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## Section 1. Biology

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### The effect of fertilizing buckwheat on the growth and fertility of the plant

**Abstract:** Field experiments have been conducted on identifying the need in fertilizers of buckwheat planted on the land previously the same year used for growing wheat. We have found out that the annual norm of fertilizers for the buckwheat is  $N_{150}P_{90}K_{60}$  kg/ha. This norm is economically efficient and provides 20,6–21,7 c/ha harvesting in the hot and dry climate of Uzbekistan.

**Keywords:** fertilizing, nitrogen, phosphorus, potassium, plant height, elements of harvest, the mass of 1000 seeds, fertility.

**Actuality:** It is well known that the plant of the buckwheat requires fertilizing, and with its crops it takes out of the land its mineral elements. In order to grow one ton of buckwheat, the plant intakes 35–40 kg of nitrogen, 15–20 kg of phosphorus, 50–70 kg of potassium. The nitrogen containing fertilizers when used moderately provide good growth and development of the plant. As a result, they increase fertility and quality of the plant. When planted on wide rows, and 50% of phosphorus fertilizers are added during the first fertilizing with cultivation, the plant grows well and becomes resistant to diseases and insects.

For the first time, in our republic, we are conducting a research on growing buckwheat on the land previously used for wheat at a later time of the year. Using irrigated lands effectively, and double harvesting is significant in the conditions of intensive agriculture. Because the land that was initially strongly fertilized for the main crop was very beneficial for the buckwheat grown as the second crop.

Buckwheat takes in much of the nitrogen fertilizers from the soil during the period of growth, in the budding period in the body of the plant the amount of phosphorus was sufficient, and the plant feels need in potassium fertilizers when budding and blossoming. The writers think that buckwheat should be fertilized once using nitrogen + phosphorus + potassium at the beginning of budding and blossoming period [1, 23–25; 2, 11–13]. In the black soil of Altay area buckwheat

needs fertilizing with phosphorus during the dry and wet periods equally, and it increases fertility of the plant [3, 45–47].

**Materials and methods.** When conducting laboratory, field, and production experiments, harvesting and analyzing the following methods were used: “Methods of conducting field experiments” (Tashkent, 2007), “Methods of the State sort experimenting of agricultural plants” (Moscow, 1971). The experimented sort of the buckwheat-Kazan buckwheat was grown in the meadow lands of Samarkand region, Republic of Uzbekistan. We conducted a research on growing buckwheat at a later time of the year on the land previously used for wheat in order to find out the needs of the plant in nutrients. We also found out that fertilizing during vegetation and before planting buckwheat and fertilizing the plant during its vegetation period prolongs its vegetation period.

**Results and discussion** In the observation period of the experiment the vegetative period was 65 days growing and development was provided with the soil fertility and the fertilizers added to the soil during the growth of the first planted culture. When fertilizing norm was  $N_{180}P_{90}K_{60}$  kg/h the vegetation period lasted 80 days (table 1). Especially, adding nitrogen containing fertilizers prolonged the periods from blossoming till the first crop ripening and from the first crop ripening till the full ripening to 6–10 days.

Table 1. – The effect of fertilizing on the vegetation period of buckwheat in the pre-harvested fields (2013–2015 years)

Experiment variants	from planting till first sprouts	from first sprouts till budding	from budding till blossoming	from blossoming till first crop ripening	from first crop ripening till full ripening	Vegetation period
Control area (non-fertilized)	8	16	9	18	14	65
back ground $P_{90}K_{60}$	8	15	9	19	15	66
$N_{90}P_{90}K_{60}$	8	14	8	21	19	70
$N_{120}P_{90}K_{60}$	7	14	8	23	22	74
$N_{150}P_{90}K_{60}$	7	13	7	25	25	77
$N_{180}P_{90}K_{60}$	7	13	7	27	26	80

We have also found out that moderate fertilizing of the buckwheat grown in the pre-cropped fields also has a large influence on its productivity. While the control variant (non-fertilized) had 79,8 pieces of crop per  $m_2$ , the same area of the fertilized field using

the scheme  $N_{180}P_{90}K_{60}$  kg/h produced 104,2 pieces of crops. The height of the plant in non-fertilized filed was 53,1 cm, while in the filed fertilized using high dosage the height of the plant was 106.6 cm which is twice as high as in control group.

Table 2. – The effect of fertilizing on the productivity of buckwheat in the pre-harvested fields (2013–2015 years)

Experiment variants	The number of crops in one m <sup>2</sup>	The height of the plant	The number of crops on one individual plant					The mass of 1000 crops
			Number of branches	Number of blossoms	Crop			
					Full crop	Empty crop	Total number	
Control area (non-fertilized)	79,8	53,1	3,2	10,5	96,3	24,9	121,2	29,6
back ground P <sub>90</sub> K <sub>60</sub>	85,2	69,6	4,6	16,6	132,6	21,4	154,0	30,0
N <sub>90</sub> P <sub>90</sub> K <sub>60</sub>	94,7	88,3	6,7	25,3	163,9	18,6	182,5	30,9
N <sub>120</sub> P <sub>90</sub> K <sub>60</sub>	96,4	96,8	7,3	27,8	171,6	16,7	188,3	31,4
N <sub>150</sub> P <sub>90</sub> K <sub>60</sub>	99,1	102,3	7,8	29,6	176,6	16,1	192,7	31,6
N <sub>180</sub> P <sub>90</sub> K <sub>60</sub>	104,2	106,6	8,2	32,7	180,9	14,8	195,7	31,8

It was found out that the amount of nitrogen fertilizer was directly proportional to the number of branches on the plant, the more fertilizer was used the larger was the number of branches. While in control group the number of branches on each plant was 3,2 in the field fertilized using 180 kg/ha their number reached 8,2. When individual plant was analyzed for the effects of fertilizer, we saw that the increase in the amount of fertilizer reflected in the increase of the number of vegetative and generative organs of the plant (table 2). Whereas the weight of 1000 crops grown in the non-fertilized soil was 29,6 grams, the weight of the same number of crops grown in the soil fertilized by scheme N<sub>180</sub> P<sub>90</sub> K<sub>60</sub> kg/h was 31.8 grams. In the pilot variant, one plant fertilized with phosphorus and potassium containing fertilizers produced 132,6 full crops, with the increase of nitrogen, it was recorded that the number of crops grew from 163,9 to 180,9. While the number of empty crops decreased from 24,9 to 14.8. But the total number of crops depending on the amount of nitrogen grew from 121,2 (in the control group) to 195,7.

With the increase of the amount nitrogen containing fertilizer that was used the weight of 1000 crops also showed the increase (from 29,6 grams in the control group to 31.8 grams in the N<sub>180</sub> P<sub>90</sub> K<sub>60</sub> kg/h scheme fertilized group).

The influence of the mineral fertilizers used in growing buckwheat in the fields that were previously planted with wheat was researched. The results obtained (Table 3) are presented. As the data in the table show, following normal fertilizing influences the growth, development, and increase in the productivity of the plant. Due to the previously grown plant fertilizing, secondary grown control (non fertilized) plant produced 11,3 centners of crops. When the plant was fertilized using the schemes of N<sub>120</sub> P<sub>90</sub> K<sub>60</sub> kg/h and N<sub>150</sub> P<sub>90</sub> K<sub>60</sub> kg/h, the harvest also showed the increase from 21,1; to 22,2 c/h respectively, and the additional productivity was 9,8–10,9 c/h respectively. Though increasing the amount of nitrogen used for fertilizing led to 0,4 c/h increase in productivity, it did not influence the efficiency largely.

Table 3. – The effect of fertilizing of the fertility of buckwheat in the pre-harvested fields (2013–2015 years)

Experiment variants	The harvest of crops, c/h				Productivity, c/h	Additional harvest	
	I repeated	II repeated	III repeated	IV repeated		c/h	%
Control area (non-fertilized)	10,1	11,2	11,7	12,2	11,3	–	100,0
back ground-P <sub>90</sub> K <sub>60</sub>	12,6	13,4	14,0	14,8	13,7	2,4	121,2
N <sub>90</sub> P <sub>90</sub> K <sub>60</sub>	18,1	18,9	19,4	19,6	19,0	7,7	168,1
N <sub>120</sub> P <sub>90</sub> K <sub>60</sub>	20,1	20,8	21,6	21,0	21,1	9,8	186,7
N <sub>150</sub> P <sub>90</sub> K <sub>60</sub>	21,4	22,2	22,5	22,7	22,2	10,9	196,4
N <sub>180</sub> P <sub>90</sub> K <sub>60</sub>	22,4	22,6	22,7	23,0	22,6	11,3	200,0

**Conclusions.** To conclude, the annual norm of fertilizing buckwheat is N<sub>120-150</sub> P<sub>90</sub> K<sub>60</sub>, this can allow us to grow the planned

amount of the crops, and economically it provides the increase of productivity to 21.1–22.2 c/h.

#### References:

- Vajov V.M. Efficiency of additional fertilizing and pollination of buckwheat in the forest-steppe areas of Altay. Zemledelie. – Moscow: 2013. – № 1. – P. 35–36.
- Strijova F.M. Crop sector: tutorial. – Barnaul: 2008. P. 219.
- Chasovskih D.V. Efficiency of using phosphorus fertilizers on various species of spring-sown wheat in conditions of Altay Pri-Ob lands. – Barnaul: 2013. P. 278–279.

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## Physiological peculiarities of Columbus grass (*sorghum alnum* Parodi) in Samarkand region conditions of Uzbekistan

**Abstract:** For the first time in the conditions of the Samarkand area growth, development and efficiency of a grass of Columbus (*Sorghum alnum* Parodi) are studied. Rates of formation of leaves, a sheet index, pure photosynthetic efficiency during all vegetative period of plants are defined. It is noticed that in flowering of plants the size of a sheet index reaches the greatest size and the maximum of net productivity of photosynthesis is revealed.

**Keywords:** Columbus's grass, growth, development, efficiency, a sheet index, factor of photosynthetic efficiency, mineral fertilizers.

**Actuality:** Due to the sharp continental climate of Uzbekistan and limited availability of irrigated croplands area it is very important to develop rational utilization of land resources. Active investigation and introduction in to the practices new and non-traditional crops, which have higher productivity and nutritional value, will allow successfully solve a wide spectrum of agro ecological problem. In the other hands, introduction of new higher promising crops will widen an assortment of fodder crops with higher protein level, as well as fast growing, higher productive and tolerant to different environmental factors.

In this regards, Columbus grass (*Sorghum alnum* Parodi) can be considered as a promising fodder plant in the dryland regions. This fodder plant exceeds on productivity and nutritional value the traditional fodder plant — corn. The vegetation period of this grass is longer than vegetation period of corn, due to higher re-growth ability and can be used during growth as a green biomass, hay and silos as well. But production technology and biological peculiarities of Columbus grass in our republic not investigated yet, seeds production also was not investigated. Consequently, we started to study bioecological, physiological and biochemical peculiarities of Columbus grass (*Sorghum alnum* Parodi) in the different conditions of our country as well as to develop principal elements of production technologies.

**Materials and methods.** Small scale field experiments were carried out in the Akdarya region of Samarkand province. Planting of seed was done at the end of second decade of April, when soil temperature at the depth of 4–5 cm was no lower than 18 °C. The distance between plants was 60 cm, planting norm — 8 kg/h.

Physiological stage descriptions of seasonal development of plants were carried out according to I. A. Borisova [3]. Intensity of the photosynthesis and respiration were determined with using Plant Vital 5030 (INNO — Concept GmbH, Germany), oxygen content was analyzed with using Klark electrodes [2]. Net photosynthetic productivity was determined by A. A. Nichiporovich et al [5] leaf area index — with using L. G. Tretyakov method [7]. Statistical data analyses were carried out according recommendations of B. A. Dospikhov [4].

**Results and discussions.** The Columbus grass is a perennial fodder plant, which belongs to sorghum genera of cereals from Gramine family. Basic biochemical peculiarities of Columbus grass are linked with it origin and manifestation of genetic potential in different conditions of growth [6]. Seeds are germinated at higher temperature gradient but lower positive temperature (up to 10–12 °C) gradient leads to decreasing of seed germination. Total seed germination occurs after 10 days of planting time. Further growth and development of plants also depends from temperature and humidity. The temperature range 25–35 °C is considered as an optimal for growth and development of this plant. Branching of plants starts earlier and occurs intensively at higher temperatures, but lower temperatures causes to prolongation of this stage up to 10–15 days. Total vegetation period of Columbus grass depends from production conditions: application of mineral fertilizers and irrigation prolongs this period for 15–25 days, and may consist of 85–100 days (vegetation period under three time harvest may continue up to the end of October and consist of 170–200 days) [1].

Table 1. – Leaf area formation of Columbus grass, cm<sup>2</sup>/plant

Treatments	Periods of vegetation					
	branching	tubing	heading	flowering	silking	ripening
no fertilizers	2516.6±6.5	6037.5±14.7	7085.1±16.8	7660.2±18.3	6442.8±15.2	6191.4±12.8
N <sub>100</sub> P <sub>70</sub> K <sub>50</sub>	2826.8±7.4	7148.7±16.5	7851.3±17.6	9126.9±20.1	7789.2±17.3	7340.4±16.3
N <sub>200</sub> P <sub>140</sub> K <sub>100</sub>	3904.2±9.6	7469.1±17.3	8981.4±18.7	9682.8±22.6	8616.9±19.4	8465.1±17.6
N <sub>300</sub> P <sub>210</sub> K <sub>150</sub>	3910.3±9.8	7434.3±17.1	8782.2±19.2	9581.1±21.4	8561.7±18.9	8157.3±17.2

Successful adaptation of plants to different soil and climatic conditions and manifestation of maximal productivity depends

from adjusting physiological processes, mainly photosynthesis, to the local conditions. Principal physiological and biochemical pro-

cesses of plants directly depend from leaves function. In this regards, we studied the intensity of leaf formation in different conditions of mineral nutrition. On the basis of investigation it was identified that leaf area is changed due to growth of plants as well as from applied mineral fertilizers.

The data from table 1 show us that leaf area is increasing due to growth of plants. Most intensive leaf area increase was observed at the flowering stage, with slow decrease in other physiological periods. In the branching stage leaf area of one plant was in average 2516 cm<sup>2</sup>, in the flowering stage 7660 cm<sup>2</sup> and at the ripening stage it was 6191 cm<sup>2</sup>.

Table 2. – leaf area index of Columbus grass

Treatments	Periods of vegetation					
	branching	tubing	heading	flowering	silking	ripening
No fertilizers	2.01	4.83	5.67	6.13	5.15	4.95
N <sub>100</sub> P <sub>70</sub> K <sub>50</sub>	2.026	5.72	6.28	9.30	6.23	5.87
N <sub>200</sub> P <sub>140</sub> K <sub>100</sub>	3.12	5.97	7.18	9.75	6.98	6.77
N <sub>300</sub> P <sub>210</sub> K <sub>150</sub>	3.13	5.95	7.03	9.67	6.85	6.53

Later on, leaf area index (at the silking and ripening) is decreasing gradually. It may be stipulated by decreasing of growth of plants. Formation of leaf area of plants totally depended from the level of mineral fertilization: at the branching stage the optimal rate of fertilizers was N<sub>200</sub>P<sub>140</sub>K<sub>100</sub>. Further increase of fertilizers did not caused to the increase of leaf area index.

We also studied the effect of mineral fertilizers to the growth, development and productivity of plants. It was shown that optimal doses of mineral fertilizers promote formation of larger leaf area. In our experiments the effect of mineral fertilizers was higher at the initial stages of plants developments (branching and tillering). The rate of mineral fertilizers N<sub>200</sub>P<sub>140</sub>K<sub>100</sub> was optimal for better formation of leaf area.

Data analyses on leaf area index of Columbus grass showed that at the beginning of vegetation in all tested variances leaf area increased according to growth stage. Thus, at the flowering stage of plants leaf area index achieved it's highest level (table 2).

Net photosyntetical productivity of Columbus grass varied depending from conditions of mineral fertilization and from periods of plant growth. Net photosyntetical productivity increased from period of branching up to mass flowering with later on decrease (table3).

Table 3. – Net photosyntetical productivity of Columbus grass g/m<sup>2</sup> day

Treatments	Periods of vegetation					
	branching	tubing	heading	flowering	silking	ripening
No fertilizers	5.43±0.16	9.71±0.19	10.92±0.32	11.20±0.33	7.85±0.22	6.82±0.19
N <sub>100</sub> P <sub>70</sub> K <sub>50</sub>	6.03±0.18	10.76±0.32	11.28±0.34	12.51±0.36	9.32±0.28	8.30±0.24
N <sub>200</sub> P <sub>140</sub> K <sub>100</sub>	6.51±0.18	12.42±0.37	13.63±0.40	15.47±0.42	11.92±0.32	9.81±0.27
N <sub>300</sub> P <sub>210</sub> K <sub>150</sub>	6.47±0.17	11.86±0.35	13.08±0.39	14.94±0.42	11.78±0.34	9.76±0.26

It is known that on the basis of changes of intensity of photosynthesis or respiration impossible to conclude on deterioration or improvement of physiological state of plant. During recent years, it was used a special index for estimation of apparent physiological state of plant such as coefficient of photosynthetic efficiency which is a

ration between photosynthesis velocity and night time respiration (mgO<sup>2</sup>/sec.m<sup>2</sup>) [2].

We calculated coefficients of photosyntetical efficiency of leaves of Columbus grass for different stage of development. Obtained results were shown in Fig. 1.

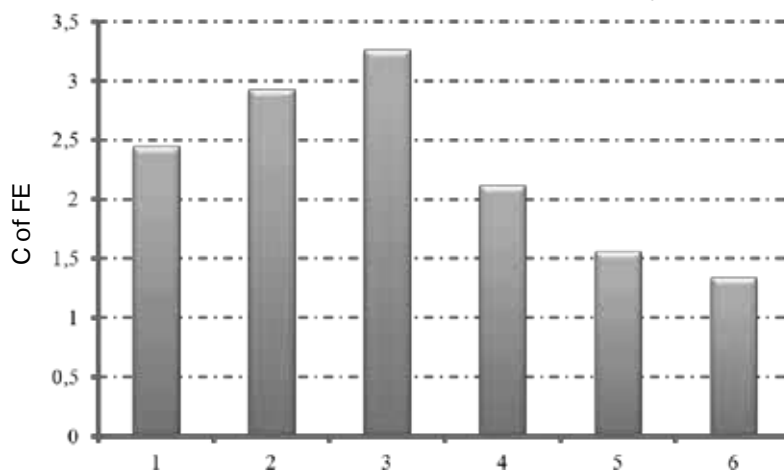


Fig. 1. Coefficients of photosyntetical efficiency of leaves of Columbus grass for different stage of development 1 – branching, 2 – tubing, 3 – heading, 4 – flowering, 5 – silking, 6 – ripening

It was stated, that highest coefficient of photosyntetical efficiency had a leaves at the tillering stage, and after this stage it was decreased. This data correlates with maturing intensity during ontogenesis: highest indexes were at the tubing and tillering stages.

We also stated that in the conditions of Samarkand region

at spring plantation it is possible to make three cuttings of green biomass per vegetation period. First cutting can be done at the beginning of flowering (60–65 days after germination) second cutting can be done after 45–60 days. The yield of green biomass was shown in table 4.

Table 4. – The yields of green biomass and seeds of Columbus grass (t/ha)

Treatments	Green biomass	seeds
No fertilizers	1196.7±36.4	23.6±0.8
$N_{100}P_{70}K_{30}$	1757.8±30.6	29.8±0.9
$N_{200}P_{140}K_{100}$	2119.2±59.4	33.6±1.1
$N_{300}P_{210}K_{150}$	2101.7±57.7	32.3±0.9

As can be seen from obtained data, the yield of green biomass of Columbus grass depends either from climatic factors or from rates of mineral fertilizers. The highest yield obtained in treatment  $N_{200}P_{140}K_{100}$ . Further increase of fertilizers did not increase the yield and productivity of plants.

It is necessary to point out that during second cutting the yield was higher which can be explained by increase of air temperature and solar radiation intensities as well as with optimal branching of plants. Thus, plants of spring planting during first cutting had 4–5 lateral shoots, after first cutting branching intensity is increasing (up to 8–10 shoots). After second cutting it is formed 6–7 lateral shoots, climatic changes occurs (daily temperature changes, shorter days) and consequently the growth intensities also decreases.

Seeds production of Columbus grass varied also depending from applied mineral fertilizers. Thus, as it can be seen from table 4 in the treatment without application of mineral fertilizers seed production was 2.36 t/ha, in the treatment  $N_{200}P_{140}K_{100}$  the yield of seeds was 3.36 t/ha. It was stated that increase of applied mineral fertilizers caused to decrease of seed yield.

**Conclusions.** It was shown that in flowering of plants the size of a sheet index reaches the greatest size and the maximum of net productivity of photosynthesis is revealed. It is noticed that the yield of green biomass of Columbus grass varied from 11967 to 21191 t/ha in dependence from cultivation conditions and climatic factors. Application of mineral fertilizers leads to sharp increase of productivity of plant.

#### References:

1. Avutkhanov B. S., Safarov K. S. Photosynthetic activity of Columbus grass in introduction//Vestnik KKO Academy of sciences of Uzbekistan – Nukus, 2012, – n 3. P. 28–36.
2. Akinshina N. G., Azizov A. A., Karaseva T. A., Kloze E. New possibilities for plant state evaluation//Siberian ecological journal. – Novosibirsk, 2008. – 2 – P. 249–254.
3. Borisova I. V. Seasonal dynamics of vegetation//Field geobotanic. – L.: Nauka, 1972. P. 5–94.
4. Dospikhov B. A. Field experiments handbook. – M., Agropromizdat, 1985. – P. 347.
5. Nichiporovich A. A. Plant photosynthetic activities in the fields. – M., 1961. – P. 131.
6. Sivak E. E. Introduction efficiency of Columbus grass in central black soil region. Kursk: Kursk agrarian academy publish, 2006. P. 191.
7. Tretyakov L. G. Praktikum on plant physiology. – M; Agropromizdat, 1990. – P. 116–119.

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## Substantiation of the change of chemical content of the soils polluted by oil and oil production

**Abstract:** The change of organic and chemical content of desert soils polluted by oil and oil products has been studied in this article. The humus and carbon contents have been analyzed by up-to-date methods.

**Keywords:** soil, oil and oil products, pollution, humus, carbon, cations.

In the soils of oil and oil polluted soils the total carbon content increases, destroys the biochemical balance, dehydrogenase, urease, phosphatase enzymes and the nitrifying process are intensified [1; 2]. The optimality of soil properties determines the self-cleaning process of soil that soil respiration, enzyme activity and plant cover [3; 14], management of microorganisms community, activity of soil humic acid [4; 5] are important measures of the soil.

In purification of the soils polluted oil and oil products the microorganisms, their consortium, the biotechnological approach based on strains and the phytoremediation method can be effective [6; 7; 8; 9; 10; 13; 15; 16]. Oil hydrocarbons affect on soil mineral, organic and chemical contents, physical and biological properties, plants as well as anions and cations, pH change, carbonate amounts and to the increasing of salt content in soil that are visible [11; 12; 17; 18].

Oil and oil products are complex pollutants that effect on soil overall. In initial period of pollution the microorganisms, plant cover can be affected, than soil physicochemical properties might be changed and in its turn it impacts of changing the soil chemical content. Moreover soil carbon nitrogen ratio is misbalanced and organic carbon content increases as well. If soil pollution level till 5%, the humus content does not change, if pollution level reaches from 25 to 97%, the humus amount decreases, resulting breakdown of humification process and purification measures can only be effective in rehabilitation of pollution prevention.

Oil doses can effect to the soils differently, for instance, sorghum cropped in 0.2, 0.4, 0.6 and 0.8 ml/kg doses that after 4 weeks their effect has not observed. The organic carbon, nitrogen and magnesium contents after pollution than control, the phosphorus content was vice versa. The increase of oil amount in soil,

the Fe, Cu, Zn and Pb contents increased [19]. Some authors have studied the change of nutrients and carbon content. For instance, in the soils treated with 10 g/kg dose of diesel bacteria, available carbon, nitrogen and phosphorus elements have degraded within 15 and 40 days. Studies concluded that the degradation goes faster in forest soils than savanna soils [20]. It is observed the increasing of organic carbon in oil polluted soils. The increase of acidity in 0.1–0.3 pH<sub>KCl</sub> impacts on available form of nitrogen, phosphorus and potassium in soil. Besides, oil pollution leads to technogenic salinity, mostly the salinity type would be chloride. In providing recultivation measures it is necessary to apply the meliorants with calcium (gypsum, borate, calcium carbonate etc.) and in salinity high local areas it is more effective salt washing measures as well [21].

The study areas are situated in two regions of Uzbekistan, Kashkadarya and Surkhandarya, there are five soil types chosen for our researches. The main soils of study areas are sandy soils and they spread around of pollution sources “Kukdumalak”, “Zevarda”, “Khovdak” “North Oknazar” and “Kakaydy” oil fields. These soils form in the sandy areas that stabilized with plant species. Study objects in Surkhandarya region oil field “Tashkuduk” (Termez district), “Kakaydy” and “Khovdak” oil fields (Djarkurgan district), in Kashkadarya region “Kukdumalak” oil field (Mirishkor district),

Mubarak oilgas (Mubarak district) with soil types sandy desert, grey-brown, taky, meadow-saz soils were investigated. Humus spots in some cases reach 25–30 cm with amount of 0.2–0.5% (without oil pollution), groundwater lie more than 5 meters.

The laboratory work was done at Czech University of Life Sciences Prague by the support of Erasmus Mundus CASIA Project and at National University of Uzbekistan, Department of Soil Science. Soil organic content was determined by Tyurin modification method, the cation content was done by Aqua regia method. Soil sampling was as following: the distances from “Kukdumalak” oil field 1, 3, 6, 9, 13 and 16 km accordingly with PK-10-1; PK-10-4; PK-10-6; PK-10-9; PK-10-12 and PK-10-14; in the same distance from “Khovdak” oil field samples were named PX-10-2; PX-10-5; PX-10-7; PX-10-10; PX-10-13 and PX-10-15 respectively. Samples were named according to oil field name, so that “PK”-Profile Kukdumalak, “PX”-Profile Khovdak.

These soils are less supplied with organic matter, so it can cause the oil pollution more serious problem. In the soil samples of PK, the humus content in unpolluted soil is 1.5–1.62% in average and organic carbon is 0.88–0.95%. The humus and carbon content decreased under oil pollution in 24% and 14% respectively. In PX samples, humus and carbon content decreased at 48% and 31% accordingly (table 1).

Table 1. – Humus and organic carbon contents in the soils polluted by oil and oil products

	PK-10-1	PK-10-4	PK-10-6	PK-10-9	PK-10-12	PK-10-14	PX-10-2	PX-10-5	PX-10-7	PX-10-10	PX-10-13	PX-10-15
Carbon content, %	0,83	0,69	0,61	0,71	0,8	0,70	1,43	0,54	0,59	1,22	1,14	0,94
Humus content, %	1.43	1,18	1,050	1,22	1,38	1,20	2,46	0,93	1,01	2,09	1,96	1,61

Table 2.

Cox (%)	Humus (%)	Evaluation
<0.6	<1.0	Very low
0.6–1.1	1.0–2.0	Low
1.1–1.7	2.0–3.0	mediium
1.7–2.9	3.0–5.0	high
>2.9	>	Very high

It can be proved that the decreasing of humus content in desert soil polluted with oil and oil products as follows:

First point — the physical properties of soil such as density increasing and moisture decreasing under oil pollution can lead to;

Second point — the humification process ongoing in soil breaks down;

Third point — if amounts of chemical substances in soil (such as oil and oil products, heavy metals, salts etc.) reach the maximum allowable concentrations can cause damage of whole processes in soil;

Fourth point — plant cover richness is decreased, in some areas totally destroys and it its turn the biomass incoming back to soil decreases sharply;

Fifth point — the microorganisms’ amount and their physiological groups can decrease and if pollution is high in level they can negatively impacted by.

Furthermore, oil and oil products causing the soil chemical content lead changing of the element content of soil. The cations content changes differently according to pollution type (pic. 1).

In desert soils before oil pollution are more reach of calcium and magnesium as well as sodium content is high in sorption com-

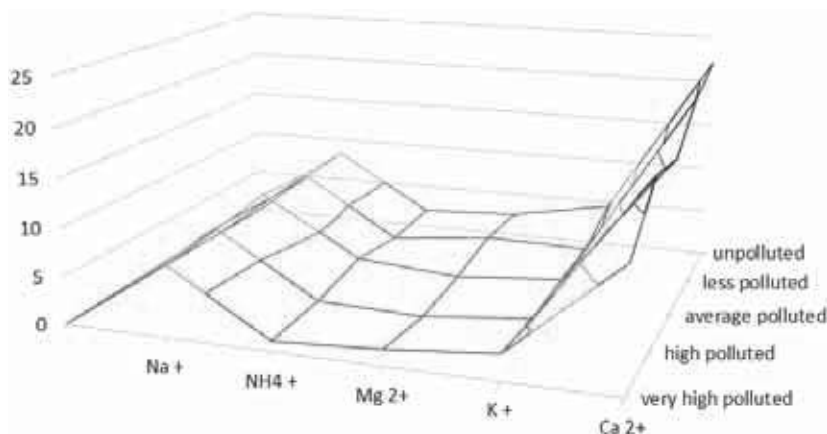
plex. Calcium content is 8–12.5 mmol (+)/100 g, after pollution it raised to 12.3–20.5 mmol (+)/100 g.

Soil sorption complex in oil polluted soils may be affected by the substances and matters buried at the same time with oil water such as mineral salts, additives and other substances that leading to fluctuations of cations content in sorption complex of soil of these areas.

Oil and oil products influence on soil physicochemical, biological properties and features somehow effectively and negatively. Especially it is observable decreasing of soil microbial content, self-cleaning ability of soil decreases as well. The pollution with more than 4 years seriously affect to soil biological community and its functions.

Thus, it is necessary to provide complex remediation measures at polluted sites with applying modern approaches. The bases of the remediation technology are bacteria strains with ability to degrade oil and oil products, and agricultural crops with phytoremediation ability that when they will be introduced in association the high results are achievable.





