something from outside, life food, water or oxygen, and to excrete impure products of metabolism); and it is perishable and mortal).

c) Thinking that which brings misery can bring happiness (for example, one can notice that material things, that he desired before, can't make him eternally happy: as all material things sooner or later will be destroyed; too much enjoyment of material things will lead to satiety; when we are in process of enjoyment our mind are usually anxious; even the best material enjoyment soon makes us its slave, we become addicted, and to enjoy it in future we should again and again increase quality, or quantity, of this material things or experience, that is also brings us sufferings).

d) Taking that which is not-self to be self (according to philosophy of Gaudia Vaishnavas, person used to forget about his real nature as an eternal soul and about his eternal relationship with God. He can consider his mind, his body and wealth, other people (as spouse or children), other things, as a self, or part of self. For example, our mind gives us opportunity to enjoy such things as fame or own authority, and when it stops, one feels pain as if someone hurt him. Or when someone hurt one's things to that he was too attached, he can feel pain as he himself was hurt, not just his things was hurt.).

1.2 *asmitā* – false ego; bodily identification and the tendency to only accept sense perception; taking the *buddhi* (“intellect”, which

knows, decides, judges, and discriminates) to itself. It is a tendency to mix, who is “me”, and what is “mine”.

If first two *kleśas* have connection with one's intellectual level; next two are opposite to each other, and connects with emotional level: in simple words, *raga* (that one likes; that attaches him) and *dveśa* (that one dislikes; that causes his aversion).

1.3 *rāga* – attachment, the desire for material happiness and the means to achieve it. Desire to have more coveted substance.

1.4 *dveśa* – hatred of unhappiness and the causes of it. And the last *kleśa* (*abhiniveśa*) has connection with one's instincts.

1.5 *abhiniveśa* – inclining to sense enjoyment, attachment to body and the means for enjoying the senses, fear of death, desire for continuity, clinging to the life [4; 10].

Four kinds of sins are also included in *kleśas*:

– *aprārabdha* – sin which fruits have not manifested yet, they are not in active state and have not attained yet the *kūṭa* form.

– *Rūḍha* or *kūṭa* – internal tendency that already started to appear (it is future *bījas*), but one still is not aware about them.

– *bīja* – it is a seed of *karma* that will give its fruit in future; desire that has already appeared; one's tendency (*kūṭa*) that assume the shape of concrete sinful desire (for example, desire of social success, money, fame, and others).

– *prārabdha* or *phalonmukha* – sin whose fruit manifests as suffering; fructified sin; previous sinful action (when one already realized his sinful desire) which results are already appeared as, for example, weak body that one has; more or less sensitive feelings; level of intellect; family condition where one was born; and others things that already appeared in one's present life.

It is possible to compare this part with quotations from *Padma Purāna* that *Śrīla Rūpa Gosvāmī* gives in *Bhakti-rasāmṛta-sindhu* (1.1.23):

“*aprārabdhaphalaṁ pāpaṁ
kūṭaṁ bījaṁ phalonmukham
krameṇaiva pralīyeta
viṣṇubhaktiratātmanām*”

Translation: “All stages of sin – unmanifest, internal, seed, or manifest – are destroyed in turn by Vishnu-Bhakti” [3].

2) *sukṛtottha* – *anartha*s that arises because of previous pious activity, that causes the desire for sense enjoyment (*bhukti*) or desire for

liberation (*mukti*). It is sad in *Bhakti-rasāmṛta-sindhu* (1.2.22):

“*bhukti-mukti-sprhā yāvat piśācī hṛdi vartate
tāvad bhakti-sukhasyātra katham abhyu-
dayo bhavet*”

Translation: “As long as the two witches *bhukti* and *mukti* exist in the heart of a person, how can one enjoy the transcendental bliss of devotional service?” [4] That proves that such desires prevent followers from reaching the highest aim of religion practice (*bhakti*).

Bhukti (enjoyment, consuming) includes any efforts to satisfy own body and mind, such as excessive care about own health, desire for delicious food, desire to be strong, to have power, fame, wealth, desire to have a large following, to have a good wife, desire to win enemies, etc.

I can give simple example here, how accessory results of practice can mislead a devotee. When one sinful person became involved to devotional service, slowly he understood that he should follow moral rules, should not lie, and respect others. And after some time he got high social position, people starts to respect and trust him, and they invest their money to his business. He became successful businessmen, and daily he was worrying about developing his business and about his money, but slowly he forgot about devotional service.

Mukti (release, liberation) is subdivided into five types, as it is mentioned in *Śrīmad-Bhāgavatam* (3.29.13): *sālokya*, *sārṣṭi*, *sāmīpya*, *sārūpya*, and *ekatva*:

– *sālokya* – living on the same planet as the Supreme Personality.

– *sārṣṭi* – gaining the opulence that is equal to the opulence of the Supreme Lord.

– *sāmīpya* – becoming a personal associate of the Supreme Lord.

– *sārūpya* – getting bodily features that are exactly like those of the Supreme Person (four-armed form same as *Bhagavān Viṣṇu*).

– *ekatva* – oneness with the Supreme Lord. *Ekatva* is attaining *sāyujya-mukti* (merging) that is subdivided into two types: 1) *brahmasāyujya* – cultivating of impersonal knowledge, that leads to merging into the Lord’s effulgence); and 2) *īśvara-sāyujya* – merging into the Lord’s form [1].

Even though devotees can accept first four types of liberation, but it is sad that pure devotee should be free from any desire of liberation (as it is also one of variant of self-enjoyment). Pure devotee feels indifference to own liberation, and has only one desire – to please, to serve the Supreme Lord.

As it is said in *Śrī Caitanya-caritāmṛta* (*Madhya-līlā*, *Madhya* 19, verses 167):

“*anyābhilāṣitāśūnyam
jñānakarmādyanāvṛtam
ānukūlyena kṛṣṇānu
śīlanam bhaktir uttamā*”

Translation: “When first-class devotional service develops, one must be devoid of all material desires, knowledge obtained by monistic philosophy, and fruitive action. The devotee must constantly serve *Kṛṣṇa* favorably, as *Kṛṣṇa* desires.”

That means that *uttama adbhikārī*, or pure devotee, is one who fully engages in devotional service. His only aim is to satisfy Krishna by servicing his spiritual master (*guru*). And his master is one who dedicated all his life only to spreading spiritual knowledge about Krishna and who (same as his student) does not interested in attaining success in mundane activities. And if devotee satisfies the guru, Krishna automatically become satisfied. And for such devotee it is success of his devotional service [11].

These two types of *anarthas* (*duṣkṛtoṭtha* and *sukṛtoṭtha*), this desire for self-enjoyment, that leads practitioner to committing different types of sinful activity, can be stopped approximately easy, when one involves to devotional service. At stage of *bhajana kriyā* practitioner slowly eliminates from such defects; at *niṣṭha* stage these *anarthas* are destroyed (but still can appear if there be favorable conditions; as seeds for such tendencies are still present); and starting from *āsakti* stage, desire for such sinful activity is fully destroyed, and never return.

3) *bhaktiyuttha* – *anarthas* that arises because of mistakes what one commits in process of devotional service.

It is said in *Mādhurya kādambinī*: “*atha bhaktiyutthās te ca mūla śākhāta upaśākhā iva bhaktyaiva dhanādi lābha pūjā pratiṣṭhādyaḥ sva vṛttibhiḥ sādḥaka cittam apyuparajya sva vṛddhyā mūla śākhām iva bhaktim api kunṭhayitum prabhavantīti*”

Translation: “Now *anarthas* arising out of *bhakti* are being described. They grow along with the main *bhakti* creeper as weeds. Such weeds appear as wealth, gain, fame, respect, and others received from *bhakti* and they influence the heart of a devotee. By their nature, they choke the development of the main *bhakti* creeper.” [4]

It means that along with spiritual results from devotional service, material results as *lābha* – gain; *pūjā* – respect; *pratiṣṭha* – fame;

and other comfort comes to practitioner. Other people can admire him, they want to follow him, respect his knowledge and his high level; they can bring him money and other material things. All of these can attract practitioner and his material desires will arise, that can mislead him from way of *bhakti*.

Such material wishes starts slowly decreasing while one is continuing, insisting on his practice and tries intentionally control own desires that arise along with this process.

At stage of *anartha nivr̥tti* practitioner slowly eliminates from such imperfections (it does not start at level of *bhajana kriyā* simply because at this stage practitioner has nothing to be too much proud of and attract others attention; but in process of practicing, his visible wrong behavior changes to right and respectful, that gives reasons for *bhaktiyuttha anarthas*). At *niṣṭha* stage they leave follower, but still can return in favorable conditions. And at the stage of *ruci* they are fully eliminated, as at this stage he gets a taste, sweetness, which comes from *sādhana-bhakti*, such practice does not need more his conscious effort, but he becomes spontaneously attracted to servicing to Lord, and from this time he is not interesting at such material desires as fame or wealth.

As it is said in “*Sri Bhajana Rahasya*” of *Śrīla Bhaktivinoda Thākura*: *anarthas* give birth to six enemies: lust, anger, greed, illusion, pride, and envy; and also beget six waves: distress, illusion, hunger, thirst, old age, and death [11].

But following the process of *sādhana-bhakti* slowly purify practitioner from these three types of imperfections that were mentioned above. And don't cause too much problems for him. But the forth type of *anarthas* (*aparādhotta*) cannot be eliminated so easily, and can be an obstacle to reach the highest aim of religious practice.

4) *aparādhotta* – *anarthas* that arises from different types of offences.

Śrīla Bhaktivinoda Thākura gives similar classification of *anarthas*, and he mentions four types of *aparādhas*:

a) *Nāma-aparādha*: offences against the Holy Name that also includes offences of saint people, Holy Scriptures and glory of the Holy Name. Ten offences from *Padma Purāṇa* are mentioned in *Śrīmad-Bhāgavatam* (2.1.11, Purport) [8].

b) *Sevā-aparādha*: offences made during service and worship the Deity.

List of such offences is mentioned, for example, in “The Nectar of Devotion” (Chapter 8 “Offenses to be avoided”), that itself is a summary study of *Śrīla Rūpa Gosvāmī's Bhakti-*

rasāmṛta-sindhu [12]. In Gaudia Vaishnava's literature about instructions of worshipping to Deity (*arcana*) you can find list of 32, or 62, actions that one should avoid during this process, or more [13; 14].

This type of *aparādhas* is comparatively easy to avoid. One should worship to Deity very attentively without desire initially to commit any offence; should studies carefully from own guru how to worship in right way. In this case, if devotee, who dedicated all his life to servicing Krishna, will make unintentional mistake during process of worshipping, such mistakes will be eliminated and will have no negative reactions, till one continue his devotional service in sincere mood and with desire to cultivate awareness in practice and trying to avoid mistakes.

c) *Vaiṣṇava-aparādha*: offences against *Vaiṣṇavas*.

Vaiṣṇava means devotee of *Viṣṇu* (Krishna); that one who surrendered everything for the service of God. Offences of any *vaiṣṇava* will have a serious negative consequences; even offence of beginners who still commits sinful activity. As devotional service has power slowly purify him, such beginner in future also will be a saint, a *sadhu*. So one who commits offence even of simple *vaiṣṇava*, or beginner, and especially of spiritual master (*guru*), or *sadhu*, or *brāhmaṇa*, will get great negative results, for example, a lot of suffering in his present and next lives, and, that is the most important, it will prevents one from reaching the highest aim of religious practice. If even very much advanced devotee will commit such offence, his devotional service will be spoiled. If devotee will forgive such offender (as any devotee should cultivate humbleness and love to others), offender still will continue to suffer from results of his offence.

It explains in *Śrī Caitanya-caritāmṛta* (*Antya-līlā. Antya 3*, verses 213):

“*bhaktasvabhāva, – ajñadoṣa kṣamā kare kṣṇasvabhāva, – bhaktanindā sahite nā pare*”

Translation: “A characteristic of a pure devotee is that he excuses any offense by an ignorant rascal. A characteristic of *Kṣṇa*, however, is that He cannot tolerate blasphemy of His devotees” [11].

In *Śrīmad-Bhāgavatam* it is given many examples when Krishna protects His devotees. For example, even *Śrīla Haridāsa Thākura* tolerated an offence of *Gopāla Cakravartī*, Krishna immediately punished offender by making him suffer from leprosy.