Pic. 1. Cations' amounts in the soils polluted by oil and oil products in different level

### References:

1. Ежелев З. С. Свойства и режимы рекультивированных после разливов нефти почв усинского района республики коми. Дисс. ... канд. биол. наук. – Москва, 2015. 142 с.
2. Wyszowska J., Wyszowski M. Role of compost, bentonite and lime in recovering the biochemical equilibrium of diesel oil contaminated soil. *LANT SOIL ENVIRON.*, 52, 2006 (11): 505–514.
3. Чугунова М. В., Маякина Н. В., Бакина А. Г., Капелькина А. П. Особенности биодеградации нефти в почвах северо-запада России. – Вестник Нижегородского университета им. Н. И. Лобачевского, 2011. – № 5 (1), С. 110–117.
4. Sarand I., Timonen S., Eeva-Liisa Nurmiaho-Lassila, Koivula T., Haahtela K., Romantschuk M., Robin Sen. – Microbial biofilms and catabolic plasmid harbouring degradative fluorescent pseudomonads in Scots pine mycorrhizospheres developed on petroleum contaminated soil. *FEMS Microbiology Ecology* 27. 1998. P. 115–126.
5. Иванов А. А., Юдина Н. В., Мальцева Е. В., Матис Е. Я. Исследование биостимулирующих и детоксицирующих свойств гуминовых кислот различного происхождения в условиях нефтезагрязненной почвы. *Химия растительного сырья*. 2007. – № 1. С. 99–103.
6. Hashem A. R. Bioremediation of Petroleum Contaminated Soils in the Arabian Gulf Region: A Review. *JKAU: Sci.*, 2007. Vol. 19, P. 81–91.
7. Fatima Menezes Bento, Flávio Anastácio de Oliveira Camargo, Benedict Okeke, Willian Thomas Frankenberger-Júnior Bioremediation of soil contaminated by diesel oil. *Brazilian Journal of Microbiology* (2003) 34 (Suppl.1) P. 65–68.
8. Баландина А. В. Микробная ремедиация нефтезагрязненных агродерново-карбонатных почв и техногенных поверхностных образований в подзоне Южной Тайги. Дисс. автореф. канд. биол. наук. Перм. ПГФА, 2013. 29 с.
9. Коршунова Т. Ю., Мухаматдырова С. Р., Логинов О. Н. Консорциум микроорганизмов, окисляющий нефтяные углеводороды. – Вестник Башкирского университета. 2013. Т. 18. – № 3. С. 734–735.
10. Плешакова Екатерина Владимировна Эколого-функциональные аспекты микробной ремедиации нефтезагрязнённых почв Дисс. автореф. докт. биол. наук. Саратов, СГУ. – 2010. 47 с.
11. Середина В. П., Непотребный А. И., Садыков М. Е. Характер изменения свойств почв нефтезагрязненных экосистем в условиях гумидного почвообразования. – Вестник КрасГАУ. 2010. – № 10 С. 49–54.
12. Шаркова С. Ю. Изменение химических характеристик почвы под действием нефтезагрязнения известия пензенского государственного педагогического университета имени в. г. белинского естественные науки – № 25. 2011. С. 610–613.
13. Шамаева А. А. Исследование процессов биоремедиации почв и объектов, загрязненных нефтяными углеводородами. Дисс. автореф. канд. биол. наук. Уфа, БГУ. – 2007. 24 с.
14. Суслонов А. В. Влияние нефтяного загрязнения почв на морфологические и генетические характеристики растений и на формирование растительного покрова. Автореф. дисс. канд. биол. наук. Уфа, ПГУ, 2010. 19 с.
15. Киреева Н. А., Григориади А. С., Водопьянов В. В., Амирова А. Р. Подбор растений для фиторемедиации почв, загрязненных нефтяными углеводородами. – Известия Самарского научного центра Российской академии наук. 2011. Т. 13. – № 5 (2). С. 184–187.
16. Mariano Adriano Pinto, Kataoka Ana Paula de Arruda Gerald, Dejanira de Franceschi de Angelis, Bonotto Daniel Marcos Laboratory study on the bioremediation of diesel oil contaminated soil from a petrol station. – *Brazilian Journal of Microbiology* (2007) P.346–353.
17. Cruz J. M., Lopes P. M., Montagnoli N., Tamada I. S., Gsilva N. M., Bidoia E. D. Phytotoxicity of soil contaminated with petroleum derivatives and biodiesel ecotoxicol. *Environ. Contam.*, V.8, – № 1, 2013. P. 49–54.
18. Петрова Н. А. Влияние химического загрязнения на биологические свойства почв сухих степей и полупустынь юга России. – Дисс. канд. биол. наук. ЮФУ, Ростов-на-Дону – 2014. 136 с.
19. Okonokhua B. O. Ikhajiagbe B., Anoliefo G. O., Emede T. O. The Effects of Spent Engine Oil on Soil Properties and Growth of Maize (*Zea mays L.*) *J. Appl. Sci. Environ. Manage.* September, 2007. Vol. 11 (3) 147–152.
20. Lawson I.Y.D., Nartey E. K., Darko D. A., Okrah V. A. and Tsatsu D. Microbial degradation potential of some Ghanaian soils contaminated with diesel oil. *Agric. Biol. J. N. Am.*, 2012. 3 (1): 1–5.
21. Леднев А. В. Изменение свойств дерново-подзолистых суглинистых почв под действием загрязнения продуктами нефтедобычи и приёмы их рекультивации: Автореф. дис. докт. сель-хоз. наук. – И.: ВГСХА, 2008. 41 с.

## Biogeochemistry of mercury in mountain-brown soils

**Abstract:** Our studies have found that in the mountain-brown soils content, maximum permissible concentration, Clark concentration and dispersion, radial migration, coefficient of biological absorption of mercury higher in favor of the mine below. The genetic horizons of virgin and conditionally-irrigated soils above the mercury mine contained within 0.42–1.15 mg/kg.

**Keywords:** mercury, virgin and conditionally-irrigated mountain brown soils, biogeochemical indicators, maximum permissible concentration, migration, accumulation.

Aristotle 350 BC, called mercury as liquid silver, hydrargyrum, “silver water” occurs in Pliny, Central Asian nations designated mercury as “simab” that indicates in forsi as silver water. Simab mined at Almaden in Europe, Huankovelike in Peru, as in Russia. Old development places of mercury found in Central Asia, are mining deposits of Chauvai, Haydarkon and others. Around which formed special halos, stretches for several kilometers beyond the fields.

Chauvai deposits located in the south of Fergana at a distance of 50–60 km in mountain systems of Alai, where to the north borders with the mountains of Saribel at the altitude of 1200 meters. Here begins river Chauvai that downstream at a distance of 10 km flows into the river Isfayramsai. Isfayramsai river flows through a series of villages, towns and the city of Fergana, is further used completely in order to irrigation and watering. The importance of the study and evaluation of the content and the biogeochemistry of mercury in the soil, air, water, plants and in other facilities of the region due to the fact that the Ferghana region borders with the industrial object, i. e. a mercury-antimony deposit, this neighborhood brings both advantages and disadvantages.

We according to the method of landscape-geochemical research studied the migration of mercury in eluvial dedicated to the well-drained elevated landscape elements.

Here, the water table is deep and are not involved in soil formation processes. The migration of elements, including mercury goes on principle removal of substances mainly by water flowing downward. Here active biological capture elements of natural and agricultural plants that hold chemicals, including mercury, in the biogeochemical cycles in elementary geochemical landscapes opposes to the removal.

We studied the mountain-brown carbonate soils that formed on the northern slopes of solar exposition in eluvial-xeromorphic moisture conditions under sparse grassland and trees and shrubs, on powerful fine earth and skeleton eluvials, deluvials.

We have collected and compiled averages samples of soils and plants according to morphogenetic method from two key areas where laid on 4 soil sample profiles. The first group of soil sample profiles laid on the virgin site, and the second on conditionally irrigated key areas. The two key areas were taken at the same distance from the mine Chauvai to the south and the north for 500 m, i. e. up and down from the mine. The depth of the soil sample profiles and the power of genetic horizons for the purpose of easy comparison, taking into account the depth of the tillage horizon adopted as the same, such as 0–7, 8–15, 15–60, 60–100, 100–120 cm. In virgin soils (soil sample profile. 1, 2) the content of humus in the sod horizon (0–7 cm), in average is 4.2%, under the sod (8–15 cm) is 3.3%.

The nitrogen content varies at 0,28–0,45%. The content of total phosphorus in these horizons ranges at 0.20–0.22%, mobile at

40–60 mg/kg. The content of total and mobile forms of potassium, respectively, varies between 2.2–2.5%; 250–320 mg/kg.

Effervescence with 10% hydrochloric acid is observed on the surface. That is, in the sod and under the sod horizons carbonate content varies between 4–7%. Throughout the profile of its content is at 4–21%. The soil reaction is neutral and slightly alkaline pH of the aqueous extract varies in the range of 6.5–7.5. Total of absorbed cations in the studied soils ( $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ ) is 12–14 mg/eq to 100 g of soil.

In the conditionally-irrigated soils (soil sample profile 1<sup>a</sup>, 2<sup>a</sup>) the humus content in the tillage horizon is 2.3%, which is less than in virgin soils. They can be classified as low-humus soils. But it should be noted that the humus content throughout the profile remains almost stable and fluctuates in the range of 0.9–2.3%. The content of total nitrogen, which depends on the amount of humus, is quite high. In the content of total and mobile forms of phosphorus, potassium, significant differences between the studied virgin, conditionally-irrigated soils is not observed. Small differences in the upper horizons are existing they are associated with a slight decrease of humus in conditionally-irrigated soils.

The average mercury content in the studied vegetation cover, at above the mine is 1.64 mg/kg, at lower the mine is 3.51 mg/kg. Changes of the content of mercury in uncontaminated soil profiles is inherited mainly from the parent rock. However, Hg easily volatile metal, so in accumulation of mercury it is difficult to rule out the role of additional sources such as a mercury-antimony deposit, thermal activity of lithosphere and others.

The accumulation of mercury in the soil and its horizons associated with the organic matter of the soil, i. e., with humus, for this reason, its concentration in the upper humus layers of conditionally-irrigated and natural soils is higher. In the genetic horizons of virgin soils above the mine the content of mercury (M) is 0.42–1.0 mg/kg, whereas in conditionally-irrigated soil is 0.51–1.15 mg/kg, its maximum content accounts for 0–15, 15–60 cm horizons, i. e., horizons with more humus.

It is necessary to emphasize the role of mercury-antimony deposits, which relatively seriously pollute soil and vegetative cover underlying zone. In this case the mercury content, as in virgin and in conditionally irrigated soils and plants is quite high, so in the profile of virgin soils it contains 5.8–7.2 mg/kg, and in conditionally irrigated soils 3.7–7.8 mg/kg.

Radial migration throughout the soil profile, both in virgin and in conditionally-irrigated soils occurs. Background content of mercury in soils is difficult to estimate because of the wide influence of anthropogenic pollution from this metal and its migration ability. Despite this, the available indicators in different soils of the world show that the average concentration of Hg in the surface layer of the soil does not exceed 400 mg/kg (A. Kabata-Pendias, H. Pendias, [1,

180–190]). According to Haidoutic C. and others [2, 251] interval of mercury concentration in different Greece soils ranges from 33 to 98 mg/kg, and for the contaminated soils from 45 to 325 mg/kg.

Background concentrations of mercury in the soil are 0.6 mg/kg according to international standards. The content of the metal that exceeds this norm, it can be regarded as contaminated from different sources.

In the contaminated soils of UK (B. E. Duvies, [3, 394]), USA (C. J. Blanton, C. E. Desforges et al., [4, 139]), Japan (S. Gotoh, S. Tokudome et al., [5, 391]), Germany (N. El-Bassan et al., [6, 309]) the mercury content is in the range 0.21–40 mg/kg.

In this migration characteristics of mercury in soils, as well as other heavy elements depends on the forms of the presence, the chemical properties of mercury and redox conditions, the water-air mode, agrochemical properties, soil reclamation condition and other factors.

The main indicators of internal factors of migration should include ionic potential of Kartledzha, according to which the ion potential of mercury is equal to 1.78 and according to this indicator occupies an intermediate position, i. e., between I and group III elements.

No less important factors of internal migration of elements considered to be an energy constant of elements. This indicator of mercury is 15.2, this energy due to the energy of the crystal lattice, sulfur mercury, which takes place in our objects. With regard to the accumulation of Hg in plants grown on contaminated sites higher, it is associated with mercury ores.

Hg is water migrant, slightly mobile element in an oxidizing condition and practically immobile in a hydrogen sulfide environment. It is precipitated alkaline barriers. It migrates in an oxidizing condition. Unfortunately, threshold concentrations for individual groups of plants and soils are not yet developed. We know that plants are able to absorb from the environment, depending on the conditions, a number of elements. This property of plants depends on a number of factors related to the plants themselves, and the element, soil cover and others. This ability of plants characterized by the coefficient of biological absorption ( $A_x$ ), which shows how many times the content of the element in the plant ash greater than in the lithosphere or the soil. According to our estimates given in the table and in a number of biological absorption of mercury elements, the element of the biological average absorption,  $A_x$ , in the plants above the mine varies in the range of 1.04–3.90.

There is an interesting fact, in spite of the fact that the plants below the mine contains almost twice higher mercury than in the plants above the mine,  $A_x$  much lower and varies in the range of 0.45–0.94, which is associated with quite contaminated background on this the key area and the electoral capacity of plants to high concentrations of heavy elements such as Hg. The maximum permissible concentration (MPC) of mercury in soils taken 2.1 mg/kg. This figure is not definitive and it varies depending on the properties of different soils.

At the same time the MPC coefficient shows how many times more or less elements contained in the studied soils than in the whole of the soil (soil clark). Studies show that in uncontaminated soils samples 1, 1<sup>a</sup> the MPC coefficient is in the range 0.20–0.55, is almost 4–10 times less Hg contained in these soils, compared to Clark. In the contaminated soils the MPC rate was expected at 1.78–3.55. It is clear from the above that the mercury contamination goes around the soil profile, regardless of its condition. This was facilitated by Clark concentration (CC) mercury, which is in the soils above the mine is 1.75–4.79, below the mine is 15.58–32.50 that provides a basis for the allocation of a biogeochemical province of mercury concentration, especially in the area of the below mine. It must be remembered that mercury is trace element and this indicator (Cr) in the studied soils is in the range 0.03–0.57.

Local migration ( $C_m$ ) factor of mercury in the soils below and above the mine, regardless of the location varies in the range of 0.95–2.38. It should be emphasized that a  $C_m$  in genetic upper horizons of soil higher than in all studied lower genetic soil layers.

From the above it follows that, according to geochemical classification of mercury migration in landscapes under the studied mountain-brown soils condition is included in the group of mobile and slightly mobile, in an oxidizing condition it accumulates in alkaline barriers. In this case the soil is performed as the barrier function to the path of mercury.

With the accumulation of mercury soil is polluted, partially loses fertility and growing plants on it absorbs it and included in the subsequent cycle, forming mercury biogeochemical province. This province in the studied conditions is azonal where their characteristics do not correspond to the general characteristics of the zone the anomaly is associated with ore occurrences and technogenic pollution.

#### References:

1. Кабата-Пендиас А., Пендиас Х. Микроэлементы в почвах и растениях. – М. Мир. 1989. – С. 180–190.
2. Haidoutic C., Skarlou V., Tsoulouchou F. Mercury contents of some Greek soils. *Geoderma*, 35, 1985, 251.
3. Duvies B. E. Heavy metal pollution of British agricultural soils with special reference to the role of lead and copper mining, in Proc. Int. Semin. on soil Environment and Fertility Management in intensive agriculture, – Tokyo, 1977, 394.
4. Blanton C. J., Desforges C. E., Nowland L. W., Ehlman A. S. A survey of mercury distributions in the Terlingau area of Texas, in Truce Subset, in *Environ. Health*, vol. 9, 1975, 139.
5. Gotoh S., Tokudome S., Koga H. Mercury in soil derived, from igneous rock in northern Kyushu, Japan, *Soil sci. Plant Nutr.*, 24, 1978, 391.
6. El-Bassan N., Poelstra P., Frissel M. J. Chrom und Quecksilber in einem seit 80 Jahren met stadtischen Abwasser berieselten Bodem, *Z. Pflanzener –naehr Bodenkd.* 3. 1975, 309.

## Section 2. Geography

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### The historical and natural-geographical aspects of Nurota

**Abstract:** According to the researchers and archaeologists Nurota city (Uzbekistan) was built in the ancient century and here is preserved ruins of fortress of Nurand — wall of “Pirosta” (IV–VI centuries).

Around the Nurota oasis there are famous Sarmishsoy (approximately 6,000 rock paintings), Uchtut antique stone workshop. The toponym of Nurota is formed around the water source — spring, giving the beam that reaches to the heavens, the earth that is not found elsewhere. “A ray of divine” rises to the sky from “Chashma”, therefore curious tourists rush to see this unique appearance of nature.

**Keywords:** antique castle, ruins of “Nur” and “Pirosta”, Sarmishsoy, toponym of Nur, Chashma, source of “giving ray”, a place for tourists.

Toponymic objects and their names are valuable sources in the history of every nation. Uzbekistan is famous for one of the oldest sacred cities — Nurota. According to the archaeologists, Nurota city was built in the ancient century, and here are the ruins of the fortress Nur. The question of when there was a settlement Nur, has not yet been clarified.

The indigenous population of Central Asia, including Nurota, now speaks the languages belonging to two large language families: Altaic (Turkish languages) and the Indo-European (Iranian languages). The Tajik language, which is spoken by the vast Iranian-speaking population of the city Nurata refers to the western group of the Iranian languages. Nurota is known as Kalai Nur, “Nur of Bukhara” and Nurota. If we compare on the etymological comparisons Nurota city, the name “Kalai Nur” and the term “kala” means “fortified settlement on the hill” in Persian and means “castle on the hill” in Arabic [1, 42]. Thus, the term of “kala” — has many meanings, and they are close in meaning. Then it turns out that the name of Nur existed before the arrival of the Arabs.

Nur fortress is formed around a water source — spring Chashma, it is necessary for life inhabiting this area people. There are two historical phrase “nur” and “ata” in the name of “Nurota”. According to the etymological meaning of the first of them — “Nur” is associated with the theological aspect — power like the dawn, the beam of light and heat, and the second — “ata” is giving a ray source of water and life, “sacred place.”

“Nur” means “light” in Arabic. Local people say that the Tashkent is famous for an abundance of water and Bukhara is for its light. Before independence, Uzbekistan has used the term Nur Bukhara, according to archeological, architectural and epigraphic data (there is a speech about the sources of the Persian and Arabic languages), and it appeared in the study of the ancient city of Nurota.

The researching of the ancient city of Nur, located in the foothills of the Nurota range indicates that the chapel, mosque and madrasah repeatedly ruined fort during the Mongol yoke and again restored. Historical scientist Narshakhi says: “Nur is a vast area and it has a large mosque. The man, who visited to the area of Nur, equated to a person who has committed the Hajj. In honor of the returning from the holy place of worship human, city was colorfully decorated. In other areas of Nurata called “Nuri Bukhara”. Many of

the followers of the Companions of the Prophet Muhammad are buried here” [2, 81–82].

Written sources is not fully reflect the defense system of the settlement of Nur, but however it is possible to do the analysis, that the fortress of Nur was well strengthened on the basis of available data. As a result of the invasion of enemy forces Nur settlement was destroyed several times. Locals were forced to leave their homes, prayer facilities and restores their home. In studying the history of defensive structures Sources can be local toponym like a spring Nur, well of Nurgulata, Nurbulak. Therefore, to provide water to the population during the long siege of the fortress, in the fortifications were provided tools in the form of wells (well of Nurgulata) and spring water Chashma.

The people of the Stone Age left petrographic archaeological monuments, which is approximately 6,000 rock paintings in the mountains of Vaush (Karatau) in Sarmishsoy such as the Sahara (Africa), Altamira (Spain), cave drawings in France and other claims on outstanding rock painting in the world. In addition, there are petroglyphs of Takatash and Zangibaba near the town of Nurota (approximately 6–8 km) in the mountains of Aktau. In this region, scientists and archaeologists have found the remains of ancient stone workshops in the mountains of Vaush (Tau) and the hill of Chakmaktube.

Proceedings of the archaeological studies indicate that tools found in this area, historical and cultural layer dates back to the Bronze Age. The research results indicate that the center of the ancient settlement was a place of worship and conduct ceremonies. At this point, to this day remains of the defensive wall of the fortress Nurota — Pirosta wall. According to the issuing of the Uzbek researcher and archaeologist Yahyo Gulomov (1908–1977), the wall of Pirosta was built in the IV century BC and lasted until the reign of the Samanid dynasty (X century), and for 400 years served as a line of defense. Archaeological excavations of the ancient city ruins Nur showed that around the body of water source “Chashma” people lived in ancient times. According to Y. G. Gulomov in the distant past, access to the valley of Zarafshan was possible only through a mountain gorge of Ilon-Otti in Jizzakh city and through the Nur (Nurota), so Jizzakh and Nur as the major shopping sites and military-strategic points since ancient times been protected by powerful fortifications [3, 133].

According to other scientists — V. V. Bartold, Y. G. Gulomov, V. A. Shishkin, B. H. Karmyshev, H. Mukhamedov, L. Y. Mankovsky,

V.A. Nielsen, L.I. Rempel, O.M. Rostovtsev, the Nurota was the second Islamic center of the state in Bukhara Emirate in the XV–XIX century.

Nurota famous ancient and eternally alive the unique architectural and natural-geographic monuments. This city is evidence of active trade and economic contacts of the Middle Ages, keeps a “secret” stories that have yet to uncover. Until now, no one knows why the times of spring “Chashma” rises to the sky, “a ray of the divine”, therefore the most of tourists are hurrying to see this unusual appearance of nature.

In the folk legends and stories repeatedly mentioned that here arrived with his legions of the great military leader Alexander the Great. One day early in the morning, Alexander wanted to mow her hair and ordered to find a good local hairdresser master. Local master treated Alexander with tortilla after the breakfast, which they ate together. Hairdresser saw two horns on the head of the commander during the haircut. To this mystery is not to disclose the Great wanted to cut off the head of a barber. But the barber told him that the tortilla made from the milk of his mother’s breast, and added that they are family. After that, the Great ordered the barber to take an oath that the mystery will reveal it to anyone. Master vowed and he didn’t tell anyone about this secret until the end of his life, but one day he came to one of the wells, which grew reeds and sentenced this mystery. Barber died, many years have passed and the local shepherds (the shepherds) of dewdrops reeds prepared local nay (whistle). And because the whistle went deep rhythmic ringing that Iskandar (Alexander) had two horns.” After this event, the well named “Iskandarquduq”. This a well on the outskirts of the city there to the present and in front of the locals becomes a “sacred place.”

The legends of Nurata oasis associated with Alexander of Macedon also, preserved in the place-objects — Iskandarquduq, Iskandarkul Zulmkhariz. The city’s name was Nurota commercial

and strategic significance for the wide spread of Islam and Islamic traditions. Therefore, there is a “divine ray” in Nurata, which reaches up to the heavens, the earth, which is nowhere to be found, and this city is famous for the world’s Muslims is considered a sacred place of pilgrimage.

According to sources of the Middle Ages there are ancient and unique remains of hydraulic structures kharizes about 300 (VII–XII centuries) in a mountain of Nurota. One of the ways of Great Silk Road paths crossed was the ancient city of Nur, because the city was very important strategic object on the road from Bukhara to Jizzakh.

As for the name of the object of Nur, it is likely Arabized transformation of the ancient name of the object. Unfortunately substrate of the name has not been preserved. According to M. Iskhakova center of the ancient city of Nur was a place of worship and conduct ceremonies. In it concluded primitive people’s ideas about the integrity of the universe, and their despair, the myths about green fragrant vast pastures of the well-fed and fat cattle, fed with moisture on the endless expanse of cultivated so forth [4, 63]. But before the arrival of the Arabs in Zoroastrian religion Mithra (god of fertility) ≈ Møhr (sun-light, the dawn) ≈ Ishtra associated with divine light, effulgence. This meaning has led to the fact that the image of Mithra merged with an image of the sun. In fact, Mithra is an independent deity in Zoroastrian tradition, genetically much older than in relation to the time Zoroastrian canon [5, 18].

Currently, the place of pilgrimage to the Nurota comes every year thousands of tourists. The city preserved the architectural and historical buildings, such as the famous old spring «Chashma» mosque of «Chilustun» (Forty-column) (IX–XX centuries), the Mosque of «Big Dome», «Sayidota», «Oqmasjid», «Bargsuz» (end of the XIX century), sauna of «Sudur Bobo». Nurota has been a particularly important strategic cultural facility for Muslims for thousands of years.



This city is evidence of active trade and economic contacts of the Middle Ages and keeps itself a “secret” history.

Thus, according to the value of the historical and natural-geographic aspects of Nurota we can make conclusions following items:

– Stored architectural structures in the city of Nurota, including the wall of “Pirosta” (IV–X c) “Kalai Nur” (X–XIX cc) shows

that, the city was a particularly important strategic cultural center for many centuries;

Nurota was the second center of Islamic rites and customs in the Emirate of Bukhara for thousands of years.

– Settlement of Nur remains “secret” passages of history itself, which has yet to be disclosed with its unique natural phenomenon, such as “Chashma” and the Mosque of “Chilustun”, “Pyandzhvahta”.

#### References:

1. Rozenfeld A. Z. Qala – sort of Iranian location with castle // «Sovet Ethnography», 1951, – № 1. – P. 42.
2. Narshakhi. History of Bukhara. – Tashkent: «Kamalak», 1991. – P. 81–82.
3. Gulyamov Y. G. Nur Bukhara // Ethnography and Archeology of Central Asia – Moscow: «Sience», 1979 – P.133.
4. Iskhakov M. Avesto and its effect on the development of our life. – Tashkent – Urgench, 2001. – P. 63.
5. Avesto: The book of Yasht. Translated by Mirsadik Iskhakov. – Tashkent: Orient 2001, – P. 18.

## Section 3. History and archaeology

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### Education system and great sufi in central Asia XVI Century

**Abstract:** This article analyzes the education and training in the Central Asia of the XVI century. In education system, the role of mosques and madrassas, how students were studied and lived in the middle Ages in Central Asia. In addition, the material is present first-hand analysis and research of local historians, examined the merit of philosophers, artists and clergy during the Central Asia.

**Keywords:** Madrassah, mosque, school, Khanate, philosopher, Timurids, Shaybanids, education, religion, sufizm, Yasaviy, Naqshbandiy.

The Bukhara Khanate among other khanates of Central Asia distinguishes by a plenty of schools, madrassah. The largest scientific centers of the Khanate was Samarkand. Here, along with the secular sciences deeply were studied the main directions of Islam, hadith, theology, science of the laws of Sharia and other fields of religious knowledge. Speculator of the XVI century Hasanhoja Nisoriy stated a lot of times — "In this city lived, and worked many scientists. Samarkand, even nowadays is the center of science. Local Mavlyans mostly engaged in real science". The value of the city as a center of scientific and religious knowledge well kept up in the last centuries. In this very important activity had madrassah of the city.

The strengthening of the position of Islam and its dominant position among the population, in the study and teaching of secular sciences and religious knowledge, in the formation of the spiritual image of the population in the XVI century, as in previous centuries, the value of schools and madrassah was priceless. In this sense, it should be highlighted that, in different towns and centers of Central Asian Khanates in order to educate people in mosques, in large numbers were organized schools and madrassas that served the cause of enlightenment and is a center of science and education. In these madrassas, there were possibilities to meet not only the residents of a city center, but also a lot of inhabitants of the neighboring villages and other centers of khanates, as well as a lot of knowledge enthusiastic representatives of foreign countries. Worthy of special attention to the information representative of the XVI century Zayniddin Vosify about how suffering "Ten students from Khorasan" a terrible freezing and "hungry" winter of 1504 in Samarkand.

Wanting to enrich their knowledge in Central Asia, came a number of representatives of various sectors in society of the Middle Ages. It was possible to meet among them the governor, officials, academics and other representatives of intelligentsia of the society. Best reader of the Koran, the founder of the dynasty Sheibanids Sheibanikhan Muhammad, in the words of the XVI century philosopher Muhammad Solih, "It was not his equal absolutely no readers, reading the words of the righteous". Deserves special attention the kindness of the historian of the XVI century that Muhammad Sheibanikhan to complete the conquest of Maurya, in Bukhara "for two years, he studied the art of reading the Koran".

In Bukhara, Samarkand and other cities in the XVI century, life was at a high level, and these cities were not only political and economic, and the centers, but also remained the center of cultural life. Graduate School of Muslim theologians — madrassas, as always occupied a leading place in the cultural life. Shaybanids built many new buildings and handed them over to the madrassas and mosques. Many of these buildings were built in Bukhara, Samarkand, Tashkent, Balkh and other cities, and some of them have survived to the present day. Architectural art of the buildings, according to experts, was based architectural traditions of the past and further developed it. Only during the reign of Abdullakhan II, there were built new and restored more than 500 buildings, mosques, and madrassas.

Many sources mention that many mosques and madrassah erected by Timurids, have not lost their importance and in later centuries continued to serve the cause of learning and education. In this regard, it may serve as a model madrassas erected in Samarkand by Mirzo Ulugbek, who in the XVI century continued to train students to secular knowledge, as evidenced by references to Muhammad Olim Shaikh in his work "Lamahot". "Shaikh Hudoydod Vali in his student years, he visited Samarkand and passing by the madrasa of Ulugbek envied students there", once in Samarkand passing by Ulugbek I witnessed students dispute this madrassah, which speculated about astronomy. I listened to them with interest and envied them". From the above it is clear that, Shaikh Vali Hudoydod as a representative of religious teachings, no less keen of secular sciences. It deserves special attention and the fact that in the century, in madrassah of Ulugbek people continued to study secular science.

The history of the madrassah of the khanate where the traditional principles of education were at the highest level dates from the X century. Madrassah served as the places of higher education and played a significant role in preparing administrative personnel and personnel in legal and educational systems. Madrassah were named after their founders, the ones in villages were usually named after the names of villages and were located in market places. After the end of building process the madrassah was usually handed over to the guardian of religious and educational institution who was called mutavvali. He had a right of using incomes of this property, but he did not have a right to sell it.

In this ancient and great city people who understood the significance of the science and education, rulers, officials, priests, merchants who wanted to perpetuate their names in history built lots of mosques, madrasahs and chapels.

Europeans were also fascinated by the fact that even at that ancient time in Bukhara khanate the architecture and culture were developing dynamically. In the middle of XVI century when the ruler of Bukhara was Shaybanizade Abdullahan the traveler Antonio Jenkinson visited the city. He said that "Construction process in the city was in dynamic progress. In the recently built madrasah Mir Arab there were being taught more than 200 students. Near one of the nine ponds Labi Havuz which provided the population of the city with drinking water there was being constructed madrasah Kukaldosh". On the bank of Labi Havuz near the madrasah of Nodir Devonbegi where Jenkinson was staying with his friends there was built a grand chapel. The travelers were also fascinated by the fact that the centers of these constructions were reservoirs whereas in Europe the centers of such constructions were squares.

In the first half of the XVI century in the cities of khanate of Central Asia there were plenty of schools, madrasahs which were the main centers of getting both religious and secular education and which were the places of raising the level of population's education. These centers thanks to the efforts of the representatives of different classes of society worked for the nation's development and cultural and spiritual progress.

According to the statements above we can conclude that the culture of the Bukhara khanate and in particular, creation of material culture in the XVI century was really significant.

Among the religious tutors of ancient times there were two great personalities from Karmana (the ancient town of Bukhara) Sheikh Hudoydod Vali and Qosim Sheikh Azizon. Sheikh Hudoydod Vali (1461–1532) lived in the place in the eastern part of Karmana during the reign of Sultan Abu Said who was the grandfather of Zakhridin Muhammad Bobur the descendant of Temurids. He did not belong to the caste of rulers, aristocrats and military leaders, and he lived among the ordinary people going through all of their difficulties. The rulers from Sheybanid dynasty asked him for the help, gave him gifts, invited to the palace, but he usually returned these presents or gave to the poor. He always lived according to the principle "Al-fakrun fahrin" which means "My poverty is my pride".

The base of the scientific work of Sheikh Hudoydod Vali made his wise sayings where the influence of his teachers Hoji Ahmad Yassavi and Sulayman Bokirgoni was noticeable. In his works Sheikh Hudoydod appeals the nation for patience, faith, love and calm, appeals the rulers for justice, mercy and peace. His views were formed not under the influence of books and studies, but under the influence of communication with people, observances, bases of Sufism and his theory which appeals every person for going in a righteous way.

In many historical documents there are evidences of practical activities of Sheikh for the interests of the nation and of wonder-working talent. Some of these works were published, others are still being studied by the researchers.

In the second half of the XVI century Bukhara became the capital and developed thanks to the merits of the ruler Abdullahan II (1557–1598), Qosim Sheikh Azizon from Karmana contributed to the military and political successes. The information about him was passed from different works into others and it came till our time, namely in the works of "Sharafnomai shohiy" ("Abdullanoma") of Hofiz Tanish Bukhari, "Muzakkir al-ahbob" of Hasanhoji Nisari, "Lamahot min nafahot al-kuds" of Hazrat Olim Sheikh Azizon, "Tazkiratul-avliyo" of Muhammad Tohir Eshon Horezmi, "Tuhfataz-zoirin" of Said Muhammad Nasriddin.