So devotee should cultivate awareness to avoid such offences, as to eliminate its results will be very difficult, as it is mentioned in *Śrīmad-Bhāgavatam* (4.26.24, Purport), such offence can be atoned only by begging the pardon of the offended *vaiṣṇava* [8]. After committing such offence, one should immediately come to *vaiṣṇava*, should bow in front of him, ask his pardon, glorify him, pray to God too for forgiveness, feel very deep repentance, and try to serve *vaiṣṇava* till he will please him.

So one should prevent himself to commit offence by actions of his body, his speech, his mind; avoid criticism of *vaiṣṇavas* in his mind; prevent himself even from listening others (or reading such texts) who commits such offence, who criticize or blaspheming *vaiṣṇavas*.

d) *Dhāma-aparādha*: offences against the Holy *Dhām* (holy place of pilgrimage).

As *Bhaktivedanta Swami Prabhupāda* explained in his lecture (on March 14, 1974), spiritual results of chanting the Holy Name in the place of pilgrimage will increase thousand times, but results of committing any offences (that were described before), any sinful activity (like illicit sex, taking intoxication, meat-eating, gambling and others) will increase also thousands times. So devotee should be very aware to avoid them [15].

e) *Jīva-aparādha*: offences against other souls.

According to Gaudia Vaishnavas philosophy, God does not stay alone, He is always in eternal relationship with His creatures – *jīvas* – individual selves (souls); eternal servitors of Krishna. And servicing to Krishna is eternal *dharma* (nature, peculiar condition or essential quality) of *jīvas*, or their *svabhāva* – their true nature; it is a reason for their creation: to be in loving relationship with God. But some of them prefer to use their freedom and leave such relationship and change it to desire to enjoy by themselves. And because of such choice, all *jīvas* are subdivided into two groups (see *Śrīmad-Bhāgavatam* 1.10.22, Purport) [8]:

1) *nitya-mukta* – eternally liberated, those *jīvas* who chose to be in eternal relationship with God and to serve Him in spiritual world;

2) *nitya-baddha* – eternally conditioned *jīvas*, who chose to be independent from God and enjoy and suffer in different material worlds. So devotee should avoid to commit offence towards all types of *jīvas* (independent souls): to demigods, people (including all, *vaiṣṇavas* and not *vaiṣṇavas*, good or bad), animals, plants, insects, and even some stones, etc. In other words, devotee should try to avoid all types of violence without reason, commit-

ted by his body, speech or mind, toward all leaving beings and nature.

More completed classification of *jīvas* is available, for example, in work of *Śrīla Bhaktivinoda Thākura* “Jaiva-Dharma” (chapter 15 “Prameya: *Jīva-tattva*”; Chapter 16 “Prameya: *Jīvas* Possessed by *Māyā*”; Chapter 17 “Prameya: *Jīvas* Free from *Māyā*”) [16].

Next questions can appear: What is the method to avoid negative consequences of these four types of *anarthas* (*duṣkṛtotha*, *sukṛtotha*, *bhaktyuttha*, and *aparādhotta*)? How to prevent oneself from offenses, and how one should eliminate himself in case if he already committed any type of sinful activity that were mentioned above? And for what reason one should have a desire to be purified?

First of all, if devotee wants to reach the highest aim of religious practice, all *anarthas*, results of all sinful activity and desire to produce initially new sinful activity should be eliminated. As for being in relationships with pure God, one should be fully clean. And first step for realizing it is to accept a spiritual master (*guru*) and start this process of purification under his guidance. Second, is to be associated with other devotees and do *bhajana kriyā* together. Worshiping to Deity, chanting the Holy name, listening lectures, preaching and so on, together with other devotees. At the same time, continue individual practice of chanting the Holy Name. Slowly process of devotional service will purify such devotee, and results of unintentional sinful activity (except *aparādh*) will be eliminated. As it is mentioned in *Śrīmad-Bhāgavatam* (11.5.42): “Indeed, if such a surrendered soul accidentally commits some sinful activity, the Supreme Personality of Godhead, who is seated within everyone’s heart, immediately takes away the reaction to such sin.”

Negative results of unintentional *sevā-aparādha* also can be illuminated by chanting the Holy Name, reciting prayers, and permanent engagement in devotional service. But if one will commit *sevā-aparādha* hoping that the power of Holy Name will purify him, such *sevā-aparādha* will become the 7th *nāma-aparādha*.

For other *aparādh*s, one should be very attentive all the time, and should try to avoid producing offences by his any act of body, speech and even committing *aparādh*s in his mind.

If one unintentional committed something wrong, he should immediately repent his sinful activity and pray for forgiveness of the Holy Name. If one committed offence to *vaiṣṇava*,

he should come to him, pray for his forgiveness, to serve him, as it was mentioned before, till one will get his pardon.

Work with own *aparādhās* means that one tries to cultivate in himself qualities from the *Śikṣāṣṭaka* Prayers that was mentioned before: humility, patience, respect to others, and not expecting personal honor, whether others respect him or not.

Qualities of such purified devotee (*sādhu*) are explained in *Śrīmad-Bhāgavatam* (3.25.21):

“*titikṣavaḥ kāruṇikāḥ
suhṛdaḥ sarva-dehinām
ajāta-śatravaḥ śāntāḥ
sādhavaḥ sādhu-bhūṣaṇāḥ*”

Translation: “The symptoms of a *sādhu* are that he is tolerant, merciful and friendly to all living entities. He has no enemies, he is peaceful, he abides by the scriptures, and all his characteristics are sublime.”

Such enlighten person knows that without servicing to God, life will be spoiled. And as he is a friend to all living entities, and he is full of compassion and very merciful to all, he goes to preach with idea to help all fallen soul to get the transcendental knowledge of devotional service, and to become servants of Krishna. And if during such preaching he meets people who humiliate him or commit any other violence toward him, he stays humble and patience, and continue his work (as, for example, *Haridāsa Ṭhākura*, who was caned in twenty-two marketplaces), because it is mission that his *guru* gave him: to deliver this knowledge to all fallen souls [8].

And aim of the level of *anartha nivṛtti* (purification from any results of sinful activity and from desire to commit new one) is to reach state of such *sādhu*, who is free from most types of impurity.

But even *sādhu* may not be free from all *anarthas*. As some of them needs more time to be eliminated. And, for example, *pratiṣṭhāśā* (desire for fame) will be the last *anartha* that will leave a devotee (even high level of devotee still can want to enjoy that respect that others express to him because of his high position, his deep knowledge, his high level of austerity, etc.), but he should not concentrate too much to such desires of mundane enjoyment and should continue his devotional service, even some of *anarthas* will return to him from time to time. He should continue to cultivate humility and patience; think about himself less, and think more about realizing the mission that spiritual master gave to him.

After passing level of *anartha nivṛtti*, when devotee’s chanting of the Holy Name was not pure because of *anarthas*; one will continue his devotional practice and will reach next level of chanting that is called *nāma-ābhāsa*, and then *śuddha-nāma*, that will lead a devotee to stage of *bhāva* or *prema*, the highest aim of devotional practice.

Conclusion

Person’s egoistic desire to be independent from God and from other His creatures (that is envy to God’s high position, and disagreement with own position of servant), and person’s desire to enjoy by himself, is a reason of permanent dissatisfaction of one’s life. It is a main reason of suffering in material world, of falling from spiritual world and separation from God.

Self-purification and avoiding sinful activity is a very important initial step of spiritual practice; practice that has meaning to change the inner nature of practitioner: from someone who attached to self-enjoyment and has egoistic and pride nature, to someone who considers himself as a servant of others and develops his humbleness and compassion, desire to give rather than take; who feels himself as a part of a whole, and who understands that his happiness, divided from happiness of others, can not exist. And without such understanding further progress in religious practice will be impossible.

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IDEOLOGEME “NURLY ZHOL”: NEW STATE IDEOLOGY OF KAZAKHSTAN

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The article is devoted to the ideologeme “Nurly Zhol”. An ideologeme is one of the elements of ideology as a set of views and concepts that make up the self-consciousness of a people. In it, the main idea is at the same time the norm that directs the views of citizens in a strictly defined value-semantic channel. The linguistic perception of the modern world has changed. Thus, the need and relevance of the study of ideologies has increased. In the speeches of the Head of State, the *ideologeme* “Nurly Zhol” (“The Shining Path”) for the first time receives a social and political meaning and expression. “Nurly Zhol” is actively functioning in the titles of articles. The analysis of the headlines of journalistic articles revealed various ideological connotations of the *ideologeme* of “Nurly Zhol”: “bright dream of Kazakhstan people”, “bright path of Nursultan”, “key to success”, “development of housing infrastructure”, “new economic policy of the Republic of Kazakhstan”, “historical heritage”. *Ideologeme* symbolizes new opportunities for the dynamic development of the Republic of Kazakhstan. It is treated as an effective means of guaranteeing stability and economic prosperity of Kazakhstan, which means a colossal project that is aimed not only at solving current problems, but also at long-term results for future generations. Using this ideologeme, an image of the national policy in the Republic of Kazakhstan is formed.

Keywords: Nurly Zhol, ideologeme, the path to success, a new economic program, historical heritage

Ideologemes are the main linguistic means of political discourse. The linguistic perception of the modern world has changed, thereby increasing the need and relevance of studying *ideologemes*. The term ideologeme is widely used in the scientific literature and has many interpretations. There is no consensus in the interpretation of the term *ideologeme* among scientists. Some scientists consider the category of *ideologeme* as a language unit, others refer it to a non-linguistic level. The third group of scientists proposes to consider these two approaches simultaneously. An *ideologeme* is one of the elements of ideology as a set of views and concepts that make up the self-consciousness of a people.

Applying the terms ideology and *ideologeme*, M. M. Bakhtin emphasizes their ideological character: “the abstract single national language is divided into verbal ideological and social horizons, ideological languages, each of which has its own socio-ideological semantic conjuncture, its own slogan, its own abuse and its own praise” [1].

In modern linguistics, there are various typologies and classifications of *ideologemes*. “*Ideologeme* is a language unit loaded with ideological (political) meanings that define (model and regulate) extra-linguistic reality” – this definition is found in the work of T.A. Kuteneva [2]. O.N. Kupina believes that “an *ideologeme* is a verbal unit, a word directly associated with an ideological denotate” [3]. A.P. Chudinov defines *ideologeme* as “a word having an ideological component in its meaning” [4].

N.I. Klushina considers *ideologeme* as a unit of communicative stylistics. In her opinion, an *ideologeme* is an ideologically saturated generalizing word, most often a figurative word, a metaphor possessing powerful suggestive power. *Ideologemes*, the scholar emphasizes, are represented not only in basic discourses (ideological, political, informational, mass, journalistic), but also in other types of discourse: advertising, sports, educational, scientific, religious, entertainment, everyday; however, even within most discourses, for which the *ideologeme* is not a substantive dominant, the cognitive universal implements its most important suggestive function – “purposeful influence from the sender on the consciousness of the addressee (speech receiver)” [5].

Ideology is a system of attitudes and ideas in which attitudes to one or another reality, attitudes, interests, goals, attitudes of classes, subjects of politics and the power of one or another epoch are expressed.

The concept of ideology as a stable form of organizational, regulatory and control systems of the state-social structure was introduced into circulation at the beginning of the nineteenth century by a French scientist, philosopher A.L. Destuth de Trassi.

With independence, Kazakhstan faced the need to form a new state ideology. The period of economic, social and political transformations, corresponding to the stage of the sovereign development of Kazakhstan, led to a “cardinal change in the whole life context” [6]. All these years “the state – on the one hand,

citizens – on the other, are in a situation of renewed identity” [6].

“Ideology, – according to S.Usenov, is an integral part of any state, including, of course, independent Kazakhstan. The ideology of an independent Kazakhstan is a system of ideas of its first president, N.A. Nazarbayev. In his books, articles, messages to the people of Kazakhstan, he always pays special attention to the theoretical aspect” [7].

As the Head of State noted, “in essence, ideology is a time-tested way of consolidating and mobilizing a community of people to solve political and economic tasks, it is a mechanism for the formation of social behavior” [8]

According to A. Bukhayeva, “the development of ideology reflects the complex and contradictory processes occurring in the republic”. In the article “Ideology of Kazakhstan: problems of Formation”, she notes: “In modern ideology, there is a desire to rethink concepts formed in other socio-historical conditions, to develop models and programs that meet the laws of natural history of Kazakhstan” [9].

In this regard, it is relevant to study the ideological evolution of a sovereign state, the study of the ideology – tools for identifying social reality and social processes. The concept of ideology in the political discourse of modern Kazakhstan belongs to the less studied categories in linguistics, knowledge of which is necessary when studying the characteristics of the development of the language system.