Hazratkutbul-avliyo Sheikh Azizon was born approximately at the beginning of XVI century in Karmana. He was the representative of the jahriya trend of Sufism, successor of the study of Hoji Ahmad Yassavi. Qosim Sheikh Hoja Ahmad was the representative of the third circle of jahriya where the first was Hoja Ahmad Yassavi. These were Hakim Ota, Hazrat Zangi Ota, Hazrat Said Ato, Hazrat Sadr Ato, Hazrat Elomon Ato, Sheikh Alisheyh, Mavdud Sheikh, Hodim Sheikh, Sheikh Jamoliddin, Sheikh Hudoydod, Hoja Mulloi Nuri, Qosim Sheikh. Sheikh Hudoydod also contributed to Qosim Sheikh's reaching such a high status.

In the work of Hasanhoji Nisori "Muzakkir al-ahbob" there is information about Qosim Sheikh: "Qosim Sheikh Azizon used to neglect body and he worked out the theory of superiority of the spirit over physical body. And now with his wonder-working talent he helps people who are suffering and he eases their pain and together with angels helps so that souls from this sin world could enter the world of spiritual perfection. In his main place which became a house of peace for people there is propagated the symbol of faith: "the person who comes here finds peace and calm". His place is located on the frontier territory of Karmana: "... for some time Hasanhoja Nisori was with him, discussed the importance of "greatness of Allah's directions and mercy towards those whom he created". In these days the nobleness of this person (Qosim Sheikh) from Sogd is the symbol of pride. As they note in some sources, thanks to the activities of Qosim Sheikh in the whole region there was peace and calm, prosperity and security. As the defender of the nation's interests he was against oppression when relevant officials gathered taxes. He did his best to eliminate injustice and violence, bad consequences of mutual conflicts between the rulers. We should also note following saying about Sheikh Aziz on which are mentioned in the work "Abdullanoma": "He tried to gather together the whole nation of the region, to create a prosper life for the all classes of the society, dreamt of the peace in the country and was ready to make generosity for all good people". Qosim Sheikh later caught plague and died in Karmana in 986 according to hijra (1578) and he was buried near his place.

Nowadays there are great opportunities for studying the life, works and heritage of these two personalities, the government also adopted decrees and decisions of improving these sacred places where they were buried. Their life and works are being studied; scientific articles and other works are being created on their base.

## References:

1. Khasankhoja Nisoriy. 'Muzakkiri akhbob' (Memories about friends)/translation from Farsi of Ismoil Bekjon – T.: publishing house of national heritage named after A. Kodiriy. 1993. – P. 32.
2. Boldirev A. N. Memoires of Zayn-ad-din Vasifi, as a source of the researches on the Central Asian and Khorasanian cultural life at the turn of XV–XVI centuries.//Works of the history, culture and art of the East department of the State Hermitage, L., 1949. – T. II/ – P. 226.
3. Mukhammad Solikh. 'Shayboniyoma' – T.: Art and literature publishing house named after G. Gulom, 1989. –P. 29.
4. Kamaliddin Binai. 'Sheybaniname'//Materials on history of Kazakh khanates of XV–XVIII centuries (Extractions from Persian and Turkic essays)/Editors: S. K. Ibragimov, N. N. Mingulov, A. K. Pishulina, V. P. Yudin. –Alma-Ata: Science, 1969. – P. 651.

5. Sagdullaev A. The history of Uzbekistan. Part 1. T.: University, 1999. – P.270. Mukhammad Olim Shaykh Azizon. ‘Lamakhot.’ Translation from Farsi of K. Kattaev and A. Narzullaev. – Samarkand, 2007, – P.86.
6. Narshakhiy. The history of Bukhara. Book series about heritage. Editor – Khurshid Davron. T.: – Kamalak, 1991, – P. 98.
7. State Archive of the Republic of Uzbekistan, 47-fond, 1-handlist, 333a-file, P.76. The journey of Mr. Antony Jenkinson from Moscow to Bukhara in Bactria in 1558, described by himself for London merchants of Moscow company//Readings of historic society in the ancients of Russian – M.:1884.; See also: history of Uzbekistan in sources. The knowledge of travelers, geographers and scientists of XVI –first half of XIX centuries. Composer B. V. Lunin.
8. Scientist Sheykh Azizon. Lamakhot. Translators – Kataev K.m Narzullaev A. – Samarkand, 2007.
9. Khasankhuja Nisori. Muzakkir al-akhbob. Translators – Ismoil Bekjon.
10. Khafiz Tanish al-Bukhari. ‘Abdullanoma’ (Sharafnamayi shakhi). Vol.1, translator: S.

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## Makhnovism as a historical tradition expression

**Abstract:** This article represents the judgment of the makhnovsky movement place in the course of the Ukraine social development. Historical development dynamics of the people’s movement — “Makhnovism” as expressions of social bottoms requirements is designated.

**Keywords:** a Makhnovism, anarchism, personal freedom, public self-government, communal equality.

Peasant war in Ukraine in 1918–1921 years under Nestor Ivanovich Makhno (1888–1934) leadership known as makhnovsky movement, or a Makhnovism, arose on demolition of historical eras, was the embodiment of a national protest and became a part of the Civil war in Russia. At the same time, makhnovsky movement wasn’t the spontaneous indignation which began only owing to simple confluence of social circumstances at all. A Makhnovism, was historically determined as an expression of a certain historical tradition development of a part of Russia known as Ukraine.

By C. C. Volk words, in the introduction to Nestor Makhno’s memoirs: “Makhnovsky movement which is external representing of makhnovets throwings between reaction and revolution, in fact, was an attempt to find the country rate in storms of a civil war when in Ukraine there was a fighting antagonism of several forces hostile each other ...» [1, 10].

The movement phenomenon under the command of N. I. Makhno is rather widely lit in domestic and foreign scientific, publicistic and fiction researches. Exhaustive list of works see [2]. Detailed analysis of sources was also provided by Alexander Skirda [3, 276–295, 300–311].

Historical tradition which generated peasant war under N. Makhno’s leadership can be provided as a steady, long-term social reflection which arose owing to a combination of certain internal and external circumstances of the Ukrainian society development. Fundamental signs of this tradition are:

**1. A condition of society as environments covered by contradictions:**

– between provided for, or prosperous, the villagers/selyanstvo-kmetstvo (classical «middle peasants» and «kulacs» of the 19–20th centuries) tied to steady agricultural life — and the mobile social «freebooters» concentrated on the territorial periphery (Zaporizhia Sech, Gulyaypole);

– between peasants and citizens petty bourgeois (then — urban proletariat), as carriers of the different social ways;

– between it is religious (ideologically) both ethnically homogeneous circle of «Ukrainians»/maloross/Russinians — and different religious and ethnically, or mentally groups: Polish gentry, «kikes», citizens Protestants and, in subsequent, the city intellectuals.

**2. A geopolitical condition of the territory, with is rather not as suburb/«ukraine» but is a cross field — space to which several adjacent states pretend [4, 32–34].**

Combination of called space conditions qualities, forms reflexive dynamics which cornerstone is aspiration to find a method of designing, identification and society development expression of model, state and external environment. Phenomenon which termed as «Ukraine» is such a method.

Ukraine, therefore, is not quite a subject, but it is rather a method of wider community segment self-determination. This method creates problems social, first of all — a socio-cultural and geopolitical order.

The first problem it is necessary to call determination of a «wide community». Whether it is the European community, or it is a part of the Russian community. Two communities have different identification criteria (Tab. 1).

Table 1. – Criteria of social communities

Criteria of a community	Name of a community	
	European	Russian
Cultural	Personal freedom	Social justice
Political	Political democracy	Social democracy: public self-government, Soviet power
Economic	Market freedom	Communal equality

It is necessary to recognize Makhnovsky movement as identification attempt of a «wide community». Defending personal

freedom, Makhno and makhnovets were adherents of a social democracy, in the form of public self-government [5, 94–98]. Other



criterion — communal equality, assumed barter between the city and the village, ideally — non-market relations, in practice — use of all cash systems extended in Ukraine (an example of such relations adjustment see [6, 58–63], detailed description: [5, 98–101; 3, 138–139]).

Gulyaypole turned into a country lumpen-proletariat movement center, established mutually advantageous interaction with Ukrainian middle peasants and kulacs [3, 4; 7, 22–23]. This center alienated from Donbass urban proletariat [5, 101–108; 8, 134–137] and regularly clashed with Bolshevik ideologists (that didn't prevent to enter into periodic alliances with Bolsheviks) [9, 317–319]. Fundamental principles of makhnovets were: «1) consolidation of all peasantry in general organizations (without excluding also kulacs) for solution of all country questions; 2) non-interference of the city, in this case — the proletariat, in intra rural relations and intra rural class fight» [5, 114–115]. More economic, than political, orientation of makhnovets to the solvent village strata, allows the Soviet researchers to refer makhnovsky movement to the kulak «fifth column» [8, 151].

Whereas lack of obvious ideological and political identity, gives so powerful grounds to call a Makhnovism domestic form of a political gangsterism [8, 194].

Aspiration to defend an original way of development, independent of the external environment, became the second problem. Political reasons for originality was an anarchism [10, 134–141], irreconcilable in relation to liberalism, conservatism, imperialism and nationalism and alternative to Marxism (see [11]). Ukrainian anarchists federation «Nabat» applied for the role of a Makhnovism ideological vanguard, for some time. But, in realities, a Makhnovism developed as the movement which wasn't held down by ideological dogmas. First of all, in that, as for the economic organization of society. Ideological and political views of anarchists on the social organization after 1917 were researched by O. A. Ignatyeva [12, 68–76]. Relations with federation «Nabat» were depicted by V. D. Ermakov (with the reference, first of all, for I. Tepera-Gordeev's work «Makhno») [13, 76–86].

The third problem consists in need of an optimum combination of the development strategy to tactics of «today fight» (the

period of Civil war). Expression of such a combination was original «makhnovsky dictatorship» providing speed, determination and courage [14, 21] during military operations, together with picturesque «freedom of customs» during the period between fights. In the areas occupied with makhnovets, all authorities were dismissed, but political parties and labor unions activity freedom remained. So cultural and educational activity developed [14, 84–86; 15, 23–26; 3, 143–144, 148–149; 15, 62–73, 124–134; 16, 337–340, 376–380, 402–404; 10, 87–88, 101–104, 124–125].

A «Makhnovism» remained in historical memory as an attempt to search not only ideological choice, but also as aspiration to create a new image of Ukraine. Ukraine seems Makhno and makhnovets not politically independent state, but a free society which is rooted in Zaporizhia Sechi and pre-state forms of social relations [10, 22; 8, 63]. In this sense, a «Makhnovism» resembles «conservative utopia» focused, at the same time, on a social ideal of the past and a political ideal of the future (in N. Makhno and his colleagues representation).

Nevertheless, some researchers carry a «makhnovsky ideal» to libertarianism. Understanding it as modernistic «philosophy of personal liberty», but not ideology of libertarizm/ultraliberalism. According to V. M. Volin: «This libertarian orientation of the movement was expressed in deep distrust in relation to unearned or privileged elements, in refusal of any dictatorship over the people and in an idea of free and full workers self-government on the places» [16, 335]. Internal uncertainty concerning the past and the future, the tradition and a modernist style as it is represented, reflects a Makhnovism dialectics. Such dialectics assumes, first, aspiration to develop society, relying on the traditions of freedom and liberty and, secondly, improving search of a social dynamics escalation possibility, but not destroying society. Anyway, «makhnovsky ideal» is a future ideal, not a past one.

In general view the essence of a «Makhnovism» was captured quite precisely by the Program of «A true Soviet socialist system» [17, 253–254].

Pressure of the XX century beginning historical realities has overturned an utopian ideal and has doomed a «Makhnovism» to defeat.

## References:

1. Волк С. С. Нестор Махно в дни войны и мира // Махно Н. И. Воспоминания. – М.: Республика, 1992.
2. Назаров И. Ю. Идеология и политическая практика махновского движения. – Диссертация по ВАК 07.00.02. – М.: 2006.
3. Александр Скирда. Нестор Махно. Казак свободы (1888–1934). Гражданская война и Борьба за вольные советы в Украине 1917–1921. – Париж: Громада, 2001.
4. Плешаков К. В. Геополитика в свете глобальных перемен // Международная жизнь. – 1994. – № 10.
5. Кубанин М. Махновщина. Крестьянское движение в степной Украине в годы Гражданской войны. – Л.: «Прибой».
6. Махно Н. И. Воспоминания – Париж: 1936.
7. Дорогой урок // Долой махновщину. Статьи т. т. Раковского (Председателя Совета Народных Комиссаров Украины), Б. Самсонова и др. – Харьков: Изд. Политотдела Югзапфронта, 1920.
8. Волковинский В. Н. Махно и его крах. – М.: Изд. ВЗПИ, 1991.
9. Махно Н. И. Воспоминания... Приложение 1. Гуляйполе в русской революции.
10. Аршинов. История Махновского движения (1918–1921 гг.). – Берлин: Изд. «Группы Русских Анархистов в Германии», 1923. – Электронный ресурс: <http://www.makhno.ru/lit/Arshinov/01.php>.
11. Коваль Б. И. Этика анархизма // Новая и новейшая история. – 1990. – № 5. Электронный ресурс: <http://vivovoco.astronet.ru/VV/PAPERS/ECSE/ANARCHY.HTM>.
12. Игнатъева О. А. Взгляды анархистов на проблемы экономического переустройства общества после Октябрьской революции // СОЦИС. – 1991. – № 3.
13. Ермаков В. Д. Махновщина: некоторые социально-бытовые аспекты повстанческого движения крестьян Украины // СОЦИС. – 1991. – № 3.
14. Семанов С. Н. Под черным знаменем. Жизнь и смерть Нестора Махно // Роман-газета. – 1993. – № 4.
15. Комин В. В. Нестор Махно: мифы и реальность. – М.: Московский рабочий, 1990.

16. Волин В. М. Неизвестная революция, 1917–1921. – М.: НПП «Праксис», 2005.
17. Rossum L.J. Proklamations of the Machno Movement, 1920//International Review of Social History. – 1968. – V. XIII. – Part 2.

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## **Historical background of completing the joining the North Caucasus to Russia**

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**Abstract:** Joining North Ossetia to Russia took place in a difficult political environment. In order to consider this issue in detail, it is important to pay attention to the historical background of the merger. This article discusses the historical background data, because this process was mutually beneficial to both parties.

**Keywords:** North Ossetia, the historical background, affiliation, orientation to the Russian government, defense and commercial relations.

The peoples of the North Caucasus have been connected with Russia and the Russian people by centuries-old ties. For centuries they have maintained trade, cultural and political relations with Russia.

In the XVI–XVIII centuries the peoples of the North Caucasus have focused on Russia, it was a complicated and long process of voluntary entry into the Russian state. The Russian government has taken care, first of all, of the consolidation of the security and power of the state, spreading Russia’s political influence on the new territories. Russia didn’t tend to subject these nations to its immediate ruling and its orders, but could provide real help and support against attacks by the Shah of Iran, the Ottoman Empire and the Crimean Khanate. On this basis, between the peoples of the Northern Caucasus and the Russian state known affinity, even a relative community of interest was formed, as relations with Russia met the aspirations of the peoples of the North Caucasus to the greater security from external attacks.

The Caucasus connected Europe and Asia, the Caspian Sea and the Black Sea. Through the Volga and Astrakhan trade routes to Iran both by sea and by land were opened — through the Caucasus, along the western shore of the Caspian Sea. Russia has planned for a long time the expansion of trade and for its needs, and mediation prospects in the exchange of goods between Western Europe and East through Dagestan and the Caspian Sea. These extensive plans intensified the interest of Russian landlords and merchants to Dagestan Khanate. The objectives of expanding trade with the East continued to exert great influence on Russian policy in the Eastern Caucasus and in Transcaucasia and later — at the end of the XVIII century and in the XIX century.

Hit-and-run raids of the Iranian and Ottoman conquerors and feudal civil wars for centuries were the reasons of monstrous disasters and looting the Caucasian population, and they also depleted the productive forces of the Caucasian peoples. As Engels wrote, it is not surprising that the struggle against the Shah of Iran and the Sultan of Turkey, standing on a very “low” and “barbaric” stage of development [1, 6], forced the nations and many federal rulers of Caucasus to seek the protection of Russia.

Constant invasion of Ottoman troops and raids of the Crimean Khanate, capture and hijacking enslaved prisoners, the extermina-

tion of local residents, violence and arbitrariness, the lack of basic security in the vast expanses of Pre-Caucasus and North Caucasus for centuries made it impossible to settled agricultural life and the settlement of these vast spaces, the development of the trade and crafts, forming villages and towns. This was one of the reasons that gradually the territory of the Russian state was spreading to the south, the settlement and development of open spaces, despite the aggressive nature of the tsarist policy had great positive significance objectively [2, 36].

It is important to note the necessity to differentiate between different paths and forms of including peoples into Russian population, to distinguish successive stages of the process. Voluntary entry of the North Caucasian peoples into Russia in XVI — XVIII centuries and even in the early XIX did not mean spreading military and administrative authorities and the Russian laws on them. Indigenous peoples and ownership remained feudal fragmentation under control of its princes, khans, feudal and community leaders.

By the end of the XVIII century Russia united with the North Caucasus, it was of great importance — it was the historical prerequisite for completing the merger of the North Caucasus to Russia and its firm establishment in the South Caucasus. All these premises was a complex process, in which intertwined the results of successful wars with the Ottoman Empire, the economic development of the steppe Ciscaucasia, voluntary joining the North Caucasian peoples, and the feudal lords under the protection of Russia.

Development of Pre-Caucasus began in the late XVI century, when the town Terek was founded with surrounding trade and craft villages. Earlier the settlements of Russian Cossacks of the Terek “on the crests,” started their history, i. e., on the eastern and northern slopes of the Terek Ridge, hence the nickname “Greiben Cossacks.” Then the Cossack settlers from the Don, the Volga and Chopra moved to the North Caucasus. It combines a natural settling, and the government’s actions for the development of vacant land. A lot of the oppressed people, i. e. farmers, the poor Cossacks, artisans moved to Pre-Caucasian region and Terek from internal and outlying areas of Russia and Ukraine [3, 7]. There they freely farmed the land, raised cattle, fields, orchards and gardens, fished, mined salt, engaged in mountain fishing, all of them became the part of the

population of the North Caucasus, joined the peaceful economic and cultural-household, family and other ties with the indigenous peoples, although this is often hindered religious strife and military raids and clashes. Government measures of military Cossack development became increasingly important.

After 1774 the Caucasian peoples and their feudal lords sharply wanted to join Russia. In 1774, the Russian-Ossetian negotiations culminated in the voluntary joining North Ossetia to the Russian Empire. [4, 239,252–253.] Digorians Ossetians, who did not want to follow before the rest of Ossetia, in 1787, also received the Russian citizenship. Many Ossetians again had a new opportunity to move from close to the fertile plains of the gorges.

At the same time colonization of the steppe Ciscaucasia was continued with Russian peasants and Cossacks. Their work of developing virgin steppes had great importance. The Pre-Caucasian region carried out measures to strengthen the military and administrative authority and conducted further construction of fortifications. Since 1777 Azov-Mozdok line has been started to build extending to many redoubts and forts 2,000 miles from the mouth of the Don to the Caspian Sea coast. Georgevskay and other walled cities were built.

Policy of Russia under Paul I ruling visibly moved from the energetic action of the preceding reign in the Caucasian affairs. Known previous negative attitude of Paul I to the new territorial connection (including south of the Kuban and Terek), and recorded his later belief that the peoples of the Caucasus “are more in vassalage this than to citizenship” [5, 298]. Of course, this only meant that Russia did not intervene then to the inner board of the local khans and mountain peoples of the Caucasus. At first Russia in the Caucasus under Paul I clearly affected traces of these concepts, but by the end of the XVIII century it was identified inconsistencies calculations of Paul I nor the real situation in Europe and the Caucasus, nor the views of the most influential circles of Russian landowners who were interested in the development and expansion of the southern outskirts of the empire, such as Pre-Caucasus, as well as in trade with the East through the Caucasus.

The well-known researcher of Russian policy in the Caucasus A. V. Fadeev aptly stressed that the Council of State sounded concern over the Russian landed nobility “for the safety of your new possessions of Russian landowners in Pre-Caucasian and Azov steppes” [6, 107], for the fate of the new towns erected in populated expanses of the South of Russia, new trade routes, paved in overseas countries. It was about the further strengthening of Russia in the Caucasus.

In September 1802 it was possible to collect almost all the owners of the Northeast Caucasus or their envoys to the Congress in the Georgievsk fortress where the December 26, 1802 a general contract was signed, which was of great importance. St George’s contract obliged the khans and mountain societies to maintain loyalty to Russia, not venturing civil wars, dismantling mutual disputes amicably, “general laws”, and in the case of the Shah’s attack “take up arms with one accord all in driving out their common enemy.” St. George contract agreed to promote the unity of rulers and unions of rural societies of the North-Eastern Caucasus under Russian patronage to protect against the shah’s claims and the weakening of mutual strife and legally issued their “federation” under the rule of Russia.

In the summer of 1802, Russian troops took steps to improve and provide more reliable security of the Georgian Military Road. Mostly Ossetians lived along it. Russian squad forced Tagaurian and other Ossetian feudal lords to stop looting from the Baltic to Daria. They were allowed to charge a fee instead, a fee for the construction of bridges and protection was promised from Kabardinian rulers [7, 500].

These long-term measures have led to the construction of the prerequisites completing the join of the North Caucasus to Russia. Features of economic and political situation in Ossetia helped to establish multifaceted Russian-Ossetian relations. The most important result was their adherence to the Russian North Ossetia. And the processes described in this article are just the beginning of a long historical path.

#### References:

1. Marx K. and Engels F. 2nd ed. V. 9. P. 6.
2. The October Revolution and the Russian advanced to the historical destiny of the peoples of the North Caucasus. Grozny, 1982. P. 7 and others.; Vasiliev D. S. Essays on the history of the lower reaches of the Terek. Makhachkala, 1980. P. 36.
3. The Great October Revolution and the Russian advanced to the historical destiny of the peoples of the North Caucasus. Grozny, 1982. P. 7.
4. Bliev M. M. Russian-Ossetian relations. Ordzhonikidze. 1970: P. 239, 252–253.
5. Dubrovin N. F. The history of war and domination Russian Caucasus. SPb. 1887. V. 3. P. 298.
6. Fadeev A. V. Russia and the Caucasus in the first third of the XIX century. – M., 1960. P. 107.
7. Dubrovin N. F. Caucasus from 1803 to 1806 SPb., 1866. 500 p.
8. Shavlokhova E. S. The problem of independence in the context of theoretical comprehension of the concept of “nation state.” Proceedings of the Russian State Pedagogical University. A. I. Herzen. 2008. – № 81. P.131–138.
9. Shavlokhova E. S. Conversion administration in the Terek region in 1883–1905, the Izvestia SOIGSI. 2014. – № 12 (51). P. 27–38.

## Section 4. Information technology

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### The calculating rating of electronic resources

**Abstract:** The rating of electron resources is devoted to count by theories, directions in this work. The calculating model of rating of ER by entering and exiting directions on bases of used widely PageRank is produced for calculating the rating of web pages in Google searching system. The rating of ER is taken into account for calculating the ratings of entering direction and the calculating exiting direction is accomplished by equitable distribution of ER. And also the calculating rating ER among kinds fields by entering distribution rating term is given for calculating rating of ER. And four definitions re included in it for calculating ratings. The calculating of ER rating is very important for searching information and submission of it.

**Keywords:** Electron resource, calculating excerption, calculating rating, PageRank algorithm, searching information, bestowing information, direction, graph, electron resource center, information.

#### I. Introduction

The causes of volumes and numbers of electron resources' proliferation is increasing two options of information copies in last years. One of popular and widespread methods of marking the quality of information is the rating of bringing excerption method [1]. The list of books which given excerption in scientific works or hyper direction among electron resources (ER) (web pages) may be an example to excerptions. The bringing excerption rating idea is consist of finding its quality mark by the volumes and qualities of ER.

#### II. Main part

The lists of used literatures in ER and the analogy among directions of certain pages in web pages may be actualized. Calculating ER directions from different resources gives the relevance of ER, importance or the approximate values of quality. PageRank algorithm counts the number of directions, regulates ER by the number of directions in ER on bases of equality of ER directions' importance and also expands it. The rating of ER by PageRank is found the following condition [3]:

Let's imagine,  $T_1 \dots T_n$  ERs are linked in A ER. Parameter  $d$  belongs to  $(0,1)$  space, and also it is diminishing coefficient. Usually,  $d = 0,8$ . Coefficient  $d$  is used for restricting the number of accessions.  $C(T)$  function marks the number of exiting direction from  $T$  ER. In this situation, the rating of A ER by PageRank is counted by the following formula:

$$PR(A) = (1-d) + d \left( \frac{PR(T_1)}{C(T_1)} + \dots + \frac{PR(T_n)}{C(T_n)} \right) \quad (1)$$

In the calculating  $PR(A)$  (the rating of A ER by PageRank) we can see that  $T_1 \dots T_n$  rating of ER  $PR(T_n)$  are taken into account by PageRank. And so, the rating of ER which linked it is counted in determining ER rate, the rate of ER is connected to the quality of ER which linked it. It must be make a note, PageRank marks distribution of possibilities of all ER PageRank rates sum are equal to one for every ER.

The rate of PageRank  $PR(A)$  may be counted by using simple and many values algorithms and normalized directions is correspond to their own vectors. It must be make a note, the rate of Pag-

eRank for ten billion web pages may be counted in several hours in Server which has average strength [3].

This method of calculating ER rate is used low for graduating published works and authors in scientific field. The famous defect of this method is using equal weight denotation for all directions. If we say it differently, the author's direction which has many directions from other resources are compared to the directions whose has not directions from other resources. Outside of it, this marking isn't adequate in web field, because the main duty of this method is to count the huge number of quality directions which enter ER simply.

The searching problem of marking method of direction's quality which working in as web field is settled successfully by invented PageRank algorithm. This algorithm was invented by two investigators Sergey Brin and Lorens Peydj of Stanford university, then it works as the part of Google searching system's (www.google.com) technological base.

We think about using algorithms which is such as PageRank algorithms for calculating ER rate of Electron Resource center (ERC) is expedient.

Block quotes in ERC doesn't count lodging directions in ER, its format and the others in not having some attributes, only it may imagine the structure of direction as graph in calculating to direct from one ER to other one ER.

Let's imagine, ER are given one by one in databases (DB) and it consist of  $n$  ERs which have DocID identification (the idendificator number of ER in DB) belong to  $V = [1, n]$  distance.

**Definition-1.** The ordered couple  $(i, j) \in V^2$  is called block quote or direction.  $i$  is exiting direction of ER and  $j$  is entering direction of ER. E selection is formed by all direction among ER in  $V$  selection, it is directed at  $G=(V, E)$  direction graph and these graphs are called the graph of directions.

**Definition-2.** It is  $G=(V, E)$ , in here  $V$ - the final selection of graph's summit,  $E \subset V \cdot V$  and  $i \in V$ . The selection of entering direction is marked with  $I(i)$  and the selection of exiting direction is marked with  $O(i)$ , and that is:

$$I(i) = \{e \in E \mid e = (j, i), j \in V\}$$

$$O(i) = \{e \in E \mid e = (i, j), j \in V\}$$

**Definition-3.** If there is no  $(i)$  or  $I(i)$ , it is marked with  $\{\emptyset\}$ , ER rate is 0 for  $i \in V$ .

**Definition-4.** Any ER doesn't give its entering direction  $I(i)$  and exiting direction  $O(i)$ .

The rate of entering direction  $I_{rating}$  is counted by the following formula:

$$I_{r\_DocID} = \frac{\sum_{i=1}^{|I(i)_{DocID}|} Doc_{r\_DocID}^i}{|I(i)_{DocID}| \sum_{count(I(i))} I(i)} \quad (2)$$

In here,  $count(I(i))$  — is the number of all entering directions.

The rate of exiting direction  $O_{rating}$  is counted by the following formula:

$$O_{r\_DocID} = \frac{|O(i)_{DocID}|}{\sum_{count(O(i))} O(i)} \quad (3)$$

In here,  $count(O(i))$  — is the number of all exiting directions.

The rate of ER  $Doc_{r\_DocID}$  is counted by the following formula:

$$Doc_{r\_DocID} = \frac{(I_{r\_DocID} + O_{r\_DocID})}{2} \quad (4)$$

Table 1. – The calculating of direction rate

DocID	The entering directions			The exiting directions			All rates
	$I(i)$	$ I(i) $	Rate	$O(i)$	$ O(i) $	Rate	
0	$\{\emptyset\}$	0	0.0000	$\{(1,0), (3,0)\}$	2	0.1538	0.0769
1	$\{(0,1)\}$	1	0.0059	$\{(2,1), (3,1)\}$	2	0.1538	0.0799
2	$\{(1,2)\}$	1	0.0061	$\{(3,2), (4,2), (6,2)\}$	3	0.2308	0.1185
3	$\{(0,3), (1,3), (2,3)\}$	3	0.0071	$\{(4,3), (5,3), (6,3)\}$	3	0.2308	0.1189
4	$\{(2,4), (3,4)\}$	2	0.0091	$\{(5,4), (6,4)\}$	2	0.1538	0.0815
5	$\{(3,5), (4,5)\}$	2	0.0077	$\{(6,5)\}$	1	0.0769	0.0423
6	$\{(2,6), (3,6), (4,6), (5,6)\}$	4	0.0069	$\{\emptyset\}$	0	0.0000	0.0035
7	$\{\emptyset\}$	0	0.0000	$\{\emptyset\}$	0	0.0000	0.0000

The results which taken on bases of calculating models by bloc quote of ER rate is given in upper table. The rate is counted in connecting to entering directions' rate of ER. The exiting directions are counted by equal dividing.

We can see the semantic dependences of all ERs in ERC by the following picture. In this the entering and exiting directions of every ER are expressed.

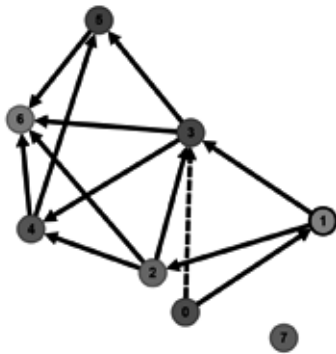


Fig. 1.

ER rate is lower when the calculating of rate by ER direction in all ERs. That's why we should count ER rate by divided rate and define their coefficients.

We can write down divided ER rate as  $TR$ .

$$TR = \{a_1r_1, a_2r_2, a_3r_3, \dots, a_nr_n\} \quad (5)$$

In here,  $r_i$  is the fields of ER and  $a_i$  is ER rate on bases of these fields.

The rate of ER fields must be also taken into consideration for calculating ER rate by block quote. It simplifies calculating the rates of ER in ERC.

Calculating ER rates by ER block quote in ERC is important for searching information from ERC and bestowing them.

### III. Conclusion

The searching problem of ER in ERC is one of important problems nowadays. In the best searching from GOOGLE system in internet global system as PageRank algorithm is to count the rate of web pages. That's why, we recommend the calculating models (2), (3), (4) of ER rate. This model:

- Accelerates the working of searching information module
- Heightens one step the quality of information on bases of the opportunity of searching information by sorting
- Gives opportunity for marking correspond border to bestow information and reordering it
- Creates elements for analyzing information by block quote and intellectual searching.

We think about the opportunity of using field rate for calculating ER rate gives opportunity for producing promising plans for ER in ERC on bases of finding ER rate among fields.

### References:

1. Кулинкович Т. О. Основы научного цитирования: метод. пособие для студентов и магистрантов, – Минск: БГУ, 2010. – 58 с.
2. Brin S., Page L.: The anatomy of a large-scale hyper textual Web search engine. In: Proceedings of the 7th International World Wide Web Conference, Computer Networks 30 (1–7): 107–117, 1998.
3. Page L., Brin S., Motwani R., Winograd T.: The PageRank Citation Ranking: Bringing Order to the Web. Stanford Digital Libraries Working Paper, Stanford University, 1998. – 17 p. <http://ilpubs.stanford.edu:8090/422/1/1999-66.pdf>

## Section 5. Mathematics

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### Quantitatively Exact proof of the Euler-Goldbach hypothesis

**Abstract:** It is shown that any even number can always be composed by two primes. Algorithms that give approximate number of pair of Euler-Goldbach and comparison with real data are presented.