Ideologemes affect society and its socio-cultural activities. They act as the main elements in the formation and re-formation of meanings, as the dominant components of social consciousness. The form of existence of ideology is a sign form: a word, a phrase.

A. Morozov and A.Tastenov argue that the process of forming the foundations of the new ideology of Kazakhstan can be divided into three main stages: “The first stage (1991-1995) was characterized by the destruction of the old ideological system and the definition of the contours of the new state ideology. The second stage (1995–1997) was characterized by the introduction of liberal democratic values into public life and the active discussion in the country of the problems of forming the state ideology of Kazakhstan. The third stage (1997 – to the present) is characterized by a new push in the formation of the ideological basis for the development of Kazakhstan” [10].

I. Dudinova, L.I. Mukhamadiev, sharing the point of view of the researchers A. Morozov and A. Tastenov, consider that the formation of the state ideology in Kazakhstan can

be divided into three stages. The first, in their opinion, dates back to the nineties of the twentieth century and is characterized by two periods: the rejection of the old ideological system and the formation of the new contours of the ideology of independent Kazakhstan. The second stage refers to the zero years of the XXI century and is characterized by progressive and ambitious programs of successful integration into the world space as a strong and self-sufficient partner. The third stage is modern; it started in 2012 with the adoption of a new development paradigm of the state – “Strategy “Kazakhstan-2050” : New political course of the established state” [11].

At the present stage of development of Kazakhstan, the following *ideologemes* can be noted: “Mangilik El”, Astana, G-Global, EXPO-2017, “Ruhani Zhandyru”, “Great Steppe”, tolerance, civil identity, Kazakhstani people, etc.

“Problems of incomplete formation of mechanisms for ideological construction in the Republic of Kazakhstan”, A.V. Ozherelyeva writes, –determine the urgency of the search for new scientific approaches to the development of a system of ideologies promoting the national idea” [12].

In the speeches of the Head of State, for the first time, she receives a social and political meaning and the expression “Nurly Zhol” (“the bright path”). In the Message to the People of Kazakhstan “Nurly Zhol – the Way to the Future” (dated November 11, 2014), the President of the Republic of Kazakhstan announced the New Economic Policy of Kazakhstan “Nurly Zhol”. He stressed that it is counter-cyclical, which means a decrease in the dynamics during the recovery period and an increase in the periods of decline in production [13].

The *ideologeme* “Nurly Zhol” in speeches and messages of the President of the Republic of Kazakhstan Nursultan Nazarbayev, as well as in scientific works of political scientists, philosophers, writers, historians, economists is quite common and is understood as “new economic policy of the Republic of Kazakhstan”. Thus, in the opinion of the Deputy Chairman of the Assembly of the People of Kazakhstan, Doctor of Economic Sciences, Professor A. Bashmakov, the Message of the President “Nurly Zhol”, voiced at the extended meeting of the Political Council of the Nur Otan Party, once again showed that “the economy for Nursultan Nazarbayev is only a method, an instrument, and its ultimate goal is a person with his culture, inner world, spiritual development, the soul of a person” [14].

Nursultan Nazarbayev emphasizes: “Peace and stability is a national wealth, which must be protected and strengthened every day” [14].

In the opinion of E. Sydykov, Doctor of Historical Sciences, “Nurly Zhol of President Nursultan Nazarbayev is a path laid out through more than one year of research, it is a large-scale development program, originating from the day Kazakhstan’s independence began. “All economic levers are aimed at improving the potential of the citizen of Kazakhstan: his education, culture, development of intelligence, spiritual and moral enrichment. Stabilization of the economy through the dynamics of the development of the entire infrastructure is a direct concern for us, Kazakhstani people” [15].

The President of the Lao People’s Democratic Republic, T. Sayasone, believes that the “Nurly Zhol” economic program is a timely response to new global threats.

T. Sayason stresses that he “highly appreciated the economic policies and achievements of Kazakhstan in the international arena being conducted by the President of the Republic of Kazakhstan N. Nazarbayev, as well as the new economic program Nurly Zhol”. In his opinion, “the main initiatives of the President of the Republic of Kazakhstan set out in the document are a timely response to the current new global threats, which, in turn, will serve the effective growth of the country’s economy” [15].

D. Akhmetzhanov, in an article entitled “Nursultannyn nurly zholy” (The bright path of Nursultan), is not just an *ideologeme*...” writes: “In late August 2014, at the rooftop Ulytau mountain, President N. Nazarbayev shared his thoughts about the future of the country. He then said that it would definitely be bright. It seems to me that it was then that Nursultan Abishevich came to the idea of a new economic policy “Nurly Zhol” [16]. According to D. Akhmetzhanov, the idea of constitutionalism in Kazakhstan goes back centuries: “From the 15th to the 17th centuries, the Kazakh steppes have become familiar with the phrase “Kasim Khannyn Kaska Zholy, Esim Khanyn Eski Zholy”. We are talking about the codes, in fact, the first Kazakh constitutions. In translation, they sound like “The bright path of Kasym Khan” and “The ancient path of Yesim Khan” [15]. He believes that the aforementioned winged phrases can be supplemented with the new ideologue “Nursultannyn nurly zholy” (The bright path of Nursultan), which translates as “Radiant (or bright) path of Nursultan”. D. Akhmetzhanov contributes a rich meaning to the ideology of Nursultannin nur-

lyzholy: “Nursultannin nurly zholy” is not just an *ideologeme*. This is our radiant route to follow the XXI century and beyond” [16].

According to V. Kuptsov, the ideologue of “Nursultannin nurlyzholy” suggests the following: the re-establishment of the Kazakh language as the state; recreation of the people of Kazakhstan as a modernized and corresponding to the challenges of the XXI century; restoration of the territorial integrity of Kazakhstan, delimitation and demarcation of borders with neighboring states [17].

The *ideologeme* “Nurly Zhol” actively functions in the headlines of publicistic articles:

1. “Nurly Zhol – **the path to the prosperity of Kazakhstan**”; “Nurly Zhol – the path to the future”; “Nurly Zhol: Moving Forward”; “Nurly Zhol is the **key to success**”; “Nurly Zhol –**the path to the development of society**”; “Kazakhstan: Nurly Zhol opens fantastic perspectives”; “Nurly Zhol is a **bright path to the future**”; “Nurly Zhol **will lead Kazakhstan to a qualitatively new level of development**”. *Ideologeme* symbolizes new opportunities for the dynamic development of the Republic of Kazakhstan. It is treated as an effective means of ensuring the stability and economic prosperity of Kazakhstan.