**Keywords:** primes, a pair of Euler-Goldbach, Euler  $\varphi$  – function.

The hypothesis of the Euler-Goldbach were formulated in 1742: every even integer can be represented by a sum of two primes (PR)  $2N = p_a + p_b$ . A couple of these two PR we call a pair of Euler-Goldbach (PEG). It is a binary version of hypothesis. Trinary version — any odd number is the sum of three PR was proved by academician Vinogradov in 1937 for PR, greater than  $10^{6.846168}$  [1; 2]. Proof of binary version does obvious the trinary hypothesis. In the works of the authors [3; 4], the binary hypothesis has been proven using a simplified version of probability theory. It gave correct qualitative and semi-quantitative result with a controlled error. Although our theory of probabilities confirms the hypothesis of the Euler — Goldbach, accurate quantitative evidence was not given.

In this work the hypothesis of the Euler-Goldbach were proved without the theory of probability by comparing the arithmetic progressions (AP), the introduction of the generalized Euler  $\varphi$ -function for relatively PR and by finding majority. The logic of the previous works [3; 4] is briefly the following. 1. Take an even number  $2N$ , and we find the greatest PR  $p_m \leq \sqrt{2N-3}$ . 2. The generated basis set (BS) consecutive PR  $a_m = \{p_1 = 3; p_2 = 5; \dots; p_m\}$ . 3. Find the number of columns  $n = (N-1)/2$  (the largest integer not exceeding  $(N-1)/2$ ) a three line of the matrix  $D(2N)$  and the first buffer zone (1BZ)  $L_N = [1, n]$ . The numbers of 1BZ are a middle (second) row of the matrix  $D(2N)$ . 4. Recorded top line ( $2N$ )  $x_t = (2t+1), t \in L_N$ . This is a set of odd numbers from "3" to  $(2n+1)$ . 5. Record bottom line  $D(2N)$   $y_t = (2N-2t-1), t \in L_N$ . This is a set of decreasing odd numbers from  $\ll 2N-3 \gg$  to  $(2N-2n-1)$ . 6. Compose the  $m$  AP on the top row of the matrix ( $2N$ )  $\{x_i = \alpha_i + p_i(k+1)\}$ , where  $\alpha_i = (p_i-1)/2$ . There is an integer  $k \geq 0$  and further. 7. Compose the  $m$  AP on the bottom row of the matrix ( $2N$ )  $\{y_i = \beta_i + p_i k\}$ . The initial number  $\beta_i$  is from the decision of the comparison  $((\alpha_i+1)\mu_i + \alpha_i) \equiv \beta_i \pmod{p_i}$ , where  $\beta_i$  are included in a complete system of deductions  $[1, p_i]$ . The number  $\mu_i$  ( $0 \leq \mu_i < p_i$ ) is the remainder when dividing  $2N$  into  $p_i$ , i.e.  $2N \equiv \mu_i \pmod{p_i}$ . 8. Delete from 1BZ  $L_N$  all the values of these  $2m$  AP. 9. Remained not deleted numbers  $t$  give PEG  $\{2t+1; 2N-2t-1\}$ .

As example, take  $2N = 56, m = 3, p_3 = 7, n = 13$ ,

$$D(56) = \begin{pmatrix} 3 & 5 & 7 & 9 & 11 & 13 & 15 & 17 & 19 & 21 & 23 & 25 & 27 \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 \\ 53 & 51 & 49 & 47 & 45 & 43 & 41 & 39 & 37 & 35 & 33 & 31 & 29 \end{pmatrix}. \quad (1)$$

In the matrix  $D(2N)$  contains all possible sums of two odd numbers, giving  $2N$ . Our task is to make the columns with two simple numbers. To make this, first in the top row delete all composite numbers that are multiples of  $p_i \in a_m(2N)$ . At the same time it will delete entire column. After the "cleaning" of the top row, composite numbers will be deleted in the bottom row, with the deletion of the entire column again. The remaining matrix contains only PEG. Dynamics of changes of the matrix are shown below.

$$\bar{D}(56) = \begin{pmatrix} 3 & 5 & 7 & 11 & 13 & 17 & 19 & 23 \\ 1 & 2 & 3 & 5 & 6 & 8 & 9 & 11 \\ 53 & 51 & 49 & 45 & 43 & 39 & 37 & 33 \end{pmatrix}; \quad \bar{D}(56) = \begin{pmatrix} 3 & 13 & 19 \\ 1 & 6 & 9 \\ 53 & 43 & 37 \end{pmatrix}. \quad (2)$$

Thus, the number  $2N = 56$  has three PEG.

The same result we get on the second row of the matrix, i.e. with 1BZ. Delete the numbers of the top AP  $\{4+3k; 7+5k; 10+7k\}$ . At the same time delete the numbers of the bottom AP  $\{2+3k; 5+5k; 3+7k\}$ . In the middle row it will remain three numbers  $\{1; 6; 9\}$ , which give the same good columns set of PEG. Therefore, we will use the second version: 1BZ and the right set of AP (RAP)

$$\begin{cases} \alpha_i + p_i(k+1); \\ \beta_i + p_i k. \end{cases} \quad (3)$$

The number  $t$ , not deleted by RAP from 1BZ gives PEG  $\{2t+1; 2N-2t-1\}$ .

To proceed further, we introduce a generalized  $\psi(m)$  — the Euler function. The original the Euler function  $\varphi(m)$  gives the number of integers that are not deleted by a single AP  $\{\gamma_i + p_i k\}, 0 \leq \gamma_i < p_i$  at the interval of the second buffer zone (2BZ)

$$C_m = [1, T_m], \text{ where } T_m = \prod_{i=1}^m p_i. \text{ This number } \varphi(m) = \prod_{i=1}^m (p_i - 1).$$

For example, we have two PR  $\{p_1 = 3, p_2 = 5\}$ , and two single AP  $\{x = 2+3k; y = 1+5k\}$ . Here 2BZ  $C_2 = [1, T_2] = [1, 15]$ . Deleted numbers are  $\{1; 2; 5; 6; 8; 11; 14\}$ . Not removed the number  $\{3; 4; 7; 9; 10; 12; 13; 15\}$ . There are eight of them in accordance with the Euler's function  $\varphi(2) = (3-1)(5-1) = 8$ . Next, for each PR  $p_i$  it will enter the index  $\delta_i = 1$  or 2. If  $p_i$  has two mismatched (double) AP,  $\delta_i = 2$ , if  $p_i$  has one AP,  $\delta_i = 1$ . For example, when AP  $\{2+3k; 1+3k; 2+5k\}$   $\delta_1 = 2, \delta_2 = 1$ . In this case the generalized

Euler function  $\psi(m) = \prod_{i=1}^m (p_i - \delta_i)$  gives the number of all not deleted these AP in 2BZ. The example. In  $C_2$  this three AP removed

$\{1;2;4;5;7;8;10;11;12;13;14\}$ . There are four not removed numbers  $\{3;6;9;15\}$  in accordance with  $\psi(2) = (3-2)(5-1) = 4$ .

The probability to find not delete number in 2BZ is  $\omega_m = \psi(m)/T_m$ . We do not know the distribution probability density of not deleted numbers in 2BZ. But to evaluate the result it will make a uniform distribution. Then the probabilistic number of PEG  $\bar{S}(2N) = (n \cdot \psi(m)/T_m)$ . This number is of course different from

Table 1. – The exact  $S(2N)$  and the calculated  $\bar{S}(2N)$  on the theory of probability the amount of PEG for different even numbers  $2N$ .

$2N$	94	600	1000	2000	3000	4000	5000	6000	10000	17000	30000
$S(2N)$	5	23	31	37	104	68	75	178	127	215	602
$\bar{S}(2N)$	3,25	21,42	20,61	35,46	98,07	61,31	74,11	168,28	127,71	207,17	607,31

The question arises whether or not these  $2m$  RAP to delete all numbers in 1BZ, i. e. all numbers in the middle row of the matrix  $D(2N)$ , and not deleted numbers will not be. Therefore, there will not be PEG.

Let's move to another, the quantitative proof of the hypothesis of Euler-Goldbach. There are two intervals of 2BZ  $C_m$  and 1BZ  $L_m$ . Always for  $N \geq 7$   $L_m \subset C_m$ , since  $n(m) < T_m$  i. e. 1BZ is inside 2BZ. We know the exact number of not deleted numbers in 2BZ  $\psi(m)$ . Could it be that the smallest not deleted  $s_m$  number was greater than  $n(m)$  (at the smallest possible  $S(2N)$  and were not included in 1BZ, i. e. are there not PEG at all? To answer this question, we conducted a numerical experiment. Took a special set of pairs of arithmetic progressions (SAP), which maximally shifts the not deleted numbers in 2BZ and therefore it shifts  $s_m$  to right.

Set of SAP looks as follows. The first four AP  $\{1+3k; 2+3k; 1+5k; 3+5k\}$   $C_2 = [1, 15]$  give the maximum shift of not deleted numbers  $\{9; 12; 15\}$  to right, i. e.  $s_2 = 9$ . Also fix the fol-

lowing nearest to  $s_m$  not deleted number  $d_m$ . Here we have  $d_2 = 12$ . Immediately find  $n(2)$  from  $2N = 28$ ,  $n = 6$ , i. e.  $n < s_2$  and there are not PEG at this specific set of SAP. Take the next pairs of SAP by the principle to delete the first two not deleted the number of  $s_m$  and  $d_m$ . It AP  $\{9+7k; 12+7k\}$ ,  $C_3 = [1, 105]$ ,  $s_3 = 15, d_3 = 24$ . By taking  $2N = 52, n(3) = 12 < 15$ . Again, there are not PEG. Take the next pairs of  $\{15+11k; 24+11k\}$  to delete the first smallest not deleted number. Here  $C_4 = [1, 1155]$ ,  $s_4 = 27, d_4 = 39$ . The smallest even number  $2N$  containing  $p_4 = 11$   $2N = 124$ , has  $n(4) = 30$ . There is already  $n(4) > s_4 = 27$ , i. e., the not deleted number by SAP locate into 1BZ and PEG are appeared. Another pair of SAP has the form  $\{s_m + p_{m+1}k; d_m + p_{m+1}k\}$  and always the direct calculation gives  $n(m) > s_m$ . This suggests that even in the worst of possible sets of pairs of RAP in 1BZ there is a PEG. We conducted test until  $p_m = 17393, s_m = 32784, d_m = 32787. 2N = 302516452. n = 75629112$ . Statistics shows that  $s_m = (p_m)^{\gamma_m}, \gamma_m = (1, 4 \div 1)$ . See table № 2.

Table 2. – Dependence of  $\gamma_m$  from  $p_m$  by SAP

$m$	2	3	4	10	25	168							
$p_m$	5	7	11	31	101	1009	2003	3001	4001	5003	10007	13001	17011
$\gamma_m$	1,365	1,391	1,374	1,421	1,419	1,364	1,288	1,234	1,199	1,172	1,105	1,085	1,066

The dependence of  $n(m)$  from  $p_m$  with large  $m$  has asymptotic behavior  $n(m) \approx p_m^2 / 4$ , where it is clear that  $n(m) > s_m$ , where-in the difference  $(n(m) - s_m)$  with increasing  $m$  increases. This indicates that PEG arise with any even numbers.

Now explain why the real set of RAP giving PEG has the lowest not deleted number that is less than  $s_m$ . At first, in the top row of the matrix the first half of RAP  $x_i = ((p_i - 1) / 2) + p_i(k + 1)$  do not delete the PR, and deletes all composite numbers. On the bottom row the second half of the RAP is taken by the formula and not to delete

the first not deleted numbers. Second, often in RAP at one  $p_i$  there is only one AP, which increases the number of not deleted numbers. Third, a starting set of the first four RAP with  $p_i = \{3; 5\}$  and RAP cannot give the first not deleted number «9», as experimentally with  $2N = 28$  there are two PEG  $\{5; 23\}, \{11, 17\}$ .

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**References:**

1. Sizykh S. V. lectures on the theory of numbers, FIZMATGIZ, – M., 2007.
2. Sushkevich A. K. number Theory, Kharkov, KSU, 1956.
3. Druzhinin V. V. Scientific and technical Gazette of the Volga region –NTIT, No. 3, 14–17, 2014.
4. Druzhinin V. V., Lazarev A. A. Austrian Journal Technical and Natural Science, No. 9–10, 29–19, 2014.

## Section 6. Materials Science

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### Features of sheet metals' symmetric and asymmetric rolling

**Abstract:** In the article provided information on experimental results on the increase of the anisotropy coefficient can be achieved by means of plastic deformation, which is a result of shear forces on the sheet metal thickness.

**Keywords:** super-hard materials, diamond, powder materials, hard alloy cutting and shaping tools.

**Introduction.** In industry, most of the metal is processed by different types of rolling. When sheet metal rolling main objective is to reduce the thickness of the sheet metal to the desired size, improve the mechanical and other properties.

Many large industries such as aeronautics, automotive and architecture of the aluminum parts are widely used due to some excellent properties of aluminum as a relatively low specific weight and high corrosion resistance. The high price and limited characteristics shaping by pressure treatment are considered major aluminum sheet shortcomings that limit its wider application in various industries.

Features aluminum sheet forming mostly envy of mechanical changes during plastic deformation hardening and the anisotropy coefficient, ie, ratio of width and thickness reduction, when tested in tension, which depends on the crystallographic texture of the material. Greater anisotropy coefficient value means that when plastic deformation greater with small thickness variation.

**Objects and methods of research.** Asymmetric rolling is a new method characterized by geometric asymmetry associated with the difference in diameters between the two rollers and kinetic asymmetry associated with the difference in the linear speed of the

rollers, able to introduce shear intensive plastic deformation, in turn, formed by the strip thickness shear deformation texture.

There are several methods of asymmetric rolling, but for industrial applications in practice there are three main methods:

- Different speeds of the work rolls;
- various dimensions of the work rolls;
- one drive roller.

Until a few years ago metallurgical effect asymmetrically rolled samples received very little attention. This may be because, until now, this method is used mainly for the production of special new materials such as clad materials and composites. With the development of ultrathin grain materials using this technique, this method was developed to offer new possibilities of production of new steels with improved properties (strength, ductility, toughness and electrical resistance) by controlling the microstructure. In addition, the stimulus for the development of this technique is due to the need to adapt existing technologies for the production of materials with improved properties, extends the product range of the modified technological methods and improved rolling precision. In the asymmetric rolling process of rolling force is greatly reduced as compared with conventional rolling. Reducing rolling force has the great advantage



that a very large deformation can be imparted to the material for the production of ultra-thin structure of the grain, texture modification and manufacture of high-strength materials. Asymmetric rolling results in the development of strains with strong shear components on the surface and in the center of the band [1]. One of the consequences of this shift component is to increase the surface area of the deformed grains to higher values than is possible in a pure strain simple compressive strain. In the case of austenite, this leads to a recrystallization nucleation or the phase transformation. The net result is a smaller ferrite grains compared with the case of conventional hot rolling [1; 2].

**Scientific results and their analysis.** Theoretical calculations and experimental results have shown that an increase in the coefficient of anisotropy can be achieved by means of plastic deformation, which is the result of shear forces on the sheet metal thickness of. In order to accomplish the plastic deformation of investing shear forces, there are different methods of severe plastic deformation (SPD) as equal channel angular pressing (ECAP), torsion deformation at high pressure (HPC), cyclic extrusion, comprehensive forging (VC), hourglass (IF), forced ribbed molding (PDP), packet hydrostatic extrusion (GHG), batch rolling (PP) [3]. These methods aimed at improving/changing metal properties with SDI. For example, with the ECAP and the HPC obtained microstructure of nano-sized grains with. But these methods do not provide long-SDI processing, which limits the application in large industries.

The main purpose of this work was to study the effect of cold rolling asymmetric mechanical properties of technical pure aluminum sheet, in particular on the coefficient of anisotropy and strength of the material.

Asymmetric rolling industrial aluminum was investigated. Three different types of rolling were examined. Traditional (symmetric) rolling (CR), and asymmetric continuous rolling (ASRC) and asymmetric reverse rolling (ASRR). Influence of crystallographic orientation of grains, and dislocation structure, which developed during plastic deformation, the mechanical characteristics of the material analyzed using tensile tests, X-ray diffraction and transmission electron microscopy. Viscoplastic self-consistent (VPSC) model was used to determine the effect of the crystallographic texture on the stress-strain curve (curve stress strain) obtained from tensile tests of rolled samples before and after heat treatment.

From these results the following conclusions:

1. With increase in the total thickness reduction, increasing the tensile strength ( $\sigma_{max}$ ) and uniform deformation ( $\epsilon_u$ ), conversely, decreases. After 6 passages (62% reduction) homogeneous plastic deformation was less than 2%. From all values studied reduction (28%, 48% and 62%), asymmetrically rolled samples showed a greater than limit value strain  $\sigma_{max}$  laminated samples traditional way.

2. Texture analysis showed that the samples are laminated asymmetrically crystals with orientation close to the ideal ingredients shift in texture. However, the intensity of these components were relatively low in both ASRC and ASRR samples.

3. The conditions during heat treatment (280°C and 1 hour) of the material not subjected to recrystallization and crystallographic texture obtained for different types of rolling are stored. After the heat treatment, the microstructure was characterized by the presence sub grain size 1–2 microns.

4. After the heat treatment, laminated specimens asymmetric magnification showed relatively normal anisotropy samples and laminated by a conventional starting material. At the ASRC samples observed reduction coefficient of planar anisotropy. These results show that the asymmetric rolling can be used to improve formation characteristics commercially pure aluminum sheets.

5. Selected rolling conditions and heat treatment resulting in a microstructure with grain refinement. This, i. e. this effect is strongly reflected in the samples by conventional rolling symmetrically.

Based on these results, it is possible to make the following suggestions for future work:

– In order to increase the amount of shear texture components via asymmetric rolling, it is necessary to study different parameters like different rolling rollers rotating rolling reduction ratio in one pass, and the other friction.

– Conduct additional microstructure analysis (which must include the study of microstructures of the plane of the sheet material thickness and determining disorientations subgrains cells), to explain the difference in yield stress obtained after different types of rolling as: CR, ASRC and ASRR.

## References:

1. Salimi, M. and F. Sassani (2002). «Modified slab analysis of asymmetrical plate rolling.» International Journal of Mechanical Sciences 44 (9): 1999–2023.
2. Lopes, A. L. B. (2001). Análise microestrutural das instabilidades plásticas em materiais metálicos, Aveiro. PhD: 227.
3. Saidaxmedov R., Bakhadirov K. Mechanical properties of material after rolling and heat treatment. Journal of Technical University of Gabrovo –vol. 47, 2014. P. 17–19.
4. Salokhiddin D. Nurmurodov, Alisher K. Rasulov, Nodir D. Turahadjaev, Kudratkhon G. Bakhadirov. Procedure-Technique for New Type Plasma Chemical Reactor Thermo-physical Calculations. American Journal of Materials Engineering and Technology Vol. 3, No. 3, 2015, P. 58–62.
5. Salokhiddin D. Nurmurodov, Alisher K. Rasulov, Nodir D. Turahadjaev, Kudratkhon G. Bakhadirov. Development of New Structural Materials with Improved Mechanical Properties and High Quality of Structures through New Methods. Canadian Journal of Materials Science Research, Vol. 5, No. 3, 2016, P. 52 –58.

## Section 7. Medical science

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### Diagnostic value of definition of antibodies to antigens of microorganisms in women with inflammatory diseases of the pelvic organs

**Abstract:** The aim was to study and define the diagnostic value of detection of antibody titers to the antigens of some etiologic agents of inflammatory diseases of the pelvic organs (IDPO) in women of childbearing age. It was found that the monoculture of microorganisms detected 4.2 times more often than the association, in 7.6% cases were found negative samples. Most antibodies were found to antigens other *Mycoplasma* spp, *Chlamydia* spp, Cytomegalovirus and Herpes simplex virus type 1 and 2.

**Keywords:** antigens, antibodies, ELISA, women, microorganism, infection, inflammatory diseases of the pelvic organs.

Inflammatory diseases of the pelvic organs (IDPO) characterized by different symptoms depending on the level of destruction and the force of the inflammatory response. The disease develops as a result of the penetration of the pathogen in sexual ways and in the presence of favorable conditions for its reproduction. Such conditions are created in the post-partum and post-abortion period, during menstruation, for different intrauterine manipulations [1, 5].

The decisive role in causing inflammation play: the state of the microorganism, the massiveness of infection, virulence of the etiological agent [2].

It was found that opportunistic pathogen bacterium (OPB) does not only cause of IDPO and cause of fetal and neonatal infections [1].

In this regard, microbiological tests have a high diagnostic value in the diagnostic of IDPO. Along with bacteriological diagnostics methods in recent years, other methods are widely used, in particular immunoassay — ELISA [3; 4].

**The purpose of the work** — The study and definition of the diagnostic value of detection of antibody titers to the antigens of some etiologic agents of IDPO in women of childbearing age.

**Materials and methods.** To achieve the goal were studied 304 women of reproductive age with IDPO. All patients were treated in the Khorezm branch of the Republican Scientific Center for Emergency Medical Care Ministry of Health of Uzbekistan. They were distributed by age as follows: 18–21 years — 12 patients (3.9 ± 1.1%), 22–29 years — 136 patients (44.7 ± 2.9%), 30–35 years — 56 patients (18.5 ± 2.2%), 36–49 years — 100 patients (32.9 ± 2.7%).

The main number of women were married (97.7 ± 0.9%), rural residents accounted for 69.4 ± 2.6%, and the urban 30.6 ± 2.6%.

Among all women surveyed took a major amount of housewives and non-working women (84.5 ± 2.1%).

Patients often revealed acute salpingitis, oophoritis (98.4 ± 0.7%). The diagnosis was verified by means of clinical, instrumental and laboratory studies on the proposals of the National Center for Disease Control and Prevention (NCDC, USA, 2006).

For setting up ELISA were used diagnostic test systems for the determination of serum antibodies to the antigens of *Chlamydia* spp, *Toxoplasma gondii*, *Mycoplasma* spp., Cytomegalovirus (CMV), Herpes simplex virus type 1 and 2 (HSV 1, 2) («XEMA» company's test systems, RF), *Ureaplasma urealyticum* (test-system of the company "Vector-Best", Russia). The principle of the method lies in the qualitative detection of antibodies to the above mentioned antigens by indirect ELISA test on polystyrene. The results were obtained by spectrophotometrically method at a wavelength of 492 nm.

During carry out this research were observed all the ethical principles for medical research involving human subjects, the Helsinki Declaration adopted by the WMA in 1964 (the latest addition in Seoul on the 59th General Assembly of the WMA in 2008).

**Results and discussion.** The obtaining results showed that antibodies are not detected by the above pathogens always. Most of the time the women surveyed revealed antibodies to *Mycoplasma* spp, they were detected in 120 cases (39.5 ± 2.8%). It is known that the genus *Mycoplasma* in practical medicine the main place is occupied kinds *M. hominus*, *M. genitalium* and *M. pneumoniae*. All these types are common antigenic determinants and ELISA method to determine them separately is not possible. If we consider that *Mycoplasma* spp. causes acute and chronic inflammatory diseases of the urinary tract, they may be etiologic agents of IDPO in women [7].

On the next place on detectability were antibodies to *Chlamydia* spp. —  $27.0 \pm 2.5\%$  ( $n = 82$ ). The main representative of this kind, which may be the causative agent of TORCH-infections is *C. trachomatis*, other (*C. psittaci* and *C. pneumoniae*) rarely cause disease in humans [8]. Detection of specific serum IgG-antibodies activity reflects the extent of reproduction *Chlamydia* spp. Determination of IgG-antibodies may be used for establishing and monitoring of disease recurrence of the infection.

A distinctive feature of our research was that most frequently detected antibodies to such antigens — CMV and HSV 1, 2 respectively in  $20.4 \pm 2.3\%$  ( $n=62$ ) and  $12.5 \pm 1.9\%$  ( $n=38$ ) cases. If we consider that CMV is found in 60–90% of the adult population, the CMV problem in women, especially pregnant women, it is very serious [9].

Although IgG-antibodies do not protect against reactivation of latent virus, but can serve as an indirect indicator of CMV activity in the body of women. HSV 1, 2 are also seen very often, hit about 90% of the population [6]. Women particularly common HSV 2 (genital herpes) and identification of IgG-antibodies indicates a remission or recurrence of Herpes simplex disease.

Relatively few have been identified antibodies to *Toxoplasma gondii* ( $5.9 \pm 1.4\%$ ,  $n=18$ ) and *Ureaplasma urealyticum* ( $3.3 \pm 1.0\%$ ,  $n=10$ ). It is known that the IgG-antibodies to *Toxoplasma gondii* have a protective function, and provide a stable immunity against reinfection [10], so the definition of IgG-antibodies to *Toxoplasma gondii* is used for the purpose of state immunity anti-toxoplasmonic of women. The same diagnostic objective pursued determining IgG antibodies to *Ureaplasma urealyticum* [8].

There were revealed total 330 cases of detection of positive samples from 304 women, but it is necessary to take into account that  $7.6 \pm 1.5\%$  ( $n = 23$ ) of the women surveyed were found negative samples. Consequently, the 330 positive samples were found in the surveyed 281 women with IDPO. The percentage of detection of antibodies in healthy women who have not had IDPO was low and significantly different from women with IDPO ( $P < 0.001$ ).

Given the fact that the identification of positive samples was observed in the form of monocultures and microbial associations, we were interested to study the relationship between detection of each another.

The results show that most often encountered in associations and CMV-antigens from different *Chlamydia* spp. microorganisms (for  $n = 20$ ) and *Mycoplasma* spp. ( $n=14$ ).

In most cases the association was observed with the following organisms: CMV and HCV 1, 2 to  $3.3 \pm 1.0\%$  ( $n=10$ ); and *Mycoplasma* spp. — CMV in  $2.6 \pm 0.9\%$  ( $n=8$ ); *Chlamydia* spp. and *Mycoplasma* spp. in  $2.6 \pm 0.9\%$  ( $n = 8$ ); CMV, *Chlamydia* spp. and HSV 1.2 to  $2.0 \pm 0.8\%$  ( $n = 6$ ) patients. Other associations met from  $0.7 \pm 0.5\%$  ( $n = 2$ ) to  $1.3 \pm 0.6\%$  ( $n=4$ ) cases.

The detected associations were observed between 2 and 5 microorganisms. They were as follows: 2 in association microorganism was  $13.8 \pm 2.0\%$  ( $n=42$ ), 3 in the microorganism  $5.3 \pm 1.3\%$  ( $n=16$ ) 4 microorganisms  $1.3 \pm 0.6\%$  ( $n=4$ ) and to 5 microorganisms  $0.7 \pm 0.5\%$  ( $n=2$ ) samples.

It is interesting to note that the monoculture of microorganisms identified ( $n=266$ ) occurred 4.2 times more frequently than the association of these microorganisms ( $n = 64$ ). The presence of a certain number of negative samples ( $7.6 \pm 1.5\%$ ,  $n=23$ ) antigen above microorganisms in these studies points to the discovery of other etiologic agents (Gram-negative bacteria, Gram-positive cocci, anaerobes), pelvic inflammatory disease in women of child-bearing age who are found bacteriological methods.

The findings indicate that in addition to bacteriological methods of qualitative determination of antibodies in the serum of women against antigens of various microorganisms using the ELISA method has a certain diagnostic value and along with other methods can be used for the diagnosis of IDPO.

#### Conclusions:

1. In the serum examined women with IDPO most commonly detected IgG-antibodies to antigens of *Mycoplasma* spp., *Chlamydia* spp., CMV, and HSV 1 and 2, the least frequently detected IgG-antibodies to antigens of *Toxoplasma gondii*, *Ureaplasma urealyticum*.
2. Total 330 positive samples were found, which samples with 64 monocultures and 266 microorganisms association. Monoculture occurred in 4.2 times more frequently than the association of microorganisms,  $7.6 \pm 1.5\%$  cases were found negative samples.
3. Women who were surveyed most often in association met CMV and *Chlamydia* spp. 20 times, *Mycoplasma* spp. 14 times with other microorganisms and each other.

#### References:

1. Buyanova S. N., Shchukina N. A., Gorishkin A. V. The reproductive prognosis in patients with purulent and inflammatory diseases of the pelvic organs: the problem decisions//Russian herald obstetrician-gynecologist (Moscow). 2009; 2: 65–8. (In Russia).
2. Kozhina M. V., Zhmakin A. I., Titov L. P. Changes in vaginal microbiocenosis in patients with chronic inflammatory diseases of the pelvic organs after antibiotic therapy//Journal of Microbiology, Epidemiology and Immunology (Moscow). 2005; 3: 75–8. (In Russia).
3. Rakhmanova S. S., Nuraliyev N. A., Masharipov V. U. Comparative study of circulating antibodies to opportunistic enterobacteria in healthy children and adults//Bulletin scientific achievements (Ternopol', Ukraina). 2009; 3: 43–5. (In Russia).
4. Fluer F. S., Prokhorov V. E., Vesnina A. F. et al. Enzyme immunoassay test system for the determination of staphylococcal enterotoxin C//Journal of Microbiology. (Moscow). 2002; 65–8. (In Russia).
5. Yaglov V. V., Prilepskaya V. N. Inflammatory diseases of the pelvic organs in the practice gynecologist//Gynecology. 2007; 3: 18–20. (In Russia).
6. Isakov V. A., Borisova V. V., Isakov D. V. Herpetic infections: pathogenesis and laboratory diagnostics//Manual for physicals. St.Peterburg. 1999: 192 p.
7. Waters K. B., Talkington D. F. *Mycoplasma pneumoniae* its role as human pathogen//Clin. Microbiol. Rev. 2004; 17: 697–728.
8. Maid I. S., Nicolau I. C., Machado M. de N. et al. Prevalence of *Chlamydia pneumoniae* and *Mycoplasma pneumoniae* in different forms of coronary disease//Arg. Bras. Cardiol. 2009; 92 (6): 405–11.
9. Pass R. F. Cytomegalovirus infection//Pediatrics in Reviews. 2002; 23: 25–9.
10. Tenter A. M., Heckerroth A. R., Weiss I. M. *Toxoplasma gondii*: from animals to humans//International J. of Parasitology. 2000; 30: 1217–58.

## Disorders of neurohumoral factors in patients with chronic heart failure

**Abstract:** the aim of the study was to of neurohumoral factors in patients with chronic heart failure (CHF) in 64 patients with chronic heart failure (CHF) in the II–III functional class (FC). In patients with CHF FC II dominated mid-high levels of neurohumoral factors, whereas in patients with FC III noted the predominance of high levels of BNP and aldosterone.

**Keywords:** chronic heart failure, neurohumoral factors, natriuretic peptide, aldosterone.

Chronic heart failure (CHF) is not only a medical but also a social challenge due to significant prevalence, high mortality rates. Prognosis in the patients with CHF is extremely unfavorable. It is expected that the nearest 20–30 years CHF incidence will rise in 40–60%. This pathology sharply worsens the quality of life of patients and increases the risk of death in 4 times: it can vary from 15 to 50% during a year. The risk of sudden death in patients with CHF is 5 times higher than in those without heart failure [1; 2]. Thereby, a great interest to search for universal laboratory and instrumental markers of heart failure which are involved in the formation of pathogenic mechanisms of chronic heart failure in persons after myocardial infarction, is important in the processes of cardiovascular system remodeling, their early diagnosis, monitoring of therapy and prognosis of patients with CHF [3; 4]. Multicenter randomized studies showed that the development of LV dysfunction at the early stages occurs neurohumoral systems activation with increased activity of the sympathetic-adrenal system (SAS), which contributes to the activation of the renin-angiotensin-aldosterone system (RAAS), and other neurohormones and mediators including cytokines, endothelin, natriuretic peptide system (NUP), neurohormones and other mediators [5; 6]. Greater predictive value is the definition of NUP levels in blood. Large randomized clinical trials conducted in Europe and the USA — BATTLESCARRED, CONSENSUS II was noted increased death rate in patients with myocardial infarction who had NUP high level in blood at MI acute stage. Results of multicenter studies — The STARS-BNP Trial, HABIT Trial showed that to determine the level of BNP can not only exclude heart failure (HF), but also to confirm the diagnosis [7; 8]. Another neurohormone — aldosterone interacting with receptors of fibroblasts, endothelial cells and renal glomeruli leads to increased synthesis of collagen, fibrosis, proliferation of endothelium, remodeling NIJ-vascular and myocardial, stimulates apoptosis of cardiomyocytes, which have an important role in the formation of chronic cardiac dysfunction [9; 10].

**Purpose of research** was to study of neurohumoral factors in patients with chronic heart failure (CHF) in functional classes II–III.

**Material and Methods.** This investigation included 64 males with ischemic heart disease (IHD) associated with FC II (30) and III (34) CHF (mean age  $53.5 \pm 5.1$  years). Control group comprised of 14 healthy persons (mean age  $44.1 \pm 3.7$  years). The patients were randomized into groups in relation to FC CHF by classification of New-York Association of cardiologists on the basis of findings of the six-minute walk test (SWT) and by scale for evaluation of clinical state of the patients (SECS).

To compare the data of BNP and aldosterone plasma levels we surveyed 14 healthy men (control group) who were being treated at other departments of the hospital, matched by sex, age and weight with the examined groups. Neurohumoral status of the patients was studied by plasma concentrations of brain natriuretic peptide (BNP) and aldosterone, which were determined in plasma at base-

line and after 6 months of therapy. Determining the level of BNP and aldosterone was performed on ELISA immunoassay analyzer using reagents of company «Biomedica».

The study obtained data were subjected to statistical processing on a PC Pentium-IV using the software package Microsoft Office Excel-2012, including the use of built-in functions of the aggregation. The variation methods used parametric and nonparametric statistics with taking the arithmetic average of the studied indicator ( $M$ ), an average quadratic deviation ( $\sigma$ ), the standard errors of the mean ( $m$ ), the relative values frequency (%), the statistical significance measurements obtained by comparing the average values determined by Student ( $t$ ) with the computation of the error probability ( $P$ ) for testing normality (by kurtosis criterion) and the equality of the population variance ( $F$  — Fisher's exact test). For statistically significant changes were taken confidence level  $P < 0.05$ . Statistical significance for qualitative variables was calculated using the  $\chi^2$  criterion (chi-square) and the  $z$ -criterion (Glanz). For dependency analysis features the Pearson correlation coefficient of pair ( $r$ ) was calculated.

**Results and Discussion.** Analysis of the study results showed that patients with CHF, activation of the neurohumoral factors were marked which characterized by increasing concentrations of BNP and aldosterone in all examined patients. Established that in CHF levels of BNP and aldosterone were significantly increased and these changes correlate with disease progression. Patients with FC II had increased amount of BNP by 181.8% ( $p < 0,001$ ), and patients with FC III by 319.5% ( $p < 0,001$ ) compared with the control group. Accordingly, BNP level was 2.8-fold in FC II and 4.1-folds higher in FC III, compared with the values of the control group. There was also a significant increase of aldosterone in both groups of patients: in patients with FC II, level of aldosterone increased by 36.8% ( $p < 0,001$ ) compared with the control group. In patients with FC III it was 66.4% ( $p < 0,001$ ). Aldosterone levels increased by 1,3-fold in FC II and 1.6-fold in FC III. There was a direct correlation between BNP and AL in patients with FC II, which made up  $r = +0,91$ , and FC III  $r = +0,98$ , in both cases,  $P < 0,001$ . Fluctuations of BNP in patients with FC II ranged from 430.5 to 912.6 fmol/ml, and in patients with FC III from 675.5 to 1423.1 fmol/ml. Similar changes were observed while analyzing aldosterone level. Fluctuations of aldosterone in FC II were from 180.2 to 361.1 pg/ml, in FC III from 219.1 to 435.7pg/ml. In consideration of the changes of these indices, we study the distribution of the examined patients on basis of the content of the investigated hormone levels within the lower values of the median (mid-high level) and high values of the median (high level). Analysis of the study results showed that mid-high increase in BNP was noted in 54.3% of examined patients, aldosterone in 62.8% of patients. High level of BNP, i. e. values above the median, was observed in 45.7% and aldosterone — in 37,2% of patients with FC II CHF.

Studying the distribution of patients by the level of increase in neurohumoral factors in patients with CHF FC III showed that this group had high levels of BNP increase — 57.6% and aldosterone — 63.6% of the patients with III FC.

**Conclusion.** In patients with CHF FC II dominated mid-high levels of neurohumoral factors, whereas in patients with FC III noted the predominance of high levels of BNP and aldosterone.

### References:

1. Engelfriet P. M., Hoogenveen R. T., Boshuizen H. C., Baal van P. H. To die with of from heart failure: a difference that counts: is heart failure underrepresented in national mortality statistics?//Eur J Heart Fail. – 2011. – Vol. 13. – P. 377–38.
2. Fonarow G. C., Albert N. M., Curtis A. B., et al. Associations between outpatient heart failure process-of-care measures and mortality//Circulation. – 2011. – Vol. 123. – P. 1601.
3. Ketchum E. S., Levy W. C. Establishing prognosis in heart failure: a multimarker approach//Prog Cardiovasc Dis. – 2011. – Vol. 54. – P. 86–96.
4. Allen L. A., Felker G. M. Multi-marker strategies in heart failure: clinical and statistical approaches//Heart Fail Rev. – 2010. – Vol. 15. – P. 343–349.
5. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012. The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC//Eur. Heart J. – 2012. – Vol. 33. – P. 1787–1847.
6. Emdin I. M., Vittorini S., Passino C. et al. Old and new biomarkers of heart failure//Eur J Heart Fail. – 2009. – № 11. – P. 331–335.
7. Kelder J. C., Cowie M. R., McDonagh T. A. et al. Quantifying the added value of BNP in suspected heart failure in general practice: an individual patient data meta-analysis//Heart. – 2011. – Vol. 97. – P. 959–963.
8. HOMAGE –Overcoming Heart Failure, an European challenge. 2013. www.homage-hf.eu; http://www.inserm.fr
9. Montalescot G., Beygui F., Collet J-Ph. et al. High Plasma Aldosterone Levels on Admission Are Associated With Death in Patients Presenting With Acute ST- Elevation Myocardial Infarction//Circulation. – 2006. – Vol. 114. – P. 2604–2610.
10. Tomaschitz A., Pilz S., Ritz E. et al. Plasma aldosterone levels are associated with increased cardiovascular mortality: the Ludwigshafen Risk and Cardiovascular Health (LURIC) study//Eur. Heart J. – 2010. – Vol. 31. – P. 1237–1247.

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## Assessment of professional risk of employees of fuel and energy complex at production and use of coal

**Abstract:** The increased prevalence of chronic bronchitis among employees of the energy industry in Uzbekistan that are affected various industrial dust it is being officially carried to number occupational diseases (“chronic dust bronchitis”). Occupational incidence among employees of energy industry remains to one of the highest in the republic and almost by 7–8 times exceeding in general in the country.

**Keywords:** production factor, working conditions, coal, health, professional risk.

**Introduction.** Follow modernization and technical re-equipment in Uzbekistan of the Fuel and Energy Complex (FEC) in case of extraction and coal using in production of heat power receipt, demand from employers more careful observance of occupational health rules and workers health protection.

Uzbekistan has explored coal storage in number of 1900 million tons which composed 0,2% from the world reconnoitered coal storage, including: reddish black — 1853 million tons, stone — 47 million tons [1, 8–13]. Coal extraction, in generally concentrated in the near Tashkent (Angren Coal mine) of the carboniferous area of reddish black coal and the Gissaro-Darvaz stone coal basin (Baysun and Shargun fields), used generally for an energy purpose.

An annual average fuel balance by system of the State-owned Joint Stock Company “Uzbekenergy” has composed: natural gas — 86,7%,

mazut — 10,26%, coal — 3,04%. At the same time a coal share in fuel and energy balance of the republic will be increased by 2021 from 3,9% to 12%. Now reddish black coal is arrived to the Angren and the New Angren thermal power plants (TPP) of the following structure: the lowest warmth of combustion (1900–2020) kcal/kg, humidity — (36–45)%, content on the working mass of fuel — a mineral component (25–35)%, sulfur (1,5–,8)%. A coal share in fuel balance of the the New Angren TPP has constituted 16,93%, and the Angren TPP — 54,62%. At the same time the specific fuel consumption on released electro and heat power, respectively, has constituted: the New Angren TPP — 389,4 goe/kWh and 167 kgoe/Gcal, and the Angren — 439,0 goe/kWh and 186,6 kgoe/Gcal [2].

It is known that sanitary and hygienic value of coal dust is determined by the changes caused in respiratory organs [3, 77–85].

Bronchopulmonary diseases of an occupational etiology is continued to remain the most important problem of medicine by the extent of the caused medico-social damage that is connected first of all with insufficient study of mechanisms of fibrogenic effect of coal dust of various brands, and also actions of the combined factors of gases, aerosols, etc. [4].

*Study goal* is an occupational risk (OR) assessment and a health state of employees' energy industry of Uzbekistan.

**Study materials and methods.** Study of working conditions factors and a separate factors OR assessment of the production environment, according to the techniques approved by the Ministry health of the Republic of Uzbekistan (MHRUz) were carried out in underground mines "Shargun" (the Baysun coal basin) and "9 mine" (The Angren reddish black coal basin), and also in the Angren TPP, using coal.

Health state indicators assessment of energy industry employees depending on working conditions on a workplace was carried out based on recommendations of the International Labour Organization (ILO) — the HSEMS of ILO 2001/ILO-OSH 2001 [5]. 85 male miners and 40 employees of TPP aged from 25 till 50 years were surveyed.

Material analysis has been carried out by commonly accepted methods of variation statistics. Results and conclusions were received based on principles of evidential medicine.

**Results and discussion.** An OR management system of employees energy industry of Uzbekistan is included: work planning on identification of dangers and a risk assessment; a working conditions assessment in each workplace; workers health state assessment; actions for risk decrease; actions accomplishment control for decrease in risk.

In mine air a weighed coal and thoroughbred dust has dispersion: up to 40–80% of dust particles have sizes up to 1,3 mkm, 15–35% — up to 2,6 mkm, 5–20% — up to 4 mkm and 3–10% — over 4 mkm which, getting into lungs in case of breath, are the reason of diseases development.

Occupational morbidity among employees of TPP, is remained one of the highest in the republic and almost by 7–8 times exceeding a level about the country in general. The main place among it is taken by chronic bronchitis of a dust etiology.

Dust bronchitis is represented a combined infectious and dust affect with prevalence of a role of this or that component. The increased prevalence of chronic bronchitis among employees of the energy industry of Uzbekistan which are affected various industrial dusts it is officially carried to number of occupational ("chronic dust bronchitis"). Along with coal dust impact to respiratory organs, it is exerted an impact on emergence of patulous skin diseases of hypodermic cellular tissue (furuncles, felons, abscesses), an acute gastrointestinal diseases and helminthoses that is connected with absence in a number of mines a correctly organized underground cesspool cleaning and promoted development of conjunctivitis, an eye cornea traumatization. The fine-dispersed dust is the much.

A research analysis among "9 mine" miners has shown that by course nature of lungs diseases of a dust etiology which are classified as slowly progressing pneumoconiosis form were occurred at 12,9% of persons with more than 15 service years. The received results of functional researches of respiratory system (EBF study) have been shown that among persons with revealed lungs diseases the EBF dysfunction in 75% cases which are precede occupational disease developments were observed and are reflexed reaction of an organism to impact of coal dust. Persons, with more than 15 service years were noted in 32,3% cases slow progressing of a disease in the form

of cough strengthening, in 25,8% cases a breathlessness, 12,9% in breast pain cases and in 9,7% cases on increased fatigue.

Fungal diseases spread at underground working mines was depended on the number of social factors: most of miners (77,5%) lived in private houses or in the house of barrack-type with lack of centralized water supply (69,8%), using an individual closed rubber footwear at work (50,2%) and visiting of a production shower, without observance of personal hygiene rules (96,4%).

Changes of functional and metabolic activity of leukocytes of blood are acted as sensitive indicators of disorders of a homeostasis in respiratory organs in case of early protective and adaptation reactions. Quantitative and high-quality shifts in blood elements, decrease in functional activity of leukocytes, destruction increase level were reflected an initial phenomena of a decompensation [6].

An occupational risk is a consequence of impact on the employee of energy industry of a complex of the technological, organizational, social and economic reasons and as a type of social risk is connected with occupational activity of the person. Social and occupational risks are caused by the nature of market economy which is shown in economic vulnerability hired and occupied with private workers entrepreneurship (or family entrepreneurship).

There are two standard reasons of this sort of stock outs: loss of employment (unemployment) place and loss of physical capacity to work as a result of an illness, accident, disability or retired achievement.

OR is bore for workers a danger of health loss, working capacity, a salary, and also additional costs on treatment and rehabilitation. At the same time losing livelihood maintenance finally leads to change of financial and social status not only for worker who was injured in production, but also for members of his family.

Wide spread of OR is explained by a high level of industrial labour development when active using of equipment and technology, chemical and biological substances, different types of energy and getting radiation leads to the fact that practically all spheres of people activity (including non-productive too) are literally penetrated by risks. At the same time it is necessary to reveal OR factors, level of their impact on workers, to perform monitoring of health and safety in workplaces.

OR management of energy industry employees includes a set of mechanisms at management of the production environment, safety, occupational health and workers' health. OR can be studied from items of labour medicine, safe engineering and labor protection:

- OR from line items of occupational health and professional incidence (labour medicine) is considered as establishment of quantitative regularities of emergence of workers professional incidence and development of mechanisms of its prevention. Factors of working conditions as sources of workers' health damage are studied. Risk level is determined by comparison of diseases by certain professional groups working in specific conditions of work (an exposition of factors and a class of harm working conditions).

- OR from a line item of safe engineering and labor protection is considered in aspect of identification technical (techniques and equipments, engineering procedure and a type of production) and the organizational risk factors (job management, personnel professional training and carrying out scheduled maintenance at labor protection) influencing the level of an industrial traumatism.

The techniques existing in Uzbekistan are devoted to identification and reasons for communication between long impact of dangerous and harmful production factors (DHPP) of working conditions being factors of OR and to probability of workers' health and life dam-

nification are intended for identification of a number of correlation links, the most important of which are:

– cause and effect interrelations of OR factors and types of health losing and job capacity working in certain industries of economy, productions and employment a long time by the certain occupation causing risk of the production caused and occupational morbidity, an industrial traumatism as which consequences temporary and (or) fixed disability and a lethal outcome acts;

– a probability of manifestation of OR and degree (severity) of their consequences — in specific occupational groups and at an individual level is estimated when cases of approach losing of a temporary and/or fixed working capacity including resulting in disability are analyzed;

– an age of affected persons in production (because of DHPF or adverse psychophysiological factors of labor process), so-called an average age of disability because of an occupational accident or an average age of the dead in production;

– OR factors, probability of their manifestation and degree (severity) of their consequences, on the one hand, and types of provided compensation payments, and duration of benefits receipt or retiring income, on the other hand.

There are developments in the field of classification of labour conditions in a workplace with a description of consequences work-

ing in optimum, admissible or harmful working conditions in the Research institute of sanitation, hygiene and occupational diseases of the Ministry of Health of the Republic of Uzbekistan.

**Conclusions.** Thus, study results have been shown:

– a high prognostic importance of laboratory and functional researches in identification of before clinical signs of lungs diseases during a long work in the conditions of dust content of air coal dust;

– a prevalence of fungal diseases among miners depends on age, service years of underground work and working conditions, and also a great importance isolation of the production territories, general shower and changing rooms, wearing uniform and a closed footwear.

**Recommendations.** It is necessary for sorting out of a complex problems arising in case of an OR assessment of energy industry employees:

– to integrate characteristics of labour conditions factors by transition from regulation of separate parameters of factors to the complex indicators gathering parameters family which are mutually compensating or strengthening action of each other.

– to use algorithm of probability calculation of losing by worker of working capacity depending on a condition of labour conditions in a workplace and individual OR depending on labour conditions and worker health state.

#### References:

1. Клименко А. И., Кяро В. А., Ибрагимов Г. М., Красников С. Я. Решение вопросов энергоснабжения в угольной промышленности. Горный вестник Узбекистана. 2004 (1 (16)): 8–13.
2. Узбекистан планирует увеличить добычу угля в два раза. [Электронный ресурс]. <http://uzdaily.uz/articles-id-20435.htm> // . Дата посещения – 20.03.2015.
3. Измеров Н. Ф., Тарасова Л. А., Кузьмина Л. П. Проблема сердечно-сосудистой патологии в медицине труда. Гигиена труда и медицинская экология; 2004 (4): 77–85.
4. Хван Т. А., Хван П. А. Основы экологии. Серия «Учебники и учебные пособия». Ростов на-Д: Феникс; 2001: 256.
5. Международная организация труда МОТ-СВТО. ILO-OSH:2001. Руководство по системам управления охраной труда. – Женева; 2003: 19.
6. Калмыков А. А. Иммуновоспалительные аспекты патогенеза профессионального бронхита в сочетании с артериальной гипертензией. Автореф. дисс. канд. мед. наук. – Харьков; 2007: 36.

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## Comparative evaluation of the colon microbiocenosis in children with chronic colostasis on the background of surgical treatment

**Abstract:** The results of the state of intestinal microflora were investigated and studied in 71 children with chronic colostasis. Of them in 12 (16,9%) children the dysbacteriosis of intestine of the 1<sup>st</sup> degree was found, of the 2<sup>nd</sup> degree — in 29 (40,8%) children, of the 3<sup>d</sup> degree — in 30 (42,2%) children. The 3<sup>d</sup> degree of colostasis developed mostly often in the patients at the stage of decompensation (70,8%).

**Keywords:** chronic colostasis, microbiocenosis, dysbiosis, children.

**Background.** The multiple literature data indicate that colostasis is increasingly being recognized both among children and adults [3; 7; 9; 13]. In a number of works parallel with other diagnostic

clinical and laboratory methods of diagnosis of the patients with colostasis and for determination of the need in operative treatment there is shown microbiological diagnosis, that is, determination of

the intestinal dysbacteriosis [1; 4;10; 12]. To the most significant causes leading to disturbance of microbiocenosis there are attributed antibacterial therapy, hormone therapy, use of cytostatics, radiation therapy, the factor of nutrition; acute infectious diseases of the gastrointestinal tract; stresses; biorhythms disturbance, travelling, attenuation of the immune status and internal diseases, first of all of the organs of gastrointestinal tract, that is, theme of our research [2; 5; 6; 8; 11].

**The purpose of research.** To study on microbiocenosis of the colon intestine in children with chronic colostasis.

**Material and methods.** We investigated and studied on the results of the state of intestinal microflora in 71 children with chronic colostasis who were on the stationary treatment at the department of pediatric surgery of the Republican Research Center of the Emergency Medical care from 2010 to 2015. The patients were divided into three groups in relation to the degree of compensation of the chronic colostasis. At the compensated stage the deviations from N-parameters were related to the prevailed number of the lactose negative intestinal colon bacilli (in 4 out of 22–18,3%) and decrease in quantity of such symbiotic intestine microorganisms as enterococci (45,5%) as well as lactobacteria (45,5%) and bifidobacteria (27,3%). In all patients (100%) of this group there were normal titres of the colon bacilli; hemolytic forms of the escherichia were identified in 6 (27,3%) patients; coagulase negative staphylococci were found in 4 (18,3%) patients and Proteidae — in 9,8%. However analysis of the concentration of studied microorganisms showed that these changes were insignificant. Thus, titre of all lactose negative E.coli was  $10^6$ , that is, only one point higher than norm; titre of enterococci in 4 out of 5 patients was also reduced by one point — from  $10^5$  to  $10^6$ , lactic acid bacilli in 8 out of 10 patients from  $10^7$  to  $10^6$ , bifidobacteria have reduced titres from  $10^8$  to  $10^7$  in all 6 patients.

In the subcompensated stage the deviations from norm were found in the same indicators, but there was added reduction of E.coli (in 8 patients, 32%), appearance of Candida, higher level of identified hemolytic colon bacilli (32%) and significantly more marked decrease in lactic acid bacilli in 20 (80,0%) out of 25 patients. In the majority of cases the titres of the identified microorganisms changed compared with norm by 1–2 points, for example, the level of normal colon bacilli reduced in the majority of patients (7) to  $10^6$ , and only in one child — to  $10^5$ ; titres of lactose negative E.coli were higher than one point in 3 patients ( $10^6$ ) and than two points ( $10^7$ ) in 2 patients. The similar tendency was noted among the concentrations of enterococci, lactic acid bacilli and bifidobacteria.

In the decompensated stage of colostasis all above shown changes were more marked — this is related to quantity of patients with deviations from norm and titres of the microorganisms identified. Thus, reduction of the quantity of colon bacilli by 2–3 points ( $10^5$ – $10^4$ ) was observed in a half of patients of this group; titres of biochemical inactive E.coli in the majority of patients (4) increased by 3 point (to  $10^8$ ). More significantly reduction of the titres was revealed in bifidobacteria — from 13 patients with reduced quantity of these microorganisms in

10 children titres fell by 4 points ( $10^5$ ), and in lactic acid bacilli, respectively, in 20 out of 23 patients by three points ( $10^4$ ). Besides, in the patients with decompensated stage of colostasis there were identified P.aeruginosa (12,5%) and S.aureus (8,3%) — bacteria characterized by high potential ability to produce toxins.

#### Results and discussion.

There were expected more marked changes in the microecology of the intestine at the decompensated stage of colostasis (Table I).

Table 1. – Character of changes of intestinal microflora in chronic constipation before treatment (at admission) in 71 children

Quantitative changes of the microbial landscape in 71 patients	Quantity of patients in relation to stage of compensation of chronic colostasis				
	Compensated stage of 22 patients	Subcompensated stage in 25 patients	Decompensated stage in 24 patients	Totally 71 patients	Norm
Reduction of the total quantity of the colon bacillus $<10^7$		8 (32%)	10 (41,7%)	18 (25,4%)	$10^7$ – $10^8$
Increase in number of lactose negative colon bacilli $>10^5$	4 (18,2%)	5 (20%)	6 (25%)	15 (21,1%)	$<10^5$
Hemolytic colon bacilli	3 (13,6%)	7 (28,0%)	12 (50%)	22 (31,0%)	0
Other opportunistic enterobacteria	Pr.vulgaris 2 (9,1%)	Pr.mirabilis 3 (12%)		5 (7%)	$<10^4$
Increase in quantity of nonfermentative bacteria $>10^4$			P.aeruginosa 3 (12,5%)	3 (4,2%)	$\leq 10^3$ – $\leq 10^4$
Staphylococci (saprophytic, epidermal)	4 (18,2%)		2 (8,3%)	6 (8,5%)	$\leq 10^4$
Staphylococcus aureus			2 (8,3%)	2 (2,8%)	0
Reduction of enterococci quantity $<10^5$	5 (22,7%)	6 (24%)	8 (33,3%)	19 (26,8%)	$10^5$ – $10^8$
Reduction of quantity of lactobacilli $<10^7$	10 (45,5%)	20 (80%)	23 (95,8%)	53 (74,6%)	$10^7$ – $10^8$
Reduction of quantity of bifidobacteria $<10^9$	6 (27,3%)	6 (24%)	13 (54,2%)	25 (35,2)	$10^9$ – $10^{10}$
Increase in quantity of Candida fungi $>10^4$		6 (24%)	8 (33,3%)	14 (19,7%)	$\leq 10^3$ – $\leq 10^4$

**Conclusion:** In all 71 patients there were revealed features of dysbacteriosis.

On the basis of analysis of the data obtained all the patients with chronic colostasis independently on the stage of compensation were

considered as persons with dysbacteriosis. The complex therapy of dysbacteriosis (vitamins, diet, probiotics and others) contributed to the normalization of the every day stool and improvement of the general state in 96,3% of children.



It should be noted that dysbacteriosis of the 4 stage in the studied patients was not revealed because there was not defined full absence of bifidoflora with considerable decrease in lactoflora with simultaneous change of the quantity of the colon bacilli and increase of nonspecific for healthy human opportunistic bacteria. Dysbacteriosis of the first degree was diagnosed in the patients with insignificant changes in the aerobic-facultative flora (*E.coli* in the first turn) and absence of change of the lacto- and bifidoflora. The quantitative and qualitative changes of the colon bacilli and other opportunistic bacteria on the background of insignificant quantitative reduction (by one-two stages) of bifidoflora and lactoflora were attributed to the dysbacteriosis of the 2 degree. The 3 degree of dysbacteriosis is characterized by significant reduction (to  $10^5$ ) of bifidobacteria in combination with reduction of lactoflora and acute change of the level of normal colon bacilli. On the basis of this approach according to the recommendations in the patients with chronic colostasis of the various stage of compensation there was established diagnosis:

At compensated stage in 22 patients:

Dysbacteriosis of the 1<sup>st</sup> degree — 10 (45,5%)  
of the 2d degree — 12 (54,5%).

At the subcompensated stage in 25 patients:

Dysbacteriosis of the 1<sup>st</sup> degree — 2 (8,0%)  
of the 2 d degree — 10 (40,0%)  
of the 3d degree — 13 (52%).

At the decompensated stage in 24 patients:

Dysbacteriosis of the 2d degree — 7 (29,2%)  
of the 3 degree — 17 (70,8%).

In comparison with control indicators obtained in 71 patients at admission to the hospital with parameters after performance of conservative treatment in a number of cases there was observed their restoration. Thus, in the patients after treatment the normal colon bacillus was reduced only in 8 patients or in 18,6%, while before treatment they were 25,3%; inactive in relation to enzymes *E.coli* was found also less frequently — 13,9% compared with 21,2%; deviation among the enterococci also reduced from 26,8% before treatment and to 16,3% after treatment, respectively; lower parameters were obtained in relation to bifidobacteria (from 35,2% to 23,3%) and *Candida* fungus (from 19,6% to 11,6%). However the most important in the recovery of intestinal microflora there were changes in the lactic acid bacilli: if before treatment in the control in 74,7% of children the quantity of lactic acid bacilli was reduced, than after conservative treatment this indicator was 34,8% ( $p < 0,01$ ). About significant restoration of the intestinal microflora after treatment there were indicated statistically reliable reduction of the identification of hemolytic colon bacilli (13,9% compared to 36,6%,  $p < 0,01$ ) and absence of the opportunistic enterobacteria. At the same time after treatment the blue pus bacilli was revealed in 3 patients (7,0%), and pathogenic staphylococcus in 2 (4,6%) patients which were typical representatives of the hospital flora. Totally, evaluating quantitative and qualitative parameters of intestinal microbiosis in the patients treated by conservative approach it was found that in 23 (53,4%) patients microbiocenosis was not recovered completely.

Group of operated patients included 19 children, of them only 3 patients had subcompensated stage of chronic colostasis, and in 16 — decompensated stage.

Table 2. – The state of intestinal biocenosis in children with chronic constipation after operative method of treatment in 19 patients

Quantitative changes of microbial landscape in 19 patients	Quantity of patients in relation to stage of compensation of chronic colostasis			
	Subcompensated stage in 3 patients	Decompensated stage in 16 patients	Totally 19 patients	Norm
Decrease in the total quantity of colon bacilli $< 10^7$	1 (33,3%)	1 (6,25%)	2 (10,5%)	$10^7 - 10^8$
Increase in the quantity of lactose negative colon bacilli $> 10^5$		2 (12,5%)	2 (10,5%)	$< 10^5$
Hemolytic colon bacilli		2 (12,5%)	2 (10,5%)	0
Other opportunistic enterobacteria		<i>Kl.pneumoniae</i> 1 (12,5%)	1 (5,3%)	$< 10^4$
Increase in quantity of nonfermentative bacteria $> 10^4$		<i>Ps. Aeruginosa</i> 1 (12,5%)	1 (5,3%)	$\leq 10^3 - \leq 10^4$
Staphylococci (saprophytic, epidermal)				$\leq 10^4$
Staphylococcus aureus		2 (12,5%)	2 (10,5%)	0
Decrease in quantity of enterococci $< 10^5$	1 (33,3%)	1 (6,25%)	2 (10,5%)	$10^5 - 10^8$
Decrease in quantity of lactic acid bacilli $< 10^7$	1 (33,3%)	4 (25%)	5 (26,3%)	$10^7 - 10^8$
Decrease in quantity of bifidobacteria $< 10^9$	1 (33,3%)	4 (25%)	5 (26,3%)	$+ 10^9 - + 10^{10}$
Increase in quantity of <i>Candida</i> fungi $> 10^4$	1 (33,3%)	3 (18,8)	4 (21,1%)	$\leq 10^3 - \leq 10^4$

**Conclusion:** in 4 (21,2%) patients who underwent operative method of treatment disbiosis was not recovered.

In spite of small quantity of the operated patients difference in the parameters of intestinal microbiocenosis with control (group of patients at admission) was rather marked. Thus, deviations from norm in the colon bacilli were higher than in control 2,4 times (25,4% and 10,5%), lactose negative colon bacilli — 2 times (21,2% and 10,5%), enterococci 2,5 times (26,8% and 10,5%), bifidobacteria — 1,3 times (35,2% and 26,3%). Statistically reliable results were obtained in determination of hemolytic colon bacilli, this indicator reduced from 36,6% at admission to 10,5% after operation ( $p < 0,05$ ).

However, the most significant decrease was noted in relation to lactic acid bacilli — from 74,6% before operation and 26,3% after operation ( $\chi^2 - P < 0,01$ ) (Table 3).

According to the above presenting criteria about stages of dysbacteriosis, intestinal microbiocenosis in the patients with chronic colostasis after operative intervention was not recovered in 4 patients (21,0%). Comparison of this parameter with group of patients, receiving conservative treatment showed that restoration of the intestinal microbiocenosis in the patients after operative treatment appeared to be more effective than conservative treatment and statistically reliable ( $\chi^2 - 4,3$ ,  $p < 0,05$ ).

Table 3. – Comparison of the indicators of intestinal disbiosis in children with chronic colostasis at admission with group of children after operative treatment

Major parameters of disbiosis	Quantity of patients with deviation from N in 71 patients at admission (control)	Quantity of patients with deviation from N in 19 patients after operative treatment	$\chi^2$ P
Decrease in total quantity of colon bacilli $<10^7$	18 (25,3%)	2 (10,5%)	$\chi^2 - 1,4$ P >0,05
Increase in quantity of lactose negative colon bacilli $>10^5$	15 (21,2)	2 (10,5%)	$\chi^2 - 0,5$ P >0,05
Hemolytic colon bacilli	26 (36,6)	2 (10,5%)	$\chi^2 - 3,8$ P <0,05
Other opportunistic enterobacteria	(P. Vulgaris 2 P.mlrabilis –3) –5 (7,0)	K.pneumoniae –1	P >0,05
Increase in quantity of nonfermentative bacteria бактерий $>10^4$	0	Ps.aeruginosa – 1	P >0,05
Staphylococci (saprophytic, epidermal)	6 (8,4%)	–	P >0,05
Staphylococcus aureus	2 (2,8)	2 (10,5%)	$\chi^2 - 0,6$ P >0,05
Decrease in quantity of enterococci $<10^5$	19 (26,8%)	2 (10,5%)	$\chi^2 - 1,4$ P >0,05
Decrease in quantity of lactobacilli $<10^7$	53 (74,6%)	5 (26,3%)	$\chi^2 - 13,2$ P <0,01
Decrease in quantity of bifidobacteria $<10^9$	25 (35,2%)	5 (26,3%)	$\chi^2 - 0,2$ P >0,05
Increase in quantity of Candida fungi $>10^4$	14 (19,6)	4 (21)	P >0,05

The above presented data showed that statistically reliable reduction of the lactic acid bacilli have been determined practically in all groups of patients with chronic colostasis; less marked but constantly the microflora deficit has been found. It is known that almost in all the schemes of treatment of dysbacteriosis including also dysbacteriosis in chronic constipations the dufalac is prescribed. Because of lactulose in the intestinal flora the production of the short-chain fatty acids increased that improved trophic of the intestinal epithelium, and this, in its turn, increased in water and electrolytes absorption, normalized motor function. Thus, the wide use of dufalac in the complex therapy of the patients with chronic colostasis is advisable, because it is the strong activator of the colonizational resistance in the patients with disturbances of the normal microbiocenosis.