2. “Nurly Zhol: a new approach in the housing state program”; “Available on the available: How the **Nurly Zhol housing program** is arranged”; “Nurly Zhol –**the program of optimal home buying**”; “**How to buy an apartment** from ZhSB on the program Nurly Zhol”; “Nurly Zhol program in 2017: **how to get an apartment**”. In these titles, the *ideologeme* Nurly Zhol is understood as a new approach in the development, strengthening and modernization of housing infrastructure.

3. “New economic policy of Kazakhstan Nurly Zhol as a program of transcontinental cooperation”; “Nurly Zhol –**a bridge between cities and countries**”; “Nurly Zhol and **one road**”; “Within the framework of Nurly Zhol, **75 thousand workplaces were created on the construction of republican roads for the year**”; “Nurly Zhol: new roads will update the economy and society of Kazakhstan”. Analyzing these titles of articles, we can conclude that the ideology of “Nurly Zhol” means a colossal project that is aimed not only at solving current problems, but also at long-term results for future generations. Also, the *ideologeme* is connected with the country’s transport network – roads that should connect the macroregions with the cities of Almaty, Astana, Aktobe, Shymkent, Ust-Kamenogorsk, which are centers of activity, concentration of capital and

advanced technologies. Ray principle based on the development of transport, transit and logistics, industrial, housing, social and energy infrastructures.

4. “How the “Nurly Zhol” strategy helps to solve the problem of three-shift schools in Zhetysu”; “Nurly Zhol – the path to the future. Our task is to strengthen the integration of science, education and production. “The *ideologeme* of Nurly Zhol points to ways to solve the problems of emergency schools and three-shift education. It is also connected with the tasks of integrating business with universities, forming research institutes focused on the innovation process, and introducing scientific achievements into practice. In the headlines, the *ideologeme* “Nurly Zhol” has various connotations and includes multi-level systems: economic, ideological, historical, etc. Due to its universality, it is able to characterize a whole complex of ideological lexemes: state ideology, national idea, economic policy of the Republic of Kazakhstan, stable the state, etc. Through the use of this ideologeme in the works of President N. Nazarbayev, political scientists, scientists, a certain image of national policy in the country.

Important public facilities are called Nurly Zhol. Thus, the new railway station and the new terminal of Astana Airport are “Nurly Zhol”, one of the central boulevards in Astana, a street in the Southern capital, the bridge in the Pavlodar region is “Nurly Zhol”, a park in the East Kazakhstan region – “Nurly Zhol”, The editorial office of the Uzunkol district newspaper “Nurly Zhol” by the akimat of Uzunkol district of the Kostanay region is also known.

The neutral combination of “Nurly Zhol” in recent years has turned into an *ideologeme*, which has a clear political tint and is associated with the life and fate of every Kazakhstani person. Ideological connotations are actualized: “bright dream of Kazakhstani people”, “bright path of Nursultan”, “key to success”, “development of housing infrastructure”, “new economic policy of the Republic of Kazakhstan”, “historical heritage”.

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ANALYSIS OF THE APPLICATION OF LASER RADIATION IN THE PROCESS OF ORTHODONTIC TOOTH MOVEMENT AND SUGGESTIONS ABOUT THE IMPROVEMENT OF TECHNOLOGY

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The process of comprehensive orthodontic treatment is characterized by a long-term duration and high probability of the development of adverse effects. Researchers have proven that lasers have a positive effect in the process of orthodontic tooth movement, but the issue of selecting appropriate laser radiation characteristics and developing new modified approaches to the application of laser radiation requires further research. The aim of the study is to analyze the results of the study on laser radiation application in the process of orthodontic tooth movement, and to make recommendations for the design of a new model of low-level laser device. Materials and Methods. Content analysis of scientific publications devoted to the investigated problem has allowed us to highlight the works in which solution to this problem is covered to the fullest extent possible and has given the author an opportunity to make their own recommendations for the improvement of laser radiation systems and the development of an analog which would be more mobile in terms of construction and more clinically effective. Results of the study and their discussion. Most researchers confirm the effectiveness of laser radiation in the process of orthodontic tooth movement, although some of them did not notice any positive effect. According to the first studies, laser radiation favors the fusion of mononuclear macrophages for the maturation of osteoblastic cells, an increase in the quantity of differentiated osteoblastic cells and bone formation centers, and the acceleration of mineralized bone tissue formation in the stretching area. In other studies, the following was noted: an increase of the collagen synthesis, a positive effect on the metalloproteinase-9, cathepsin K and alpha (v) beta (3) integrin expression, and maintenance of initial parameters of bone mineral density. Further studies largely confirmed the preliminary results of tooth movement rate increase by 20-40% and showed the acceleration of pulp tissues regeneration, thus minimizing the risk of irreversible complications and a significant reduction of pain sensations. Following the results of the conducted analyses and on the basis of own practical experience, the author emphasizes the following recommendations for the development of a new model of low-level laser device: 1) using luminophores in the laser construction and selecting handpieces with different output parameters; 2) using the technology of selective dimensional metal plates' etching; 3) constructing knockdown laser systems; 4) the wavelength must be 810 nm. Conclusions. In order to determine the mechanism of the effect laser radiation has on the orthodontic tooth movement, it is necessary to carry out additional morphometric, X-ray, histological, and clinical studies.

Keywords: laser radiation, tooth movement, macrophage, osteoblast, bone formation

In most cases comprehensive orthodontic treatment of patients is a rather long process, duration of which depends on a number of determinants: number of stages in the treatment algorithm, complexity of orthodontic pathology, patient's age, initial characteristics of the dento-alveolar system, oral tissue response to a particular type of iatrogenic intervention [1, 3, 7, 9]. In addition, in the course of the use of orthodontic equipment, specific conditions are created for the development of possible adverse effects of treatment, such as gingivitis, carious lesions; as it is hard to carry out adequate hygienic control, there is root resorption, excessive reduction of the level of jaw bone tissue due to remodeling [10, 13, 14]. Finally, in order to avoid the risk of undesirable effects of iatrogenic interventions and to accelerate the process of controlled orthodontic therapy in conjunction with orthodontic procedures, a number of auxiliary exposure methods have been developed which allow one to achieve a more predictable clinical outcome, contribute to minimizing inflammatory processes, and in general allow one not only to systematically approach the process of dental rehabilitation, but

also make it more acceptable and less uncomfortable for patients. The potential or summational positive effect of treatment is achieved when carrying out the orthodontic phase and its adjacent approaches, such as orthodontically driven corticotomy, local administration of prostaglandins and osteocalcin, the use of ultrasound, laser radiation, electromagnetic field, or electric current.