**Conclusions.** 1. In all studied patients (71 children, 100%) with chronic colostasis there was identified intestinal dysbacteriosis of 1<sup>st</sup> degree in 12 (16,9%) children, of 2<sup>d</sup> degree — in 29 (40,8%),

of 3<sup>d</sup> degree — in 30 (42,2%) children. The dysbacteriosis of 3<sup>d</sup> degree developed mostly often in the patients at the stage of decompensation (70,8%).

2. At the decompensated stage of chronic colostasis compared with compensated and subcompensated stages the deviations from norm were noted in the most important parameters of microbiocenosis, that is, reduction of the quantity of normal esherichia (P<0,05), Lactic acid bacilli (P<0,01), bifidobacteria (P<0,05).

3. According to the quantitative and qualitative parameters of intestinal microbiocenosis in the patients treated with conservative method in 23 (53,4%) patients microbiocenosis was not restored completely, in the operated patients this parameter was in 4 (21,1%) (p<0,05).

4. The operative way of the treatment of chronic colostasis resulted in restoration of the normal ecology of the intestine in 15 (78,9%) children.

#### References:

1. Ardatskaya M. D. Intestinal microbiocenosis and its role in the development and maintenance of the intestinal tract disease//Novosti medicine I farmacii. – 2010. – № 11–12. – P. 331–332.
2. Lenushkin A. I., Kirgizov I. V. About prophylactic role of lactulose in relation to new interpretation of the chronic colostasis in children//Voprosi prakticheskoy pediatrii. – 2007. – T.2, N 4. – P. 23–26.
3. Minushkin O. N., d. m. s. Ardatskaya M. D. Intestinal dysbacteriosis (dysbiosis): the modern presentation, diagnosis and therapeutic correction//Educational-methodical user's guide for physicians and postgraduate students of the circles of postgraduate education for doctors. – Moscow, 2008.
4. Parfenov A. I., Clinical problems of dysbacteriosis//Russian Gastroenterologicheskij jurnal. – 1999. – N 4. – P. 49–55.
5. Tkachenko E. I., prof. Suvorova A. N. Dysbiosis of the intestine. Handbook on diagnosis and treatment. – SPb.: Speplit, 2007, 238 p.
6. Khavkin A. I., Belmer S. B. Microbiology of the intestine: methods of nonspecific correction//Children's gastroenterology and nutrition. – 2003. – N 13. – P. 772–775.
7. Anderson D., Engemann J., Harrell L. et al. Predictors of Mortality in Patients with Bloodstream Infection Due to Ceftazidime-Resistant Klebsiella pneumoniae//J. Antimicrobial Agents and Chemotherapy. – 2006. – Vol. 50. – No. 5. – P. 1715–1720.
8. Bouhnik Y., Neut C., Raskine L., Michel C., Riottot M., Andrieux C., Guillemot F., Dyard F., Flourie B. Prospective, randomized, parallel-group trial to evaluate the effects of lactulose and polyethylene glycol-4000 on colonic flora in chronic idiopathic constipation//Aliment. Pharmacol. Ther. – 2004. – Vol. 19 (8). – P. 889–899.

9. Eili Klein, David L. Smith, and Ramanan Laxminarayan. Hospitalizations and Deaths Caused by Methicillin-Resistant *Staphylococcus aureus*, United States, 1999–2005//EID Journal Home. – 2007. – Vol.13, N 12.
10. Thomas C. M., Versalovic J. Probiotics-host communication modulation of signaling pathways in the intestine//Gut Microbes. – 2010. – Vol 1, N. 3. – P. 1–16.
11. Schneider-Lindner V. et al. Antibacterial drugs and the risk of community-associated methicillin-resistant *Staphylococcus aureus* in children//Arch Pediatr Adolesc Med. Published online August 1, 2011.
12. Wunderink R. G., Niederman M. S., Kollef M. H. et al. Linezolid in Methicillin Resistant *Staphylococcus aureus* Nosocomial Pneumonia: A Randomized, Controlled Study//Clin Infect Dis. – 2012. – Vol 54, N 5. – P. 621–629.
13. Yamada K., Yanagihara K., Hara Y. et al. Clinical features of bacteremia caused by methicillin-resistant *Staphylococcus aureus* in a tertiary hospital. Tohoku//J Exp Med. – 2011. – Vol.224, 1. – P. 61–67.

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## **The role of genes of the folate cycle in the development of antiphospholipid syndrome in the Uzbek population**

**Abstract:** When comparing of frequencies of genotypes of the studied polymorphic markers we have been established the genetic associations of the genes of folate cycle to the development of antiphospholipid syndrome. The results of this study demonstrate the relationship risk of antiphospholipid syndrome in the Uzbek population with carriage of A alleles of rs1805087 polymorphism, and rs1805087 polymorphism of AA genotypes and AA genotype of the rs1801131 polymorphic marker.

**Keywords:** Antiphospholipid syndrome (APS), the genes of folate cycle, allele frequency, polymorphism of genes, genetic association.

Antiphospholipid syndrome (APS) — clinical and laboratory syndrome characterized by venous and arterial thrombosis, pathology of pregnancy and some other less common clinical manifestations and laboratory disorders, pathogenesis associated with the synthesis of antiphospholipid antibodies (aPL) [1; 2].

APS — a complex and insufficiently developed problem. This is explained by the heterogeneity of pathogenetic mechanisms that underlie the APS, the lack of reliable clinical and laboratorial indicators to predict the risk of recurrence of thrombosis. Currently, there are no generally accepted international standards of the treatment tactics of patients with various forms of APS and the proposed recommendations are based primarily on the results of the “open” tests or retrospective analysis of outcomes of the disease [3–11]. The approaches to prevention and treatment of atherosclerotic vascular lesions, often develops in patients with APS are not enough studied [12; 3].

In the population, according to the American authors, APS occurs in 5% of cases [15]. In our country, such studies have not been undertaken. Antiphospholipid syndrome is observed in women 2–5 times more often than in men, and, if the initial ratio of the number of patients with APS women and men is 4: 1, then the sec-

ondary form of the disease, this figure rises to 7: 1, which is probably due to greater susceptibility of women to systemic connective tissue diseases [14]. The investigations of HLA antigens (human leucocytes antigen) showed that in patients with APS often than in the population found HLA: DR4, DR7, DRw53, suggesting a possible genetic predisposition to the disease [13]. The literature describes familial cases of APS, constituting, according to some authors, up to 2% [14]. It is possible that there are two forms of the disease: sporadic and familial.

The genes of the folate cycle involved in processes of remethylation may also be considered as potential candidates genes in the development of the APS syndrome.

The Violation of the processes of remethylation (formation of methionine from homocysteine), which occurs because of the MTHFR enzyme MTRR deficiency and leads to the development of a number of pathological conditions, such as atherosclerosis; atherothrombosis; cleft neural tube defect; heart attacks and disruption of chromosome segregation in oogenesis. Methylation of DNA is a methyl group to join in the composition cytosine CpG-dinucleotide in C5 position of the cytosine ring.

The MTHFR gene encodes N5, N10-methylenetetrahydrofolate reductase — a key enzyme in the folate cycle, catalyzing the recovery of N5, N10-methylenetetrahydrofolate to N5-methyltetrahydrofolate, which is a donor of the methyl group in the reverse conversion reaction (remethylation) of homocysteine to methionine.

The polymorphism of A1298C (rs1801131) methylenetetrahydrofolate reductase (MTHFR), located in the MTHFR gene coding region corresponds to the substitution of glutamic acid residue (Glu) to residue of alanine (Ala) at position 429 the amino acid sequence of the protein.

As a result of such changes in the primary structure of protein conformational rearrangement occurs which results in lowering its enzymatic activity by 65%. Consequently, the carrier genotypes 1298AS and 1298SS carry a high risk of hyperhomocysteinemia and as a consequence, to an increased risk of thrombus formation. Along with this, the MTHFR deficiency contributes to teratogenic (damaging the fruit) and mutagenic (DNA damaging) action due to violations of methylation processes. The frequency of polymorphisms in European populations is 25–30%.

The MTR gene encodes a cytoplasmic cobalamin (vitamin B12) – dependent enzyme methionine synthase, catalyzes the reaction remethylation homocysteine. In this reaction, the methyl group donor advocates N5-methyltetrahydrofolate. The transfer of the methyl group to homocysteine is carried out in two stages. First, the methyl group is accepted cobalamin (methyl group substituted by a cyano group) to give methyl cobalamin-methionine synthase and, only then, a methyl group is transferred to homocysteine. This enzymatic reaction is one of the most important parts of the folate metabolism. On the one hand it provides the methionine concentration required to implement the many vital reactions of methylation of nucleic acids, proteins, lipids and others. On the other hand, due to this reaction, the concentration of homocysteine in plasma is maintained in a physiologically acceptable range (up to 15ng/ml).

The polymorphism of A2756G (rs1805087) Methionine synthase (MTR) in the coding region of the gene corresponds MTR replacing an aspartic acid residue (Asp) residue for glycine (Gly) at position 919 the amino acid sequence of the enzyme. This substitution leads to changes in the structure of the enzyme, entailing a reduction of its catalytic activity. Thus, the carrier of the mutant genotype GG and AG associated with deficiency of enzymatic activity of methionine synthase, leading to hypercysteinemia, and eventually to an increased tendency to thrombosis. Carriage of the G

Table 1. – Hardy-Weinberg equilibrium test for cases and controls in the APS Group “+” (28 people) And APS “-” (34 people)

CHROM	SNP	GROUP	A1	A2	$\chi^2$	p
1	rs1801131	case	C	A	0.27	0.6
1	rs1801131	control	C	A	2.86	0.09
1	rs1805087	case	G	A	0.01	0.92
1	rs1805087	control	G	A	1.87	0.17

The analysis of the frequency distribution of alleles at rs1801131 and rs1805087 polymorphisms of genes of the folate cycle in a group with APS and in the control sample revealed between statistically significant differences (table 2) Since the value of the relative risk of the A allele of rs1805087 polymorphism was 3.86 ( $P = 0.0008$ ), in while the G allele of this polymorphism can be seen as a protective in the development of this disease ( $\chi^2 = 11.19$ ; OR = 0.26;  $P = 0.0008$ ). The Analysis of allelic frequencies rs1801131 polymorphism of MTHFR gene, reliably significant differences were not found.

When comparing the frequencies of the genotypes studied polymorphic markers there has been found the genetic association

allele, due to methionine deficiency also contributes to teratogenic (damaging the fruit) and mutagenic (DNA damaging) action. The frequency of polymorphisms in European populations: 20–25%.

The frequency of polymorphisms related to the metabolism of the folate and homocysteine levels, varies considerably among different ethnic groups, which can currently be validated population screening using genotyping. So far, it has not been analyzed, which would estimate the frequency of polymorphisms of genes involved in the metabolism of folate and homocysteine in the Uzbek population. The present study is an attempt to estimate the frequency of polymorphic genes MTHFR and MTR in the Uzbek population and to find out the existence of a legitimate relation between the development of antiphospholipid syndrome and impaired DNA methylation due to deficiency of the enzymes of folate cycle.

**Material and methods.** The study included 62 subjects of the Uzbek population both genders aged 20 to 65 years. The test persons conditionally divided into 2 groups: a group with APS (28 people) and a group of healthy subjects (34 people), matched by age and gender.

The DNA extraction from peripheral blood leukocytes was performed by the standard method. Genotyping was performed by amplifying the relevant regions of the genome methods qPCR (RG-6000, Australia) and pyrosequencing PyroMark Q24 (Qiagen, Germany).

The statistical results of the study were carried out with the help of a package program «SPSS 13», «PLINK» and «Haploview 4.2».

**Results and discussion.** The distribution of the genotypes studied polymorphisms were tested for compliance with the expected Hardy-Weinberg equilibrium using Fisher's exact tests (Weir, 1995). For comparison, the allele and genotype frequencies between the groups analyzed using Pearson criterion  $\chi^2$  with Leys adjusting or Fisher's exact test. To assess the association of polymorphisms of genes with the pathological phenotype calculates “odds ratio» — OR. To determine the nature of the data distribution we used the Shapiro-Wilk test statistics. For the analysis of quantitative traits when comparing two independent samples with normal distribution we used the analysis of variance, with deviation from the normal distribution — Mann-Whitney (Glanz, 1999). For each polymorphism and haplotypes were calculated OR, the P magnitude, and the 95% confidence interval. Differences were considered statistically significant at  $P < 0.05$ .

Among 2 studied polymorphisms the deviation from Hardy-Weinberg equilibrium among both cases and controls was not found (Table 1).

of folate cycle genes to the development of antiphospholipid syndrome. Analysis of genotypic associations showed that the greatest risk of antiphospholipid syndrome is caused by homozygous AA genotype of rs1805087 polymorphism ( $\chi^2 = 9.29$ ; OR = 3.76;  $P = 0.01$ ). Other relevant genotypes in the development of this pathology were: AA genotype of the rs1801131 polymorphic marker ( $\chi^2 = 6.29$ ; OR = 3.71;  $P = 0.04$ ). Heterozygous combination of alleles AC (OR = 0.29), as well as the genotype CC (OR = 0.79), AG (OR = 0.77) and GG (OR = 0.09) of these polymorphisms showed no significant association with the development of antiphospholipid syndrome ( $P < 0.05$ ) (Table 3).

Table 2. – Distribution of allele frequencies of rs1801131 and rs1805087 polymorphisms in APS Group “+” (28 people) and APS “-” (34 people)

	Alleles	Cases	Controls	$\chi^2$	p	OR	95% CI
		n = 28	n = 34				
rs1801131	Allele A	0.768	0.603	3.82	0.05	2.18	0.99–4.79
	Allele C	0.232	0.397				
rs1805087	Allele A	0.804	0.515	11.19	0.0008	3.86	1.71–8.70
	Allele G	0.196	0.485				

Table 3. – Distribution of genotypes frequencies of rs1801131 and rs1805087 polymorphisms in APS Group “+” (28 people) and APS “-” (34 people)

SNP	Genotypes	Cases	controls	$\chi^2$	p	OR	95% CI
		n = 28	n = 34				
rs1801131	Genotype A/A	0.607	0.294	6.29	0.04	3.71	1.29–10.68
	Genotype A/C	0.321	0.618				
	Genotype C/C	0.071	0.088				
rs1805087	Genotype A/A	0.643	0.324	9.29	0.01	3.76	1.31–10.81
	Genotype A/G	0.321	0.382				
	Genotype G/G	0.036	0.294				

Thus, the results of this study demonstrate the relationship risk of antiphospholipid syndrome in the Uzbek population with carriage of A alleles of rs1805087 polymorphism ( $\chi^2 = 11.19$ ; OR = 3.86; P = 0.0008), as well as the AA genotypes of rs1805087 polymorphism ( $\chi^2 = 9.29$ ; OR = 3.76; P = 0.01) and the AA genotype of the rs1801131 polymorphic marker ( $\chi^2 = 6.29$ ; OR = 3.71; P = 0.04).

#### Conclusions:

1. The greatest risk of antiphospholipid syndrome in the Uzbek population is due to homozygous AA genotype of

rs1805087 polymorphism ( $\chi^2 = 9.29$ ; OR = 3.76; P = 0.01). Other relevant genotypes in the development of this pathology were: AA genotype of the rs1801131 polymorphic marker ( $\chi^2 = 6.29$ ; OR = 3.71; P = 0.04)

2. The combination of heterozygous alleles AC (OR = 0.29), as well as the CC genotypes (OR = 0.79), AG (OR = 0.77) and GG (OR = 0.09) of these polymorphisms showed no significant polymorphisms association with the development of antiphospholipid syndrome (P < 0.05).

#### References:

- Levine J., Branch D. W., Rauch J. The antiphospholipid syndrome. *N. Engl. J. Med* 2002; 346: 752–763.
- Alekberova Z. S., Nasonov E. L., Reshetnyak T. M., Radenska-Lopovok S. G. Antiphospholipid syndrome: 15 years studying in Russia In: Selected lectures of clinical rheumatology. – Moscow, Medical. Edited by Nasonov V. A., Bunchuk N. V. 2001 132–148. (in Russian language).
- Cuadrado M. J. Treatment and monitoring of patients with antiphospholipid antibodies and thrombotic history (Hughes syndrome). *Curr. Rheumatol. Rep* 2002; 4: 392.
- Roubey R. A. S. Treatment of the antiphospholipid syndrome. *Curr. Opin. Rheumatol* 2002; 14: 238–242.
- Ruiz-Irastorza G, Khamashta M. A., Hughes G. R. V. Antiagregant and anticoagulant therapy in systemic lupus erythematosus and Hughes syndrome. *Lupus* 2001; 10: 241–245.
- Derksen R. H. M., De Groot Ph. G., Nieuwenhuis H. K. M., Christiaens G. C. M. L. How to treat women with antiphospholipid antibodies in pregnancy. *Ann. Rheum. Dis*, 2001; 60: 1–3.
- Lockwood C. J., Schur P. H. Monitoring and treatment of pregnant women with the antiphospholipid antibody syndrome. *Up. To. Date* 2002; 10, No, 2.
- Berman B. L., Schur P. H., Kaplan A. A. Prognosis and therapy of the antiphospholipid antibody syndrome. *Up. To. Date* 2004; 11. 3.
- Roubey R. A. S. New approaches to prevention of thrombosis in the antiphospholipid syndrome: hopes, trials, and tribulations. *Arthritis Rheum.* 2003; 48: 3004–3008.
- Nasonov E. L. Current approaches to prevention and treatment of antiphospholipid syndrome. *Therapist archive.* 2003; 5: 83–88. (in Russian language).
- Petri M. Evidence-based management of thrombosis in the antiphospholipid antibody syndrome. *Curr. Rheumatol. Report.* 2003; 5: 370–373.
- Salmon J. E., Roman M. J. Accelerated atherosclerosis in systemic lupus erythematosus: implication for patients management. *Curr. Opin. Rheumatol.* 2001; 13: 341–344.
- Sugai S. // *Curr. Opin. Rheumatol.* 1992. Vol. 4. N. 5. P. 666–671.
- Thomas P., Greco M. D. // *Oncology.* 1997. Vol. 2. N. 1. P. 1–11.
- Triplet D. A. // *Amer. J. Reprod. Immunol.* 1992. Vol. 28. N. 3–4. P. 211–215.

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## Medical-biological evaluation of the safety of soy protein isolate

**Abstract:** It was found that soy isolate is non-toxic, does not cause local irritant effect on skin and conjunctiva, has no cumulation and sensitizing properties, can be attributed to non-toxic and low-hazard food additives.

**Keywords:** toxicology, food safety, soy isolate.

Soya is the most valuable universal culture. Its seeds contain 17–26% fat, 36–48% well-balanced amino acid composition of protein and more than 20% carbohydrates. Semi-drying soybean oil (iodine number 107–137) has a high content of physiologically active essential fatty acids (linoleic, oleic, linoleic, and others.). The quality of soy protein significantly exceeds many other plants, including cereals and oilseed. Soy protein is well absorbed by the body and its biological value approaches to proteins of animal origin, equivalent in composition to the animal protein. Isolates and soy protein concentrates are complete, high-quality proteins, which are well absorbed when compared to proteins of animal origin (i. e. casein). In fact, soy protein may serve as the only source of protein for adults and for children. While the protein compounds from 20 to 30% of the weight of most legumes, it is about from 35 to 38% of soybean weight. The amount of protein varies for different soy products: soy flour contains 50% of protein, soy concentrate contains 70% protein, and soy isolates contain 90% of protein. To date, in many countries around the world have developed the industrial soy production, producing textured protein, and other soy products (butter, milk, pasta, margarine, ice cream, chocolate, etc.). [1]. Simultaneously from soybeans have been isolated and studied in detail phytosterols, isoflavones, genistein, protease inhibitor, lecithin, allergens [2; 3].

Soy protein isolate (made in China) is used as a dietary supplement in sausage products. This food additive is permitted to be used as a natural moisture-retaining agent according to Directive 29 CFR 19112000FAO/WHO Joint Committee on Food Additives (JECFA).

The above was the basis for toxicological studies of soy protein isolate: to study the common toxicity of soy protein isolate with evaluation of the possible irritating to mucous membranes, as well as its potential cumulative effects and allergenic activity.

This contributed to research the toxicology studies of soy protein isolate.

**Aim:** toxicological assessment of wheat sprouts powder after intragastric introduction of alleged toxic dose to laboratory animals with further experimental follow-up to reveal the clinical signs of intoxication. This monitoring will provide information for the assessment and classification of risk.

### Materials and methods

Experimental studies of possible toxic properties consisted of the following stages: to study general toxicity of soy protein isolate with assessment of the possible irritant action on mucous membranes, as well as its possible cumulative effects; to study possible allergenic activity [4–11].

To carry out the experiment from the samples of soy protein isolate they prepared aqueous solutions (50%) in the amounts of 0.3–5 ml per animal.

Animals received the same dose in mg/kg body weight of investigated object within the hours of observation (16–20 hours). Animal feeding was performed in 3 hours after dose introducing. The diet is balanced in content of proteins, fats and carbohydrates, a special diet for the test animals.

Determination of acute toxicity of investigated soy protein isolate under experiment was carried out on white mongrel rats with a single intragastric intake of each form of preparation in doses of 1500 to 9000 mg/kg. Introduction of soy protein isolate at higher doses was technically impossible due to poor solubility and physiologically limited quantity of introduction of preparation in rats' stomach.

The maximum dose of preparation under study on tested animals exceeded the recommended process dose  $\approx$  in 13 times; control animals received the equivalent quantity of distilled water.

To study the effect on conjunctiva there performed the single 0.05 ml inoculation of aqueous suspension of soy protein isolate into the conjunctival sac of the rabbit eye.

The allergenic effect of investigated soybean protein isolate was assessed by single intradermal injection 0.02 ml of solutions of each pharmacological form, diluted in saline 50% concentration solution with a tuberculin syringe into the outer surface of ear of guinea pigs (6 guinea pigs in experimental group and 6 — in control). For comparative purposes control animals were introduced 0.02 ml saline. Identification of sensitization was made on 12–14 days after the injection of soy protein isolate solution: the drop test of each type of preparation under study was applied on the lateral body surface in the dosage that exceeded sensitizing in 1.5–2 times ( $\approx$  4.9 mg), 1–1.5 cm long incision through drop was made by scarification. Skin response on the spot of scarification was observed after 4–24–48 hours by the following scale:

Table 1.

Type of response	Notation of response	Description of response
negative	–	incision sizes are the same as in control group of animals
ambiguous	±	redness on the spot of scarification
weakly positive	+	redness, small induration on the spot
moderate positive	++	blister up to 5 mm, clearly visible and is surrounded by hyperemia
strongly positive	+++	redness, blister up to 10 mm, lichenification

The animals of the control group were divided into 2 subgroups and there performed scratch test: the first subgroup — with saline, the second — with soy protein isolate in anaphylaxis-provoking dose.

Cumulative capacity of investigated soy protein isolate was determined in sub acute experiment by «sub chronic toxicity» on white rats weighing 150–180 g.

The solution to investigated soy protein isolate was introduced intragastrically within 28 days. Initial dose compounded 1/10 of the recommended process water with further increase every 5 days in 1.5 times that exceeding the process water more than in 7 times. Control animals received distilled water in equal volume. Experimental animals were monitoring throughout the experiment on the following parameters: survival during the experiment, general state, activity of animals, feed intake, water consumption, body eight dynamics, morphological blood composition, and biochemical blood value.

All surviving animals were killed at the end of the study by decapitation and liquidation after pathomorphological investigations. No organ or tissue was used for other purposes.

Statistical analysis was performed by Student and Fisher to define the criteria for reliability of laboratory research and methodological recommendations «Using the principles of evidence-based medicine in organizing and conducting health studies» based on Word 2003 [12–14].

Body weight, clinical signs of toxicity, death/paralysis were monitoring throughout the experiment.

### Results

No death of the test animals was observed over the experimental period. No clinical signs of toxicity were during the time of the experiment.

Body weight of the experiment animals was not significantly different from the control animals' weight. During experimental time the death of test animals was not observed. However, after

the introduction of high doses the animals showed the anxiety, became disheveled, there was observed cyanosis of ears and tail, short motor excitation which slowly passed into the decline in physical activity in 30–40 minutes. After [2] hours the symptoms of acute poisoning disappeared completely. The animals were at rest. After [3] hours, the test rats actively ate food, had a neat appearance. The following days of observation the rats added in weight, kept the normal reaction to external stimuli. No death of animals during the entire period of observation noted.

Thus, the median lethal dose of investigated soy protein isolate for the test animals was not achieved.

When studied the effect on conjunctiva under the influence of the dietary supplement the low-grade redness of eyes was noted, after 15–30 minutes it disappeared, that was explained with mechanical irritation of mucous membranes. After washing with water the irritation had passed.

Consequently, research findings showed that soy protein isolate under investigation in concentration close to the process water use does not influence irritant action on mucous membranes.

Study of allergenic action presented the following: testing that was conducted after scratch test in preparations under study showed that in the animals of experimental group which received the soy protein isolate the response was clearly negative (by scale: “–”). Consequently, the analyzed soy protein isolate in technological doses had not allergenic action.

Study results of cumulative capacity of investigated soy protein isolate showed that the introduction of tested doses of preparation did not affect the basic integral indicators: rats had a neat appearance, quite properly responded to external stimuli, daily consumption of dry food and water in all groups of animals corresponded to normal.

Dynamics of animal body weight who received soy protein isolate during the whole experiment had no differences with the control (Table 2).

Table 2. – Dynamics of rats' body weight (% of initial) which received soy protein isolate within 28 days of observation

Observation periods, days	Animal Group	
	Control, water	isolate
14	127.5 ± 3.1	128.6 ± 1.6
28	140.8 ± 5.1	136.8 ± 3.3

No signs of toxicity and deaths were observed during subacute trial.

The study of hematological parameters of peripheral blood of the test animals no significant changes in any of the studied param-

eters revealed. The total number of erythrocytes, platelets, hemoglobin content in all the test animals was not significantly different from the control (Tab. 3).

Table 3. – Parameters of peripheral blood of rats which received with preparation under study “SEDAREM” within 28 days

Animal groups	№ of animal	Studied parameters			
		Erythrocytes, 10 <sup>12</sup> /l	Hemoglobin, g/l	Platelets, 10 <sup>9</sup> /l	Leukocytes, 10 <sup>9</sup> /l
<b>The 4th week</b>					
Control, water	1	6.4	150	426	10.5
	2	7.8	172	476	9.5
	3	6.7	149	399	15.5
	4	7.8	170	450	15.3
	5	7.1	159	421	9.8
	M ± m	7.15 ± 0.23	159 ± 3.8	439.5 ± 12.8	11.78 ± 1
Group I Soy isolate	1	7.4	162	390	13.1
	2	7.7	168	386	12.4
	3	8.5	188	463	11.9
	4	9.1	195	399	8.0
	5	7.6	164	389	9.3
	M ± m	7.75 ± 0.48	175.5 ± 5.5	397 ± 18	11.1 ± 0.6

The studied integral biochemistry blood parameters of experimental animals throughout the whole experiment were within the physiological oscillations.

When investigating the effect of soy protein isolate on the functional state of the central nervous system of rats in the «open» field conditions it was established that in the tested doses it did not reduce locomotors activity of rats in «the number of squares crossed» test and orientation response in the test of «mink reflex» compared to the control.

Macroscopic investigations of internal organs of rats received soy protein isolate within 28 days were without features: all organs were correctly positioned, the cavities without effusions and adhesions. Serous membranes were smooth, nitidous. Airway was available: the lungs were elastic, airy, on the incision spot of normal color. Heart, kidneys, liver, spleen, thymus,

gastrointestinal organs, adrenals, testes were of normal shape, texture, color and sizes.

Thus, the conducted research of soy protein isolate showed that it did not affect the basic integral indicators.

#### Conclusions

1. Soy protein isolate is non-toxic, does not cause locally-irritating expose on to the skin and irritated effect on conjunctiva, it has no cumulating and sensitizing properties.

2. Macroscopic studies conducted at the end of the experiment found that soy protein isolate with prolonged introducing in doses more than in 7 times higher than the recommended single process does not cause local irritant and systemic toxicity.

3. The test soy protein isolate can be attributed to non-toxic, (relatively harmless by S.D. Zaugolnikov) and low-hazard (IV class of danger according to State Standard Certifications 12.1.007) food additives.

#### References:

- Burton J. W., Wilson R. F., Brim C. A. Registration of N 70–2070 – 12 and N 87–2122 – 4. Two soybean greplasm lines with reduced plasmatic acid in seed oil//Crop Sci. – 1994: V34: P 26–29.
- Dalia's F. S., Rice G. E., Wahlqvist M. L. et al. Effects of datary phytoestrogens in postmenopausal women//Climacteric. – 1998: V. 1: N: P 124–129.
- Habito R. C., Montalto J., Leslie E. et al. Effects of replacing meat with soy-bean in the diet on sex hormone concentration in healthy adult males//Br. J. Nutr. – 2000: V 84: N 4: P. 557–563.
- General Toxicology/Under. Ed. A. O. Loit. SPb.: ELBI-SPb., – 2006: P. 32–68, 107–108.
- Methodic recommendations for the study of skin-resorptive activity of chemical compounds in the regulation of sanitary water. – Moscow, 1981: P. 7–13.
- Guideline on experimental (preclinical) study of new pharmacological substances. – Moscow, 2000: P. 165.
- Standards for research on chemistry № 23 “Thorough toxicological evaluation — the classic method” of March 22, 1996.
- Kagan Yu. S., Stankevich V. V., Cumulation coeffishiency as a quantitative criterion//Actual questions of occupational health, industrial toxicology and prof. pathology in the oil and petrochemical industry. Ufa, 1964: P. 48–49.
- Sanotsky I. V. Methods for determining the toxicity and hazards of chemical substances. – Moscow. 1970: P. 161–163, 175–177.
- Tillaeva G. U., Aripov A. N., Averyanova A. A. Guidelines for quality control of laboratory tests. Tashkent. 2000: V1.
- Guideline “Assessing the impact of hazardous chemicals on the skin.” Tashkent, 2001.
- Guideline 2.3.1. 1915–04 “Recommended levels of consumption of food and biologically active substances.” – Moscow, 2004.
- “Manual on experimental (preclinical) study of new pharmacological substances” under the general editorship. Kurlyandskiy B. A., – Moscow, 2005.
- Reference and methodical management # 9/m228 “Hygienic aspects of the use of food additives”, – Tashkent, 2011.

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## Metabolic disorders in patients with adrenal incidentalomas

**Abstract:** In our study metabolic disorders was the basic component in manifestations of adrenal incidentalomas to be contributed by dislipidemia, high BMI, age, high levels of hormones and glucose, and to be confirmed by significant changes in the parameters as compared with those in the control group and those in group of patients without metabolic disorders. In addition, significant correlation was established between frequency of metabolic disorders and subclinical hormonal activity, high levels of cortisol and aldosterone, in particular.

**Keywords:** hormones, adrenal incidentalomas, metabolic disorders.



Adrenal incidentalomas are basically the tumors producing no hormones, but thorough biochemical and morphological evaluations in some patients are reported to detect subclinically excessive production of adrenal hormones [1, 53–57; 2, 23–26; 3, 284–289; 4, 40–48; 5, 1309–1311]. According to literature, pheochromocytomas occur in 1.5–11% of patients; primary aldosteromas can be seen in 1.5–3.5%, and subclinical autonomous glucocorticoid secretion, that is, subclinical Cushing's syndrome is diagnosed in 1–29%. Furthermore, in patients with adrenal incidentaloma the prevalence of cardiovascular risk factors, which are known to be components of the metabolic syndrome, to name arterial hypertension (AH), impaired glucose tolerance (IGT), adverse lipid profiles and obesity, is higher than the one in general population [6, 61–66; 7, 327–339; 8, 1440–1448; 9, 4872–4878; 10, 89–97; 11, 217–223; 12, 423–439]. Some authors consider adenomas as causes of the metabolic syndrome [13, 998–1003], but the tumors could be its direct consequence. Reincke M. hypothesized that adrenal incidentalomas could be the unrecognized manifestations of the metabolic syndrome [14, 757–761]. The work was initiated to study metabolic and hormonal statuses in patients with adrenal incidentalomas.

### Materials and methods

Clinical, hormonal and biochemical parameters were comparatively examined in ninety eight patients with adrenal incidentalomas referred to the Center for the Scientific and Clinical Study of Endocrinology, Uzbekistan Public Health Ministry. Twenty two patients with arterial hypertension but without any adrenal pathology were included into the control group. All patients underwent computer tomography of the adrenals. Concentrations of cortisol and aldosterone, as well as 24-hour urinary catecholamines, such as adrenaline, noradrenalin and dopamine were measured in each patient and in the controls. Biochemical investigation included measurement of total cholesterol, high density lipoproteins (HDL), low density lipoproteins (LDL), triglycerides, and blood electrolytes, such as, potassium, sodium and chlorine. Glycemic parameters, including fasting and 2-hour postprandial glycemia were measured in all examinees by means of oral glucose tolerance test (OGTT). Body mass index and plasma renin activity were assessed in every examinee. All the parameters above were analyzed separately by a size of a neoplasm, by deviations in serum cortisol and aldosterone, and urine catecholamines, and by presence of metabolic disorders.

### Results and discussion

By a size of an adrenal neoplasm all patients were divided into three groups. Of 98 patients, 57 patients (58.2%) included into the first group had adrenal neoplasms with a size < 1 cm. In 17 patients (17.4%) of the second group sizes of adrenal neoplasms varied from 1 to 3 cm. In twenty four patients (24.5%) of the third group adrenal neoplasms exceeded 3 cm in size.

Mean age of 57 patients with adrenal neoplasms less than 1 cm in size was  $33.7 \pm 2.2$  years. Mean duration of arterial hypertension was  $3.83 \pm 1.01$  years. In this group of patients ( $n=57$ ) subclinically elevated levels of cortisol were found in 7 patients (12.3%), hyperaldosteronism could be seen in 4 (7%); in 3 patients (5.3%) concentrations of 24-hour urinary catecholamines were found increased. Mean age of patients in the second group was  $39.8 \pm 2.9$  years, mean duration of arterial hypertension was  $6.26 \pm 2.2$  years. There were 5 cases (29.4%) of subclinical Cushing's syndrome, 3 cases (17.6%) of hyperaldosteronism ( $P < 0.05$  versus the size of neoplasms under 1 cm); urinary catecholamines were found elevated in 15 patients (88.2%). As compared with the patients in the first and second groups, significantly higher concentrations of hormones were found in patients with the largest adrenal neoplasms. Thus, subclinical Cushing's syndrome and

hyperaldosteronism were found in 9 (37.5%) and 4 (16.7%) patients, respectively ( $P < 0.05$  versus the size of neoplasms under 1 cm); insignificantly higher concentrations of catecholamines were registered in 18 (75%). In this group of patients mean age was  $39.5 \pm 2.85$ , mean duration of arterial hypertension was  $4.21 \pm 1.3$  years.

As it can be seen, frequency of subclinically elevated concentrations of adrenal hormones, cortisol and aldosterone, in particular, is directly proportional to increase in the size of adrenal incidentaloma. As to catecholamines, their elevated levels were not confirmed as statistically significant; adequate clinical presentation was absent.

Regardless of a neoplasm's size, initial examination helped detecting hypercortisolism and hyperaldosteronism in 21 (21.4%) and 11 (11.2%) patients, respectively; significantly higher concentrations of catecholamines were found in 79 (80.6%) patients to confirm lower sensitivity of catecholamines in diagnosis of adrenal neoplasms.

Next, we compared character and frequency of metabolic disorders between patients with adrenal incidentalomas of various sizes and the subjects in the control group. In the first group arterial hypertension was registered in 42 of 57 patients (73.7%); its mean duration was the least one as compared with the values in other groups of patients and in the controls ( $3.83 \pm 1$  years) ( $P < 0.05$ ). Adverse body mass index (BMI) was found in 32 patients (56.2%). In this group metabolic disorders were registered in 38 patients (66.6%); dislipidemia was found in 38.5% ( $n=22$ ). As to carbohydrate metabolism disorders, the impaired fasting glucose (IFG), the impaired glucose tolerance (IGT) and diabetes mellitus were registered in 3 (5.3%), 7 (12.2%) and 3 (5.3%) patients, respectively.

Of 17 patients in the second group metabolic disorders were registered in 12 (70.1%) and included dislipidemia ( $n=7$ , 41.2%) and higher BMI ( $n=13$ , 76.5%). Carbohydrate metabolism disorders were found in 8 patients (47.1%) and included one case of the impaired fasting glucose (5.9%), 4 cases of the impaired glucose tolerance (23.5%) and 3 cases of diabetes mellitus (17.7%). In this group arterial hypertension was registered in 76.5% of patients ( $n=13$ ) with the highest mean duration as compared with the values in other groups of patients and in the controls ( $6.26 \pm 2.2$  years).

Of twenty four patients with the largest adrenal incidentalomas (size < 3 cm) various metabolic disorders were found in 18 (75%), and this frequency is the highest one as compared with the values in other groups (66.6% and 70.1% of patients in the first and second groups, respectively). In this group adverse BMI was registered in 13 patients (54.2%), dislipidemia was found in 11 (45.8%). Carbohydrate metabolism disorders were found in 8 patients (33.3%) and included 3 cases of the impaired fasting glucose (12.5%), one case of impaired glucose tolerance (4.1%) and 4 cases of diabetes mellitus (16.6%). Arterial hypertension was found in 20 patients (83.3%).

Thus, the larger the sizes of adrenal neoplasms were the higher was frequency of metabolic disorders. As compared with the controls, in patients with adrenal neoplasms significant changes could be seen in concentrations of glucose, HDL and triglycerides as well as in BMI and arterial pressure; parameters of both lipid and carbohydrate metabolism tended to increase quite clearly.

To assess the role of subclinical hormonal activity in progression of metabolic disorders we studied incidence of the metabolic syndrome components in patients with subclinical Cushing's syndrome, hyperaldosteronism and those with pheochromocytoma.

In our study subclinical Cushing's syndrome was registered in 21 of 98 patients (21.4%), 77 (78.6%) patients had concentrations of cortisol within normal limits. We have managed to demonstrate clear correlation between onset and progression of metabolic disorders and high concentrations of cortisol (Table 1).

Table 1. – Correlation between frequency of metabolic disorders and concentrations of cortisol in patients with incidentalomas (n=98)

	AH	High BMI	DLP	CMD	IFG	IGT	DM	MD
Elevated cortisol (n=21)	17 (80.9%)	15 (71.4%)	14* (66.7%)	9 (42.8%)	2 (9.5%)	4 (19%)	3 (14.3%)	17 (80.9%)
Normal cortisol (n=77)	58 (75.3%)	43 (55.8%)	26 (33.7%)	20 (26%)	5 (6.5%)	8 (10.3%)	7 (9.1%)	51 (66.2%)

Notes: AH — arterial hypertension, BMI — body mass index, DLP — dislipidemia, CMD — carbohydrate metabolism disorders, IFG — impaired fasting glucose, IGT — impaired glucose tolerance, DM — diabetes mellitus, MD — metabolic disorders.

\*  $P < 0.01$  vs a group with normal cortisol

Next, we studied effect of concentrations of aldosterone on clinical symptoms of adrenal incidentalomas. Aldosterone plays a central role in the regulation of blood pressure increasing reabsorption of ions and water in the kidney, to cause the conservation of sodium, to decrease plasma renin, to accelerate secretion of potassium, and by this to cause hypoglycemia, increase in water retention, and in-

crease in blood pressure and blood volume. When dysregulated, aldosterone is pathogenic and contributes to the development and progression of cardiovascular and renal disease. In our study subclinically elevated concentrations of aldosterone were registered in 11 patients (11.2%) with adrenal incidentalomas, its concentrations within normal limits were found in 87 patients (88.7%) (Table 2).

Table 2. – Correlation between concentrations of aldosterone and biochemical parameters in patients with adrenal incidentalomas (n=98)

	AH	High BMI	DLP	CMD	IFG	IGT	DM	MD
Elevated aldosterone (n=11)	10 (90.1%)	6 (54.5%)	7 (63.6%)	4 (36.3%)	2 (18.2%)	1 (9.1%)	1 (9.1%)	9 (81.8%)
Normal aldosterone (n=87)	65 (74.7%)	52 (59.7%)	33 (37.9%)	25 (28.7%)	5 (5.74%)	11 (12.6%)	9 (10.3%)	59 (67.8%)

Notes: AH — arterial hypertension, BMI — body mass index, DLP — dislipidemia, CMD — carbohydrate metabolism disorders, IFG — impaired fasting glucose, IGT — impaired glucose tolerance, DM — diabetes mellitus, MD — metabolic disorders.

In our study concentrations of aldosterone were found to vary from  $82.32 \pm 5.1$  pg/ml to  $195.33 \pm 12.5$  pg/ml to be significantly higher than those in the control group ( $P < 0.001$ ) and in patients with normal aldosterone ( $P < 0.001$ ). PAC/PRA (plasma aldosterone concentration/plasma renin activity) ratio was 125.8, that is, the one not exceeding the cut-off value of 140. Of note, mean age of patients with normal aldosterone was  $35.22 \pm 1.35$  years, while mean age of patients with hyperaldosteronism was  $45.7 \pm 3.3$  years ( $P < 0.01$ ) with the prolonged arterial hypertension in medical history, mean duration of which was  $4.61 \pm 0.72$  years versus  $5.91 \pm 2.25$  years of arterial hypertension duration in patients with hyperaldosteronism ( $P < 0.01$ ). It should be noted, that concurrent increase in neither cortisol nor catecholamines was registered among patients with high concentrations of aldosterone. No changes were found in the concentrations of potassium and plasma renin either. Furthermore, in patients with hyperaldosteronism incidence of the metabolic syndrome was almost as high as the one in patients with hypercortisolism. In those with hyperaldosteronism incidence of arterial hypertension was high, adverse BMI and diabetes mellitus occurred less frequently.

Pheochromocytomas, tumors associated with incidentalomas producing catecholamines are of special interest. Due to its non-specific properties it is difficult to diagnose pheochromocytoma *intra vitam*. In our study elevated concentrations of adrenaline were found in 79 of 98 patients (80%); levels of noradrenaline and dopamine were elevated in 59 (60%) and 27 (27.5%) patients, respectively. But clinical picture typical of pheochromocytoma could be seen in 7 patients (7.1%) only. Postoperatively pheochromocytoma was diagnosed in 9 (9.2%). Due to low specificity of the assay to measure catecholamines we did not make the point to analyze clinical, biochemical and hormonal parameters in association with their concentrations.

Presence or absence of the metabolic syndrome in patients with adrenal incidentalomas was the next aspect for us to analyze

clinical-paraclinical parameters of the patients. None metabolic disorders were found in 30 of 98 examinees (30%); some or other components of the metabolic syndrome could be seen in 68 patients (70%). To clarify the causes of metabolic disorders we have performed a comparative analysis of clinical, biochemical and hormonal parameters.

Mean age of patients with adrenal incidentalomas without any metabolic disorders was  $30.3 \pm 1.83$  years ( $P < 0.01$ ). There were 16 men (53%) and 14 (47%) women among them. Nineteen patients (63.3%) had arterial hypertension with mean duration of  $2.68 \pm 0.79$  years ( $P < 0.001$  vs the values in the controls). Mean arterial pressure was  $166.6 \pm 6.3/106.6 \pm 3.53$  mm Hg, mean BMI value was  $22.7$  kg/m<sup>2</sup>. There were no differences in mean concentrations of hormones between this group and the controls, though high cortisol was registered in 13.3% (n=4) and high aldosterone was found in 6.67% (n=2). High concentrations of adrenaline, noradrenaline and dopamine were found in 22 (73.33%), 17 (56.67%) and 6 (20%) patients, respectively. Parameters of lipid profile were within normal limits and did not differ from those in the controls. There were no carbohydrate metabolism disorders, and, consequently, pathological conditions, such as impaired fasting glucose, impaired glucose tolerance and diabetes mellitus in this group of patients.

The metabolic syndrome was registered in 68 of 98 patients (70%) with adrenal incidentalomas (mean age  $39.1 \pm 1.58$  years). There was similar frequency of metabolic disorders in men and women. Arterial hypertension was registered in 56 patients of this group (82.4%). Mean duration of arterial hypertension was  $5.68 \pm 0.91$  years, that is, significantly higher as compared with the one in patients without metabolic syndrome ( $P < 0.05$ ). Mean systolic and diastolic arterial pressure was  $171.9 \pm 4.84$  and  $105 \pm 2.78$  mm Hg, respectively. It should be noted that though mean concentrations of hormones were not different from the normal ones, isolated increase in levels of some hormones took place. Thus, hypercortisolism and hyperaldosteronism were registered in 1/4 (25%) and in

9 patients (13.34%), respectively. Elevated levels of adrenaline, noradrenaline and dopamine were found in 57 (83.8%), 42 (61.7%) and 21 (30.8%) patients, respectively. Total cholesterol (n=26, 38.2%), triglycerides (n=24, 35.3%), HDL (n=21, 30.9%) increased, while LDL (n=40, 58.8%) reduced. Body mass index was found adverse in 58 (85.3%) patients; mean BMI in this group of patients was  $28.6 \pm 0.43 \text{ kg/m}^2$ . Carbohydrate metabolism disorders were found in 29 (42.6%) patients and included impaired fasting glucose (n=7, 10.2%), impaired glucose tolerance (n=12, 17.6%) and diabetes mellitus (n=10, 14.7%).

To sum up, it should be noted that metabolic disorders was the basic component in manifestations of adrenal incidentalomas to be contributed by dislipidemia, high BMI, age, high levels of hormones and glucose, and to be confirmed by significant changes in the parameters as compared with those in the control group and those in group of patients without metabolic disorders. In addition, significant correlation was established between frequency of metabolic

disorders and subclinical hormonal activity, high levels of cortisol and aldosterone, in particular.

### Conclusions

Potential sources of hormonal activity, adrenal incidentalomas in our study were accompanied by subclinical Cushing's syndrome and hyperaldosteronism in 21.4% and 11.2%, respectively; in 9.2% it was silent pheochromocytoma. The larger the neoplasm the higher was frequency of cases of subclinical hormonal activity. Metabolic disorders were registered in 70%; higher body mass index was found in 85.3%, dislipidemia and carbohydrate metabolism disorders occurred in 58.8% and 42.6%, respectively. Frequency of metabolic disorders was proportional to the size of adrenal incidentalomas. In our study it varied from 66.6% in patients with neoplasms less than 1 cm to 75% in patients with neoplasms more than 3 cm in size ( $P < 0.05$ ). Significant correlation was found between subclinical hormonal activity and metabolic disorders.

### References:

1. Kalinin A. P., Bogatyryov O. P., Beloschitskyi M. E. et al. Analysis of functional activity of incidentalomas arising from the cortex of the adrenal gland. *Modern aspects of surgical endocrinology*, St. Petersburg, 2005, Vol. 2, P. 53–57. (in Russian).
2. Yushkov P. V., Opalnikov K. V., Belchenko L. V., Manovitskaya A. V. Clinical morphology of hormonally inactive adrenal tumors. *Archive of pathology*, 2001, 6, P. 23–26. (in Russian).
3. Mantero F., Masini A. M., Opocher G. et al. Adrenal incidentaloma: an overview of hormonal data from the National Italian Study Group. *Horm-Res.* – 1997. – Vol. 47. – No. 4–6. – P. 284–289.
4. Valli N. Biochemical screening for subclinical cortisol-secreting adenomas amongst adrenal incidentalomas. *Eur. J. Endocrinol.* – 2001. – Vol. 144. – P. 40–48.
5. Yoon J. K., Remer E. M., Herts B. R. Incidental pheochromocytoma mimicking adrenal adenoma because of rapid contrast enhancement loss. *Am. J. Roentgenol.* – 2006. – Vol. 187. – No. 5. – P. 1309–1311.
6. Barzon L., Fallo F., Sonino N., et al. Development of overt Cushing's syndrome in patients with adrenal incidentaloma. *Eur. J. Endocrinol.* – 2002. – Vol. 146. – P. 61–66.
7. Pivonello R. et al. The metabolic syndrome and cardiovascular risk in Cushing's syndrome. *Endocr. Metabol. Clin. North. Am.* – 2005. – No. 34. – P. 327–339.
8. Rossi R., Tauchmanova L., Luciano A. et al. Subclinical Cushing's syndrome in patients with adrenal incidentaloma: clinical and biochemical features. *J Clin Endocrinol Metab.* – 2000. – Vol. 85. – No. 4 – P. 1440–1448.
9. Tauchmanova L., Rossi R., Biondi B. et al. Patients with subclinical Cushing's syndrome due to adrenal adenoma have increased cardiovascular risk. *J. Clin. Endocrinol. Metab.* – 2002. – No. 87. – P. 4872–4878.
10. Terzolo M., Ali A., Osella G., Cesario F., Paccotti P., Angeli A. Subclinical Cushing's syndrome in adrenal incidentaloma. *Clin. Endocrinol. (Oxf).* – 1998. – No. 48. – P. 89–97.
11. Terzolo M., Reimondo G., Bovio S. et al. Subclinical Cushing's syndrome. *Pituitary.* – 2005. – Vol. 7. – No. 4. – P. 217–223.
12. Terzolo M. Subclinical Cushing's syndrome in adrenal incidentalomas. *Endocrinol. Metab. Clin. North. Am.* – 2005. – No. 34. – P. 423–439.
13. Terzolo M., Pia A., Ali A. et al. Adrenal incidentaloma: a new cause of the metabolic syndrome? *J. Clin. Endocrinol. Metab.* – 2002. – No. 87. – P. 998–1003.
14. Reincke M. Adrenal incidentalomas: a manifestation of the metabolic syndrome? *Endocr. Res.* – 1996. – Vol. 22. – N4. – P. 757–761.

## Genealogical characteristics of children with epileptic encephalopathy and symptomatic epilepsy

**Abstract:** The results of evaluation of the genealogical characteristics of children with epileptic encephalopathy and symptomatic epilepsy with different etiologies.

The results showed that the genealogical analysis of children with epileptic encephalopathy revealed a high proportion of epilepsy in families. Moreover, the family history was similar to his father's side, and from the mother's side. However, most recorded epilepsy proband degree relatives II, affinity compared to other family members. Decrease the frequency of epilepsy in relatives from distant degree of kinship of the proband may indicate the multifactorial nature of the disease. The risk of disease was higher in cases where the epilepsy suffered the father or mother of a proband. Among parents of probands had a higher frequency of consanguineous marriages, compared with the prevalence of inbreeding in the population of Uzbekistan, which is also one of the possible indicators of the multifactorial nature of epileptic encephalopathy.

**Keywords:** Children, epileptic encephalopathy, symptomatic epilepsy, genetics.

### Introduction

Epilepsy — one of the most urgent problems in pediatric neurology. The frequency of epilepsy in the pediatric population is 0.5–0.75% of the child population [5]. According to WHO, about 50 million people worldwide have epilepsy, about 90% of people with epilepsy live in developing regions, about 70% of cases, epilepsy can be treated, however, about three-quarters suffering from the disease of people in developing countries do not receive the necessary for their treatment.

The origins of the different forms of epilepsy are essential family history, exposure to exogenous and organic brain damage. The study of genetic factors in epilepsy is of great scientific and practical interest.

Scientific views in the area of inheritance of epilepsy developed in diametrically opposite directions: from total denial of the role of heredity in the genesis of epilepsy, epilepsy recognition to genetically determined disease.

Most researchers the role of hereditary factors in the occurrence of epilepsy is not denied, but is regarded as a predisposing moment [9]. Most studies have shown that the risk of epilepsy in patients with epilepsy progeny of 3–4%, which is 2.4 times higher than the general population [7].

The development of hereditary diseases due to the action of the mutant gene is transmitted in the family from generation to generation. When the family illness recurrence of a disease in family members is usually the result of the influence of the environment. The term “family” is used also in cases where it is not known whether the disease is genetically determined, or it is due to other causes.

Currently, clinical genetics has a range of information methods to identify patterns typical of hereditary diseases.

In clinical therapy used genealogy, mathematical-statistical methods and caryological genetic analysis. The main objective of the genealogical method is to study the nature of the distribution of hereditary traits in the family. This is achieved by drawing up family trees on which solved the question of the frequency of a disease, particularly its transfer.

Genealogical lineages analysis provides the basis for genetic counseling, that is, address the issue of the risk of birth of sick family, burdened with hereditary diseases [6].

In compiling pedigrees use special characters. In drawing up the tables pedigrees in several steps. First of all, it is the so-called

“legend”, held initial collection of family history. Once the pedigree carried genealogical analysis.

Pedigree patients with epilepsy are often full of families, phenotypically similar, but not identical conditions. This indicates instability of the functional state of the brain that allows some authors to conclude that the genetic predisposition that makes a special condition of the brain — “paroxysmal brain” (for AM Wayne).

In the diagnosis of epilepsy has a family history of importance. In the history of states not hurt anyone any member of the family with epilepsy. In addition, it noted there if a family illness so-called epileptic circle. These include migraine attacks, sleepwalking, binge drinking, bedwetting, stuttering, and others. It is also important to consider changes in the epileptic nature of the parents and relatives of the patient.

**The aim of this study** was to determine genealogical characteristics of children with epileptic encephalopathy and symptomatic epilepsy.

### Materials and methods

We observed 69 children with epileptic encephalopathy (group 1) and 50 children with symptomatic epilepsy (group 2). All patients of similar age from 2 to 14 years. The control group consisted of 20 healthy children.

Genealogical method surveyed 240 family of I degree relatives (parents, siblings) of children with epileptic encephalopathy and symptomatic epilepsy. Compiled detailed pedigree, which included information about the diseases in 3 generations of a family. The genetic material was collected on both parent lines by cross-survey of both parents and sometimes grandparents.

### Results of the study

Total analyzed in the model population 867 people. The data obtained are compared with a generalized response to family 20 healthy people 310 people analyzed in the model population.

The number of family members who have epilepsy observed in 31 pedigree was 234 in children with symptomatic epilepsy and epileptic encephalopathy — was 22.

According to the results of our research in 3 ( $9,67 \pm 5,31\%$ ) pedigrees revealed 2 cases of symptomatic epilepsy in 26 ( $83,87 \pm 6,6\%$ ) marked by heavy burdened family (up to 3 patients and more). In determining the epileptic encephalopathy revealed that 6 ( $19,35 \pm 7,1\%$ ) cases of epilepsy was observed in one member of the pedigree, 4 ( $12,90 \pm 6,0\%$ ) pedigrees revealed 2 cases and 1

(3, 22 ± 3,2%) marked by heavy burdened family (up to 3 patients and more).

The families of probands symptomatic epilepsy in generations in relation to the total number of patients for each concentration of III-1,05%; II-0,38%; I-0,25%, and in epileptic encephalopathy: III-0,13%; II-2,92%; I-1,21%. Weighed down in a population of healthy individuals there was significantly less: III-0%; II-0,32%; I-0%.

To illustrate, give the following observation: pedigree Omonkulova R. 5 years. Diagnosis: Epileptic Encephalopathy 2 diabetes. From the pedigree is evident that the patient has a family history of the parents: paternal — aunt of the proband (II, 2) epilepsy, and her grandmother's brother (I, 3) and the father of the proband — symptomatic epilepsy, maternal aunt and grandfather (I, 2) proband also had epilepsy, also have a brother and sister of the proband were observed spasmodic paroxysms.

Given that the prevalence of blood-related marriages among the Uzbek population reaches 10.5% [5], we analyzed the inbreeding among relatives of children suffering from epileptic encephalopathy. The main type of consanguineous marriages — a marriage between cousins, siblings, long-distance relationship is not uncommon.

The frequency of consanguineous marriages could even higher, as some families are distantly related, not know about it. The pres-

ence of blood marriages were detected in 17 (24,6 ± 9,6%) cases from families of probands with epileptic encephalopathy.

Thus, in 7 families, parents were first cousins (10,1 ± 6,1%), in 4 families — parents were uncle and niece (5,8 ± 2,2%). In 6 families, parents were distant relatives (8,7 ± 4,8%).

In the control group, consisting of 20 families found a family in which the father and mother were distant relatives (5,0 ± 4,9%).

### Conclusion

The results showed that the genealogical analysis of children with epileptic encephalopathy revealed a high proportion of epilepsy in families. Moreover, the family history was similar to his father's side, and from the mother's side. However, most recorded epilepsy proband degree relatives II (2.92%), affinity compared to other family members. Decrease the frequency of epilepsy in relatives from distant degree of kinship of the proband may indicate the multifactorial nature of the disease. The risk of disease was higher in cases where the epilepsy suffered the father or mother of a proband. Among parents of probands had a higher frequency of consanguineous marriages, compared with the prevalence of inbreeding in the population of Uzbekistan, which is also one of the possible indicators of the multifactorial nature of epileptic encephalopathy.

### References:

1. Akre B., Rasmussen M., Lundby R. Pyridoxine –dependent seizures//Norwegian Journal In formation. – 2004. – P. 162–164.
2. Alkan A., Kutlu R., Aslan M. Pyridoxine – Dependent Seizures: Magnetic Resonance Spectroscopy Findings//Journal of Child Neurology. – 2004. Vol. 19, – № 1. – P. 75.
3. Battaglioli G., Rosen D. R., Gospe S. M. Jr., Glutamate decarboxylase is not denetically linked to pyridoxine-dependent seizures//Neurology. – 2000. – № 25. 55 (2). – P. 309–311.
4. Berkovic S., Howell R., Hay D. Epilepsies in twins: genetics of the major epilepsy syndromes *II Ann. Neurol.* – 1998. – V. 43. – P. 435–445.
5. Biervert C., Schroeder B., Kubisch C. et al. A potassium channel mutation in neonatal human epilepsy *II Science* – 1998. – V. 279. – P. 403–409.
6. Caraballo R., Garro F., Cersosimo R. Pyridoxine dependence: the importance of clinical diagnosis and early treatment//Revista de neurologia – 2004. – № 38. – P. 49–52.
7. Jang Y. M., Kim D. W., Kang T. C. Human pyridoxal phosphatase. Molecular cloning, functional expression, and tissue distribution//Journal of biological chemistry. – 2003. – № 12. – P. 5040–5046.
8. Kaelin A., Caser J. P., Jaeger R. Vitamin B<sub>6</sub> metabolites in idiopathic calcium stone formers: no evidence for a link to hyperoxaluria//Urological research. – 2004. – № 32 (1). – P. 61–68.
9. Kannan K., Jain S. K. Effect of vitamin B<sub>6</sub> on oxygen radicals, mitochondrial membrane potential, and lipid peroxidation in H<sub>2</sub>O<sub>2</sub> treated U 937 monocites//Free radical biology medicine. – 2004. – № 15; 36 (4). – P. 423–428.
10. Kholin A. A., Lemeshko I. D., Il'ina E. S., Voronkova K. V., Petrukhin A. S. Seizure characteristics of early myoclonic encephalopathy//Extended Abstracts. 2nd East Mediterranean Epilepsy Congress. Dubai. – 2010. – A-246-0004-00036.
11. Kholin A. A., Voronkova K., Aivazjan S., Shevchenko A., Lemeshko I., Il'ina E. S., Petrukhin A. S. Features of status epilepticus at infancy and early childhood//28th International Epilepsy Congress 28th June-2nd July 2009. – P. 757.
12. Maeda T., Inutsuka M., Goto K., Irumi T. Transient nonketotic hyperglycinemia in an asphyxiated patient with pyridoxine-dependent seizures//Pediatr. Neurol. – 2000. – № 22 (2). – P. 225–227.
13. Najafi Reza Mohammad, Tamizifar Babak. Drug discontinuation in epileptic children: predictive value of the EEG//Archives of Iranian Medicine. – 2002. – Vol. 5, – № 3, – P. 157–161.
14. Okuda T., Sumiya T., Iwai N., Viyata T. Piridoxine-5-phosphate oxidase is a candidate gene responsible for hypertension in Dohlrats//Biochemical and biophysical research communications. – 2004. – № 313 (3). – P. 647–653.
15. Said H. M. Recent advances in carrier-mediated intestinal absorption of water-soluble vitamins//Annual review of physiology. – 2004. – № 66. – P. 419–446.
16. Schulre-Bonhage A., Kurthen M., Walger P. Pharmacorefractory status epilepticus due to low vitamin B<sub>6</sub> levels during pregnancy//J. Epilepsia. – 2004. – № 45 (1). – P. 81–84.
17. Tsuge H., Hotta N., Hayakawa T. Effects of vitamin B<sub>6</sub> on (n-3) polyunsaturated fatty acid metabolism//J. Nutr. – 2000. – № 130. – P. 333–334.
18. Voronkova K., Kholin A. A., Lemeshko I., Il'ina E. S., Petrukhin A. S. Seizure characteristics of Dravet Syndrome//28th International Epilepsy Congress 28th June-2nd July 2009. – P. 750.
19. Wanden L. R. Magnesium absorbtion using stable isotope tracers in healthy children and children treated for leukemia//Nutrition. – 2001. – № 3. – P. 221–224.

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## Season dynamics of changes in water microb structure in some water storage reservoirs of Uzbekistan

**Abstract:** The dynamics of seasonable levels of microorganisms in water samples from some water storage reservoirs of Uzbekistan has been studied in the comparative aspect. In Charvak water storage reservoir (WSR), the quality of water, judging by the microbiological indicators, many-fold exceeded the indicators of Kattakurgan WSR and Tuyamuyun water works facility.

**Keywords:** water storage reservoirs, reservoir water, microbe structure, pathogenic microorganisms, opportunistic microorganisms.

Water storage reservoirs (WSR) are special geographical natural and climatic bodies being an obligatory part of a landscape of territories of many countries of the world. Though they were created by people, they are exposed to a severe impact of many natural factors, hydrometeo-logical ones in particular [1; 7].

Alterations in mineral and chemical composition, water hardness are known to change quantitative and qualitative structure of water microflora. Pathogenic microorganisms (PM) transmitted by water, adapting to these conditions, change the biological properties. It leads to a lower percent of yielding normal microflora representatives (mesophilic aerobes and facultative anaerobes) as well as PM being in the WSR [3–5; 6; 9].

**Aim of the study.** A comparative study of the seasonal dynamics of the cultivation of microorganisms of different WSR.

**Material and methods.** Taking into consideration the three types of WSR in RUz. (bed, off-stream, mixed) three WSR chosen for the research: the bed one — Charvak, the off-stream one — Kattakurgan; the mixed one — Tuyamuyun water works facility (WWF) which include WSR (areas) Ruslovoe, Kaparas and Sul-ton Sanzhar.