Among the first scientists who studied positive effects of lasers on the process of orthodontic tooth movement were Kawasaki and Shimizu, who explained this by accelerative remodeling of the alveolar bone, which is manifested in the increase of the number of osteoblasts, increased levels of cell proliferation in the periodontal ligament space, and mineralized bone tissue formation [8]. In addition, the authors managed to also prove another, no less significant fact: the use of laser radiation with the control of its initial parameters and compliance with a particular biological range does not cause negative changes directly in the area of laser exposure and in the bodies of studied animals in general. However, the issue of selecting appropriate characteristics of laser

radiation and the development of new modified approaches in order to improve modern technologies in dental practice remains a topical scientific and practical aspect which requires further research in this industry.

The aim of the study was to analyze the effectiveness of using lasers in the process of orthodontic tooth movement and to highlight perspective aspects of the improvement of existing low-level laser radiation systems for the development of an analog which would be more mobile in terms of construction and more clinically effective.

Materials and research methods

Scientific publications devoted to the issue of expediency and effectiveness of the use of laser technologies in the dental – and in particular in orthodontic – practice for the purpose of optimizing the process of orthodontic tooth movement were analyzed in the course of the study. We searched for material using keywords in the Google Scholar search system. In the course of content analysis, we selected those research papers that most fully covered aspects related to the main aim of the study, that is, the issue of laser output parameters for orthodontic movement, clinical signs, and biological markers that confirm the effectiveness of the use of this technology in particular clinical conditions, as well as the prospects of improving existing low-level laser radiation systems. Registration of laser output parameters in a number of studies allowed us to determine those parameters which varied most of all and therefore could lead to the achievement of a particular clinical outcome. On the basis of the conducted analysis, we made a number of own recommendations, which can serve as a basis for the future improvement of laser radiation systems and the development of an analog which would be more mobile in terms of construction and more clinically effective. Numerical parameters obtained in the course of the analysis of previous publications were categorized and grouped in tabular form using Microsoft Excel 2016 (Microsoft Office 2016).

Research results and discussion

The dynamics of orthodontic tooth movement depends on the rate of bone remodeling [1, 4, 5, 8, 10]. This process does not start immediately on the first day of applying mechanical load to a tooth, but it is, in turn, connected with the phases of activation of osteoclastic and osteoblastic cells. That is why, according to Kawasaki and Shimizu, it is in the early period of orthodontic intervention

that laser radiation contributes to the process of tooth movement most of all. Such an effect, according to the authors, is observed because the effect of a laser contributes to the fusion of mononuclear macrophages for the maturation of osteoclastic cells [8]. A similar effect is observed in case of local administration of vitamin 1,25-(OH)₂D₃, which also results in a significant increase in the number of multinucleated bone marrow cells. Among other things, Kawasaki and Shimizu found that not only does laser radiation contribute to faster osteoclast activation, but also increases the rate of mineralized bone tissue formation in the stretching area 1.7 times. This effect is caused by the effects of radiation on the increase in the number of more differentiated osteoblastic cells and formation of bone formation centers. It must be noted that in many studies that were conducted earlier on the effects of lasers on processes associated with orthodontic tooth movement, the protocol was similar to the one primarily described by Kawasaki and Shimizu, which involves contact application of fiber optic to soft tissues directly around the teeth that are subject to disposition [2, 5, 10, 12]. Separate studies on the use of low-level laser radiation indicate that not only does this method contribute to the acceleration of bone tissue regeneration process, but also to the increase of collagen synthesis, which, in turn, is the main matrix protein in the bone structure. In particular, this effect was registered when using lasers in the conditions of palatal suture expansion. S. Fujita (2008), in turn, attributed this effect of low-level laser radiation on the rate of orthodontic movement to RANK and RANKL induction, which was confirmed by the corresponding positive results of immune responses [5]. M. Yamaguchi enhanced the results of S. Fujita's study (2008), having found that low-level lasers also have a positive effect on the metalloproteinase-9, cathepsin K, and alpha (v) beta (3) integrin expression. All of the above factors are necessary for the process of osteoclastogenesis [13]. In the course of studies conducted by Japanese scientists, not only did they manage to confirm stimulation of expression of the corresponding bone markers with the help of a laser, but also its positive effect on the preservation of the initial parameters of bone mineral density during orthodontic movement. When using a laser with the following output parameters: 780 nm, 20 mV, 10 s, 5 J/cm², M.V., da Silva Sousa and colleagues (2012) found a statistically significant difference in the dynamics of movement of canines over 4 months of observation [3]. At the same

time, various bone and root resorptions in teeth that were subject to mechanical loads were almost the same both in cases where a laser was used, and in cases where it was not used.

However, as a result of a double-blind, randomized, placebo-controlled, case-control clinical trial conducted by W. Limpanichkul and colleagues (2006), the scientists failed to prove the effect of low-level laser therapy on the process of orthodontic tooth movement, but at the same time, they noted that energy density of 25 J/cm³, which was used in the experiment, was apparently too small to provoke the occurrence of both an inhibition effect or the expected stimulatory effect [10]. In order to control the process of orthodontic movement of canines, the researchers used a GaAlAs laser with a wavelength of 860 nm and the following output parameters: 100 mV, a spectral area of 0.09 cm², a power of 1.11 V/cm², a dose of 2.3 J/point, and energy density of 25 J/cm²/section. M. Marquezan (2010) also noted that there is no significant clinical effectiveness when using a laser in the process of orthodontic tooth movement. In the course of the use of two treatment protocols (in case of daily exposure and only at early stages), the authors noted that there was a progressive increase in the number of osteoclasts and immature collagen at an early stage of orthodontic treatment, however this effect was leveled out in the follow-up period due to the fact that the reparation process in the area of tooth strain slowed down [11].

Unlike W. Limpanichkul and colleagues, Cruz and co-authors (2004) confirmed the effect of low-level laser radiation on the process of controlled orthodontic tooth movement, which manifested itself in the acceleration of such a disposition, and thus contributed to a reduction of treatment duration [2]. At the same time, the researchers were using a device with somewhat lower output parameters, but according to a modified algorithm of the procedure. Genc and colleagues (2012) received significantly higher results of orthodontic tooth movement in a research group where low-level laser radiation was used on the 7; 14; 21; 28, and 35 day of monitoring compared with the control group. Thus, they managed to confirm the preliminary results obtained during the studies conducted by Saito and Shimizu, Yousel and colleagues, Kawasaki and Shimizu, in which the average range of increase in the rate of tooth movement during orthodontic treatment amounted to 20-40%. It is also important to note that Genc and colleagues (2012) also pointed out the results of previous studies conducted by W. Limpanichkul, which indicated

that laser radiation has no effect on orthodontic movement. The authors interpreted such a difference in the effect of laser radiation as the dependence of the desired clinical effect on a radiation dose and the duration of the effect of a physical factor [7]. Among other things, Genc also noted the importance of registering the level of nitrogen oxide as a marker of the response of periodontal tissues to the effect of orthodontic forces. In the author's study, the researchers did not find any statistical difference between the nitrite levels in the study group and control group. Even in the context of the already proven fact that the use of laser radiation contributes to the reparation of bone tissue in the area of exposure, the aspect of the required radiation dose is still unresolved, and it is still unknown which of them has the greatest effect on the corresponding cell lines, thereby stimulating healing effect. At the same time, it is also important to carry out studies in order to check whether initial settings of the laser can cause damage to the surrounding tissues and the development of toxic effects.

L. Abi-Ramia (2012) confirmed the fact that orthodontic tooth movement causes the appearance of reactive pulp hyperemia as a result of the effect of mechanical forces, but the use of low-level laser radiation contributes to the process of faster reparation of pulp tissues, and thus minimizes the risk of irreversible complications [1]. In the group where the effect of mechanical disposition without additional use of lasers was studied, it was found that an odontoblast layer inside teeth was more disorganized; at the same time, the researchers observed undifferentiated cells and capillaries overfilled with blood. G. Doshi-Mehta and W. A. Bhad-Patil (2013) were able not only to confirm the increase in the dynamics of tooth movement by an average of 30% (29% on the upper jaw and 31% on the lower jaw), but also a significant reduction of pain sensations according to visual analogue scales on the third day of using an orthodontic appliance [4]. At the same time, in comparison with the 3rd and 30th days of observation, pain score in the experimental group where laser was not used decreased from 2.15 to 1.5, whereas in the control group it changed from 0.25 to 0.5. As a result of systematic review and meta-analysis conducted by M. K. Ge and colleagues (2014), in which they managed to analyze 173 studies with a total of 211 participants, it was found that in case of additional use of lasers, acceleration of orthodontic tooth movement was observed in the period of 7 days and 2 months; at the same time, the authors noted higher

clinical effectiveness of lower energy density compared with those exceeding 20 J/cm² [6].

An analysis of literary publications devoted to the use of laser technologies in dental practice and frequent practical application of this approach in the author's clinical work allowed us to distinguish aspects which should be taken into account in the development of a new model of a low-level laser device. Uncontrolled use of laser radiation can have a damaging effect on surrounding tissues. This effect can be prevented by using luminophores in the laser structure – this way the phenomenon of radiation becomes secondary, and conditions in which a physician can easily adjust both the spectrum and the level of energy are formed. These possible device settings, or rather selection of handpieces with different output parameters depending on the combination and composition of luminophores, allow one to use it in various clinical situations. In order to ensure high effectiveness of the new proposed system, the need for maximum cooling has to be taken into account when developing such a system. For this purpose, we suggest using a technology of selective dimensional metal plates' etching, in order to model their typology and the desired hierarchy. By combining such a technology with the methods of accelerated electrolytic metallization, you can minimize the total thickness of a plate up to 200 microns, thus ensuring the most rapid effect of a cooling system with minimal energy consumption. Taking into account the dynamics of modern technological development, as well as constant modifications and upgrades of devices used in dental practice in particular, it is logical to develop knockdown laser systems. That is, the possibility of replacing components of a laser device – a fibre optic cable, the system of luminophores, the main working unit of the system – greatly simplifies the task of adapting laser technologies in various clinical situations, and on the other hand, it enables further improvement of a device by using a modified composition of luminophores or a conductive fiber optic cable. In addition, it is this design of the system that is also the most convenient in terms of replacing outdated components, which also allows one to start mass production of each of them. Based on the existing experience, wavelength of the experimental laser system should be equal to 810 nm, given that systems with a wavelength which is close to such a value had the highest clinical effectiveness, judging by the previous studies. That is, by taking into account all the above-mentioned suggestions, it is possible to develop a laser

device for dental practice which will have significantly higher effectiveness and mobility, compared with existing systems, while solving the following three important aspects of orthodontic treatment: 1) accelerating the process of orthodontic tooth movement due to the effect on the process of bone remodeling; 2) reducing the duration of dental treatment due to accelerated disposition of teeth in the jaws; 3) reducing the signs of inflammation and pain sensations due to biostimulatory effects on the surrounding oral tissues in the area of direct exposure to radiation.

Conclusions

The conducted analysis of the results of published studies on the expediency of using low-level laser radiation in the course of orthodontic tooth movement allowed us to confirm the positive effect of lasers on bone remodeling processes, minimizing the signs of inflammation in the area of teeth that are subject to disposition and reducing the duration of treatment. The suggestions made by the author about the improvement of laser devices can be the basis for developing a system that would be more mobile in terms of construction and more clinically effective, which will expand the use of laser radiation in various clinical situations. In addition, the possibility of replacing and modifying the system of luminophores at the end of a fiber optic cable in the proposed system will contribute to the possibility of constant modification of the device, so that it complies with new scientific and technical developments related to dental practice. In order to determine the effect of laser radiation on orthodontic tooth movement, it is necessary to carry out additional morphometric, X-ray, histological, and clinical studies, which will allow us to distinguish aspects of the effect lasers have on the cells of periodontal ligament space during orthodontic disposition, to analyze the level of changes in architectonics and bone density, the loss of alveolar ridge as a result of the effect of mechanical forces, and how accurately this value can be forecast in the conditions of low-level radiation exposure, as well as the effect of lasers on inflammation in the exposed area based on changes in the concentration of cell markers and external clinical manifestations.

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