The WSR profiles: Kattakurgan WSR (Kattakurgan district of Samarkand province) — a valley, irrigational WSR of off-stream type, has been used since 1941. The reservoir is located in the left-bank part of the Zeravshan valley 6 km to the south of the city of Kattakurgan. Filling is made through the bringing channel from the Karadarya which is the Zeravshan's inflow. The reservoir surface is 80.5 km<sup>2</sup>, the volume of the WSR over 662 million m<sup>3</sup>, the dead storage is 24 million m<sup>3</sup>. The irrigational aims are gained by water accumulation during the winter-spring period through giving water from the WSR in the time of plants' vegetation. By its external water exchange it is of accumulation and transit one type I [7; 12].

Tuyamuyun WSR (Tuyamuun WWF) started to be filled up in 1984. This WSR is of mixed type (bed and off-stream). It is locat-

ed in Tuyamuyun canyon being on the border of the middle and upper water course of the river Amu Darya 450 km from the Aral Sea. The full capacity of all WSR makes 7.8 km<sup>3</sup>, the useful capacity is 5.28 km<sup>3</sup>. The water — table is over 250 km<sup>2</sup>, the area of the water surface is 780 km<sup>2</sup>. The length is 80 km, water level at the dam is 13 m. By its morphological type it is complex hollow-valley one [7; 12].

Charvak WSR (Bostanlyk district of Tashkent province, 85 km from the city of Tashkent) is a bed, valley WSR constructed in 1978. It was formed by damming the river Chirchik at its exit from the Charvak hollow. The WSR has the full volume of 2,006 km<sup>3</sup>, the useful one is equal to 1.58 km<sup>3</sup>, the surface area with the normal banked up level is 40.1 km<sup>2</sup>. The full reservoir area is over 41 km<sup>2</sup>, the maximum depth by the dam is 150 m, and the water volume is about 2 billion m<sup>3</sup>. Filling with water occurs, basically, in spring owing to snow thawing. The reservoir is used in summer during plants' vegetation. By external water exchange it is of the accumulation-transit type I [7; 12].

The water from WSR was taken by sterile bathometers from the depth up to 20 cm from the water surface in the volume of one liter. When it was necessary to take samples at different depths, benthonic samples were taken at the depth of 30–50 cm from the bottom. In bathing places (Kattakurgan and Charvak WSR), the surface water layer was sampled not immersing the bottle's neck. In the rivers (the Amu Darya) and WSR (Kattakurgan, Tuyamuyun and Charvak) sampling was made using boats. The water samples were delivered following the methodical recommendations specified by S. K. Alieva et al. [2]. The term of the beginning of the tests did not exceed 2.5–3.5 hours after the moment of sampling [13; 14].

All microbiological tests were made according to the recommendations developed by Alieva S. K. et al. [2] and Nedachin A. E. [8]. The total number of saprophile microorganisms (TNMC), the

total coliform bacteria count (TCB), thermo-tolerant coli form bacteria (TTCB), the TTCB number in 1 dm<sup>3</sup> of waters (according to the State Standard (GOST) 950–2011 — coli index), PM (*Shigella* spp., *Salmonella* spp.) and opportunistic microorganisms (OM) (*Escherichia* spp., *Staphylococcus* spp., *Enterococcus* spp.). To carry out the bacteriological tests the standardized culture media produced by “HiMedia” (India) were used. All tests were made in 2012–2014, the samples were taken three times from each study-point, all in all 9 series of tests were made.

Statistical processing was made by the analysis of variance with calculation of arithmetic mean (M), errors of arithmetic mean (m). Significance of differences was calculated according to Fisher — Student criterion (P). The differences were thought to be representative with P < 0.05. All calculations were computered using “Pentium 4” processors with a package of applied programs for medical and biologic research. When organizing and carrying out the research the principles of demonstrative medicine were applied [11].

**Results and discussion.** The obtained findings of microbiological tests of water from Kattakurgan WSR have shown that the total TCB in 1 dm<sup>3</sup> of water in summer was the lowest in the water lower the dam, i. e. 500 CFU/100 ml (means 500 colony forming units per 100 ml of sample). It corresponds to the normal values for WSR of category I but it is twice lower the norm for water reservoirs of category II [10]. In other samples taken from different places of water storage reservoirs, the TTCB values were 2–9 times higher than the indicators determined lower the dam (500 CFU/100 ml), i. e. 1,100 CFU/100 ml (in the middle of the reservoir); 5,200 CFU/100 ml (before the dam) and 9,400 CFU/100 ml (in the recreational zone). In spring this indicator was 2–3 next lower orders than in summer in all the places of sampling.

In all the water samples taken from different places in summer, the TNMC value was above the norm — no more than 100 CFU/100 ml [10]. In particular, it was expressed in the water samples from the recreational zone (250 CFU/100 ml). During the spring these indicators worsened in 1.5–5.2 times in comparison with the standard and were above the summer parameters (P < 0.05).

The research was conducted to study the microbiological indicators in the water samples from Tuyamuyun WWF as well.

The findings show that the TTCB highest parameters in summer were found out in the water samples taken lower the dam in Ruslovoe WSR and in the discharge channel (the river Amu Darya), 1,3000 CFU/100 ml each. The lowest quantity was revealed in the water samples from Sulton Sanzhar WSR (500 CFU/100 ml), this quantity corresponds to the standard values [10].

The parameters of water from Kaparas and Ruslovoe WSR (before the dam) in summer also were above the norm, but they are significantly lower than the indicators before the dam and the discharge channel (P < 0.01). The TNMC indicators in all water samples, irrespectively of the sampling place, were more than 300 CFU/100 ml that exceeded the standard values [10]. A different picture was observed when studying the spring indicators: while there were no significant changes in the TTCB quantity, the TNMC values were dramatically lowered (P < 0.001). TTCB seasonal dynamics greatly differs only in Kaparas and Sulton Sanzhar WSR.

In the water samples from Sulton Sanzhar, this parameter did not exceed the norm. This finding is explained by the fact that the water in Sulton Sanzhar WSR comes from Ruslovoe reservoir through Kaparas reservoir where the water is desilted and the clarified water comes to Sulton Sanzhar. Apparently, microorganisms together with chemical substances and suspended particles from clay and sand gravitate to the bottom of Kaparas WSR. Besides, in

these WSR (Kapas and Sulton Sanzhar) there is almost no movement of water and it excludes raising the suspended particles from the reservoir bottom on to the surface. In spring the quality of water specified by the TTCB parameter does not differ from the norm, the TNMC indicator is significantly better (P < 0.001) almost in all the samples.

By the microbiological indicators, the quality of water in Tuyamuyun WWF is significantly worse than the same indicators of the Kattakurgan WSR — both in TTCB and TNMC.

Microbiological tests were made with water samples from Charvak WSR. The findings show that in water samples from the middle of the reservoir and before the dam, the results of summer tests were below the top borders of the norm for reservoirs of category II [10].

Indicators of the coli index of water samples before the dam (800 CFU/100 ml) were within the normal values for reservoirs of category I — 1000 CFU/100 ml [10], however, in the recreational zone, they were above (1200 CFU/100 ml) the normal amounts.

TNMC indicators in all water samples, irrespectively of the place of sampling in Charvak WSR, were within the specified standard values. Only the TNMC of the recreational zone and lower the dam were above the level of the top borders of the standard, while in other water samples, the TNMC value was 3.3 and 5.0 times lower than the top borders of the norm. In all water samples, irrespectively of the place of sampling, PM were not found out.

The samples of water taken in spring did not differ much from the ones which were taken during the summer; the TTCB and TNMC indicators were significantly lower than not only the norm, but also the summer indicators (P < 0.001).

When comparing microbiological indicators of Charvak WSR to other water objects described above, it was revealed that all the indicators were many-fold lower and are within the specified limits. Apparently, it is the basic difference of water of Charvak WSR in comparison with the water of the Kattakurgan WSR, and especially the water of Tuyamuyun WWF. This demonstrates that Charvak WSR is filled with the mountain rivers with low temperature of water with no evident shoal and small amount of plankton. To study culturing abilities of PM and OM of the water samples of the WSR under comparison was the next step of our research.

The microbiological research was conducted to identify and differentiate *Shigella* spp., *Salmonella* spp., *Escherichia* spp., *Staphylococcus* spp. and *Enterococcus* spp. Causative agents of bacterial intestinal infections, e. g. *Shigella* spp., *Salmonella* spp. and *Escherichia* spp., were studied with a view of substantiation of quality of water in WSR.

In summer, identification of *Shigella* spp., *Salmonella* spp., *Escherichia* spp., *Staphylococcus* spp. and *Enterococcus* spp., irrespectively of the place of water sampling, failed in Kattakurgan WSR. Apparently, it is because the time of sampling water coincided with the reservoir filling up when water movement was considerable. Besides, the zones of sanitary protection of the WSR and regular anti-epidemic measures were strictly followed. However, another picture was observed in spring: in the samples from the middle of the reservoir, the recreational zone and before the dam *Shigella* spp., *Salmonella* spp. and *Enterococcus* spp. were found out.

The similar research was conducted with water samples from Tuyamuyun WWF. The findings show that in summer *Shigella* spp., *Salmonella* spp., *Escherichia* spp., *Staphylococcus* spp. and *Enterococcus* spp. were not found in the water samples from Kaparas, Sulton Sanzhar WSR and from the ones taken before the dam of Ruslovoe WSR. *Escherichia* spp., *Staphylococcus* spp. and *Enterococcus* spp. were found in the water samples taken lower the dam of Ruslovoe WSR and the discharge channel (the river Amu Darya). The indi-

cators of spring tests did not differ greatly from the summer ones, except for *Enterococcus spp.*, which was revealed in all the samples. No certain regularities related to the place of sampling or season were revealed.

The microbiological tests to study culturing profile of the microorganisms from water samples from Charvak WSR have yielded the following results: *Escherichia spp.* and *Enterococcus spp.* were identified in the water samples from the recreational zone. *Shigella spp.* and *Salmonella spp.* were not. The research conducted during spring did not give any positive bacteriological results.

*Enterococcus spp.* and *Staphylococcus spp.* were revealed to be cultured only on banks (at a distance of 1 m from the bank) of the WSR where there were recreational zones or cattle was grazed ( $P < 0.05$ ). Starting from a distance of 5 m and farther as well as and in the depth of 20 cm and more, PM and OM, including *Enterococcus spp.* and *Staphylococcus spp.* were not cultured in all studied water storage reservoirs.

Apparently, *Enterococcus spp.* and *Staphylococcus spp.* can be used as sanitary-indicative microorganisms (SIM) for recreational zones of WSR and their detection even in insignificant quantities can be considered as the factor of microbe contamination and a risk factor for recreational zones of WSR.

#### Conclusions:

1. The results of microbiological tests of Kattakurgan WSR have shown that TTCB in 1 dm<sup>3</sup> in summer exceeded the norm in the

water samples from the reservoir in 2.2 times on average, in the samples taken before the dam, the value was 10.4 times higher, in those ones from the recreational zone the value was 18.8 times higher. In spring, TTCB was 2–3 orders less than in summer and TNMC, on the contrary, was higher.

2. The values of the indicator were 4.5–26.0 times higher in the water of Tuyamuyun WWF. Only in water samples from Sul-ton Sanzhar, this indicator did not exceed the norm. In spring the quality of water TTCB does not differ from the norm, by TNMC it is significantly better than in summer.

3. These parameters in Charvak WSR at the level of the top borders of the norm. Microbiological indicators of the quality of water in Charvak water storage reservoir were manyfold higher than the values of the Kattakurgan WSR and Tuyamuyun WWF.

4. *Escherichia spp.*, *Staphylococcus spp.*, *Enterococcus spp.*, *Shigella spp.* and *Salmonella spp.* were found out in the water samples from Tuyamuyun WWF and the Kattakurgan WSR. The certain regularities related to the place of sampling or season were not revealed. *Escherichia spp.* and *Enterococcus spp.* were found only in the recreational zone of Charvak WSR.

5. *Enterococcus spp.* and *Staphylococcus spp.* can be used to use as sanitary-indicative microorganisms of recreational zones of WSR, their detection, even in insignificant quantities, can be considered as the factor of microbe contamination and a risk factor for recreational zones of WSR.

#### References:

1. Avakyan A. B., Saltankin V. P., Sharapov V. A. Water storage reservoirs. – Moscow, “Mysl”. 1987; 313 p. (in Russia).
2. Alieva S. K., Ishakova H. I., Pakhomova V. A. et al The method of the sanitary-microbiological analysis of water of open reservoirs (rivers, lakes, ponds, swimming pools, sewage and other water bodies) for sanitary-indicative and pathogenic flora // Methodical instructions MH of the RUz. № 12–3/0152. – Tashkent, 2009; 43 p. (in Russia).
3. Anganova E. V. Biological property of opportunistic bacteria in the water ecosystems // Hygiene and sanitary (Moscow). 2010; 5: 67–8. (in Russia).
4. Bozorova G. D., Nuraliev N. A., Matnazarova G. S. Culturing enterobacteria from water samples from of reservoirs in various regions of Uzbekistan // Ukrainian medical almanac (Ukraine). 2012; 15 (4): 39–41. (in Russia).
5. Zhuravlyov P. V., Aleshnja V. V. Monitoring the bacterial pollution of reservoirs of Rostov province // Hygiene and sanitary (Moscow). 2010; 5: 33–6. (in Russia).
6. Zagainova A. V., Talaeva J. U. Evaluation of epidemic danger of pathogenic and opportunistic bacteria isolated from water of various kinds of water bodies // Hygiene and sanitary (Moscow). 2010; 5: 68–73. (in Russia).
7. Ilinskiy I. I., Shoumarov S. B., Mirshina O. P. Urgent sanitary-and-hygienic problems of designing, building, operation and protection of water storage reservoirs of Uzbekistan // Teaching-methodical manual (Tashkent). 2012: 160 p. (in Russia).
8. Nedachin A. E. The method of the sanitary-microbiological analysis of potable water: Methodical instructions. – Moscow, the information-publishing centre of Ministry of Health of Russia. 1997; 36 p. (in Russia).
9. Savilov E. D., Anganova E. V. Water ecosystems microbiological monitoring // Hygiene and sanitary (Moscow). 2010; 5: 56–8. (in Russia).
10. MH of the RUz. Sanitary Standard No 0172–04. “Hygienic requirements to protection of superficial water in the territory of the Republic of Uzbekistan”.
11. Ponomareva L. A., Mamatkulov B. M. Application of principles of demonstrative medicine in organization and conducting hygienic research // Methodical recommendations. – Tashkent. 2004; 19 p.
12. Shoumarov S. B., Matyakubova Z. A., Tupichina M. G. Peculiar features of using water storage reservoirs under the conditions of economic-drinking provision of the population during low water supply: the review // Infection, immunity and pharmacology (Tashkent). 2013; 4: 69–73. (in Russia).
13. Uzbekistan standard (GOST) 950–2011. “Drinking water. Hygienic requirements and the control over quality”.
14. Uzbekistan standard (GOST) 951–2011. “Sources of the centralized economic-drinking water supply. Hygienic, technical requirements and choice rules”.



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## Morphological changes in children with cerebral palsy With symptomatic epilepsy

**Abstract:** Mikropoligirii is the most common defect in brain development of children with cerebral palsy, morphologically manifested in the form of small, for-rounding meanders with deep furrows, in the presence of symptomatic epilepsy marked thinning of the gray matter, the expansion of the ventricles and the emergence of foci of haemorrhage.

**Keywords:** Cerebral Palsy, mikropoligirii, morphological changes.

It is known that cerebral palsy poli-etiological neurologic disease often starts as a result of intrauterine damage to the central nervous system, continued in the first years of postnatal life, uniting all forms of spastic paralysis with similar clinical features ( ). In the structure of the causes of cerebral palsy recovered prenatal, natal and postnatal factors. These include infectious diseases of mother during pregnancy, mental, physical, and mechanical trauma during delivery, asphyxia and others. The impact of these factors leads to ischemic injury periventricular areas of the brain, and atrophic changes in different parts of the cortex. There are more than 20 forms of cerebral palsy, but most often meets double hemiplegia is characterized by a pronounced atrophy of the cerebral cortex in the form of microcephaly and increased ventricular volume; mental development of de children with this form of cerebral palsy, and corresponds to the minimum oligophrenic degree in imbecility or idiocy. At the same time, especially patomorfologic changes in different parts of the brain during cerebral palsy accession seizures have not been studied, revealing them can reveal the essence of the pathogenesis, morphogenesis and morphology of the severe pathology of nerve tissue.

The **aim** of the work was to identify features in the comparative aspect patho-morphological changes in children with cerebral palsy in the form of microcephaly with symptomatic epilepsy without it.

**Material and methods.** The object of the study were 5 brains taken at autopsy of children died from cerebral palsy, of which 3 cases on the clinical data from the disorder syndrome. First studied the anatomical parameters of the brain: the state of hemispheres, their symmetry, surface condition and convolutions, their symmetry, sphericity, and the number, state and subcortical regions of the ventricles, a condition of cerebellum and the medulla oblongata. Then brain was cut by Shore from each hemisphere, subcortical sections taken size pieces 1.5×1.5 cm. After fixation in 10% neutral solution of formalin and dehydrated in alcohols embedded in paraffin. Histologic sections 5–6 microns thick were stained with hematoxylin-eosin, Nissl method for acid mucopolysaccharides impregnation and glial cells and

**Results and its discussion.** Results of morphological studies have shown that when microcephaly all parts of the brain are reduced symmetrically due to the backlog and the violation of its growth. Mass brain compared with normal reduced on average by 24%. Hemispheres of the brain, particularly the frontal lobes atrophic, reduced in size, are asymmetrical. Sometimes the presence of mikrogirii detected lesions makrogirii, gonadal agenesis, and even nuclear structures, expansion of the ventricles and sub-archnoid spaces.

Microscopic examination revealed secondary changes caused by brain scars: Smart narrow, irregularly shaped, deep-bo-breather.

Sometimes deep in the brain revealed a cystic cavity is divided into several compartments or pores. It's time represents a scar lesions caused by vascular changes in the brain occurred during fetal life. Microscopically, there is a lack of nerve cells in the superficial layers of the cortex (Figure 1a), but the nerve cells are available in the state-of atrophic and distraital cal changes observed around glial cell proliferation and thickening of the vessel walls. Pia considerably thickened and tortuous due to the increase of fibrous connective tissue structures.

Under the brain tissue of the brain shell some what loosened, diluted and swollen. When histochemical study by Nissl in the cerebral cortex observed asymmetry and deformation of sulci and gyri. Blood vessels somewhat widened and thickened wall significantly due to proliferation of endothelial cells and connective fibers, which apparently leads to ischemia of brain tissue with subsequent atrophy of nerve cells. The cerebral sulci nerve cells randomly arranged, formed a with out cells fields in the outer part of the cerebral cortex (Fig. 1b). The surviving nerve cells of different shapes and conducted, most of them shriveled, in some neurons tiger substance densely Skopje as dark purple inclusion inclusions, while in others a little concentrated and colored Bazophilic, indicating that there are significant metabolic disorders in the cytoplasm nerve cells characteristic of seizures. Between the grooves in the neural tissue observed sprouting tufts of fibrous connective tissue.

Microscopic examination of microcephaly with seizures noted the presence of a massive outbreak of hemorrhage into the deep layers of the cerebral cortex. The peripheral of the hemorrhage observed resorption of blood cells, turning gemoglobin pigments, thinning the surrounding brain tissue, Koto-rye demonstrate the newly developed chamber hemorrhage, clinically coincides with the development of seizures, and apparently is the direct cause of death of the patient. In the center of hematoma erythrocytes and nerve tissue in a state of decay, circumferentially marked gliosis small that also speak of weakness glial cell regenerative activity due to atrophic changes in general. The circumference of hemorrhage in the brain activation is determined by a small nerve cells in the form of hypertrophy and hyperplasia of glial cells (Fig. 1C). Blood vessels slept with wall thickening and development of perivascular edema.

Mikropoligiriya according to the literature and our research were the most frequent defect in brain development of children with cerebral palsy. Morphologically it is characterized by the presence of small, rounded meanders with deep furrows. In the presence of seizures marked atrophy of the temporal lobe of the cerebral cortex with the thinned of the gray matter and a significant expansion of the lumen of the ventricles of the brain. Microscopically when the number of seizures of nerve cells is limited, and most of them underdeveloped, retain some signs of neuroblasts. Other nerve cells represent

an intermediate pattern between neuroblastoma and mature nerve cell. The processes of cells in a small amount and short. The number of nerve cells in the ITS, III is reduced cortical layers are arranged irregularly. The distribution of pyramidal cells marked anomie layers heterotopia, in all layers of the cortex are arranged randomly and uneven layers. Microscopic studies of individual areas of the cerebral cortex was noted that in the frontal area of the cerebral hemispheres of the cerebral cortex sulcus asymmetrical, deformed. Where meninges are thickened especially from the grooves atrophied due to the proliferation of connective tissue cells and thickening of the vessel walls. When histochemical study by Nissl cases with seizures showed that nerve cells are actually arranged randomly in the cortex, they are of different sizes and forms, most of them shriveled and deformed with uneven content of tiger substance (Fig. 1d). Processes of nerve cells due to lack of tiger substances are not determined. Glial cells are few in number, are also deformed and atrophic. The periventricular part of the cerebral cortex and subcortical areas of the brain is determined by polymorphic pathological changes. Vessels hyperplastic, sometimes with the development of angiomas, a wall of irregularly thickened by proliferation of connective tissue cells and fibers. Some of them extended congested, while others slept with perivascular edema. The brain tissue is determined by the pronounced swelling in the form of different formation of the vacu-

ole. Nerve cells are few in number and are able to wrinkling and atrophy. Glial cells in large amounts by hypertrophy and hyperplasia, in particular in the perivascular areas of brain tissue.

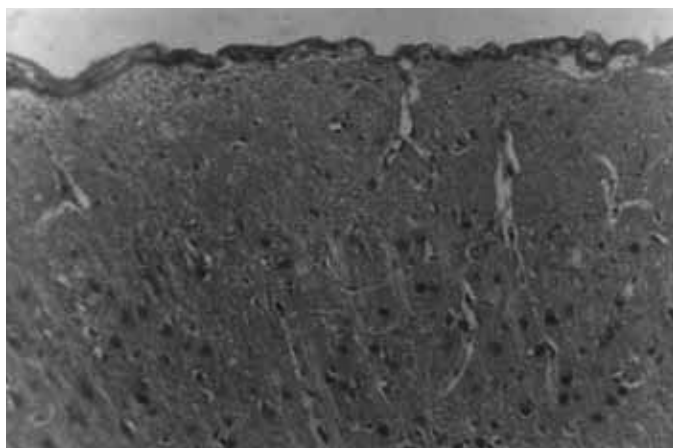
**Conclusions:**

1. ICP in the form of microcephaly seen a decrease in brain mass, atrophy and deformation of the cerebral hemispheres, the presence of foci mikrogirii, makrogirii, agenesis of individual furrows and nuclei, the expansion of the ventricles, and the accession of symptomatic epilepsy appear foci of hemorrhage and degenerative changes in the nerve cells.

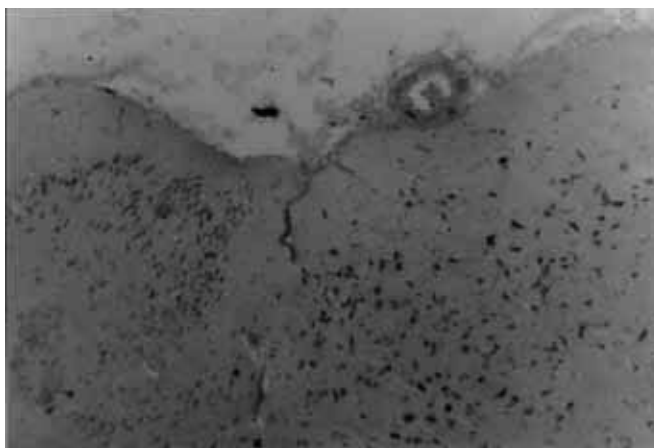
2. The microscopic features of microcephaly were lagging behind in the development and differentiation of nerve cells, the appearance with out cells fields, chaotic arrangement of nerve cells with uneven content of the tiger compound.

3. Mikropoligirii is the most common defect in brain development of children with cerebral palsy, morphologically manifested in the form of small, rounded meanders with deep furrows, in the presence of symptomatic epilepsy marked thinning of the gray matter, the expansion of the ventricles and the emergence of foci of hemispheres.

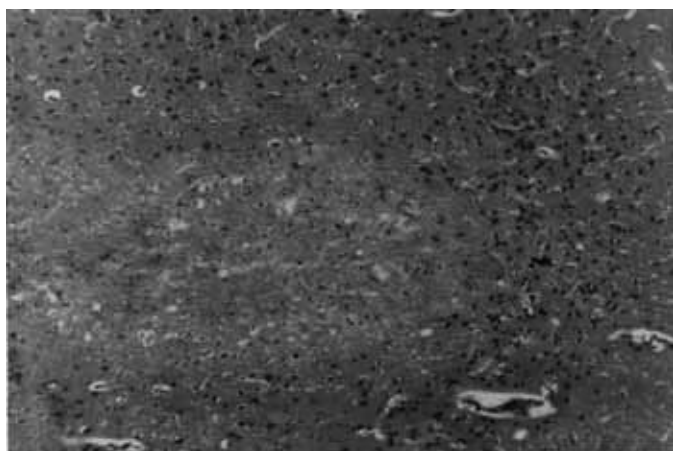
4. Mikropoligirii microscopically observed hypoplasia of the nerve cells, the preservation of evidence of neuroblasts and their disorderly arrangement of the prevalence of diffuse gliosis.



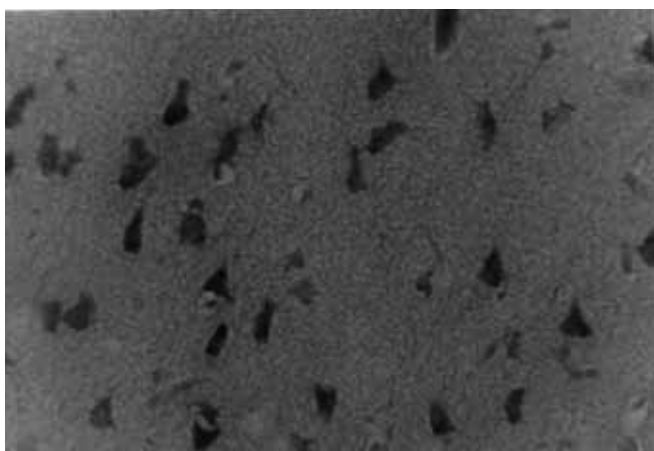
a) cortical atrophy, thickening of soft brain-ing shell extension bezketochnogo layer of the cerebral cortex. Colouring: hematoxylin and eosin. Magnification: ok.10, ob.20.



b) The asymmetry of cortical thickening of the vessel wall, a disorderly arrangement of nerve cells. Colour: hematoxylin and eosin. Magnification: ok.10 about. 20



в) Massive bleeding in the thickness of the cerebral cortex with gliosis in his circle. Colouring: hematoxylin and eosin. Magnification: ok.10, ob.20.



g) The random arrangement of atrophy, reduced substance tiger in nerve cells. Colouring: hematoxylin and eosin. Magnification: ok.10, ob.20.

Figure 1. The child of 2.7 years. Hemiplegic cerebral palsy double form with symptomatic epilepsy

## References:

1. Акимов О. В. Синдром Фара и детский церебральный паралич – последствия тяжелой родовой гипоксии у ребенка // Архив патологии. – 1991. – № 5. – С. 59–61.
2. Барашнев Ю. И. Гипоксически-ишемическая энцефалопатия новорожденных: вклад перинатальных факторов, патогенетическая характеристика и прогноз // Рос. вестн. перинат. и педиатрии. – 1996. – № 2. – С. 29–35.
3. Барашнев Ю. И. Перинатальная медицина и инвалидность с детства // Акуш и гинекология. – 1991. – № 1. – С. 12–18.
4. Кудашев Н. И., Озерова О. Е., Ворошилова Г. П. О роли вируса герпеса в патогенезе церебральных повреждений и висцеральных нарушений у новорожденных // Акуш и гинекология. – 1990. – № 1. – С. 22–24.
5. Клоосовский Б. Н. Проблема развития мозга и влияния на него вредных факторов. – М. 1960. – С. 234.

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## Morphological and morphometric features of the brain in children with cerebral palsy complicated by epilepsy

**Abstract:** Cerebral palsy (CP) is one of the most severe pediatric neurological diseases. Numerous studies are devoted to the diagnosis and treatment of this disease, but the morphological status of the brain in children with CP complicated by epilepsy has not been studied. The aim of this study is to investigate the morphological and morphometric features of the brain of deceased children with CP associated with epilepsy. The morphometric studies were performed in 32 cases with hyperkinetic, double hemiplegia and hemiplegic forms of CP in the central gyrus of the frontal lobe and the hypothalamus of the affected hemisphere. Morphological findings revealed a greater degree of immaturity of the brain of children with CP and seizures that may underlie the defect of brake mechanisms of the brain, which causes the occurrence of epileptic foci.

**Key words:** cerebral palsy, epilepsy, brain morphology, histological and morphometric studies.

Cerebral disorders in children is one of the urgent topics of modern neurology. The rate of congenital abnormalities of the central nervous system in newborn infants ranges from 0.74 to 1.89 cases per 1000 births, while in the general structure of all congenital defects of the nervous system accounts 10–20% [1, 2, 9].

Cerebral palsy (CP) is one of the most severe neurological diseases of pediatric age [3, 6, 10]. Numerous studies address mainly the issues of diagnosis and treatment of this pathology [4, 5, 7, 8]. However, the morphological status of the brain in children with cerebral palsy complicated by epilepsy has not been studied.

**The purpose of this study** is to investigate morphological and morphometric features of the brain in children with epilepsy.

### Materials and Methods

Morphometric studies were performed in 32 patients with hyperkinetic form of CP, double hemiplegia and hemiplegic form in the central gyrus of the frontal lobe of the affected hemisphere and hypothalamus.

Brain tissue for histological study was processed according to standard methods. The sections were stained with hematoxylin and eosin, as well as with 0.5% solution of cresyl-violet by Nissle method, the dignity of which is stability of the results and the possibility of directional elector identification of specific nerve cells with all their processes. In the preparations were determined morphological and morphometric characteristics of the cortex of the temporal lobe of both hemispheres and nuclear structures of hypothalamic region of the brain: the thickness of the layers of the cortex, the length (height) and width of neurons in layers, the density of neurons and neuroglia in square cut in 1 mm<sup>2</sup>.

The thickness of the layers of the cortex, the dimensions of the bodies of pyramidal neurons in layers I, II, III, IV, V, VI of the cor-

tex were measured by using ocular ruler (7x eyepiece, 20x objective, microscope Leica). There were used methods of S. M. Blinkov and I. I. Glezer (1984). The volume of bodies of pyramidal neurons was calculated according to the formula of I. N. Bogolepov, (1978). The data were processed by methods of variation statistics.

### Results of the study

The thickness of all layers of the affected areas of the cortex of the central gyrus of frontal lobe in double hemiplegic form of CP without epilepsy was significantly less, in comparison with morphometric parameters of the same areas of the brain in children who died because of other causes. In this case, there was significant thinning of the thickness of V large pyramidal layer by 2 times, III external pyramidal layer by 1.8 times, I, II, IV layers on average by 1.5 times. VI internal polymorphic cell layer thickens by 50%, compared to control (Table 1).

In case of double hemiplegic form of CP with epilepsy morphometric changes differed somewhat from the above data. It was noted some thickening of the external three layers of the cortex, while the thickness of IV–V layers was more thin (Photo 1). Morphometric changes of the thickness of layers of cortex of frontal lobe of brain affected hemisphere in double hemiplegia were undoubtedly associated with atrophic changes of cerebral cortex as a manifestation of CP. Thickening of the external layers in epilepsy seems to be associated with the development of secondary changes in the form of edema and blood filling of vessels (Table 1).

The study of astrocytes density in the cortex in double hemiplegia showed its slight increase in II, III, and IV layers of the cortex on average by 30–40%, as compared to the control. In epilepsy was observed more increase in astrocytes density in the same layers of

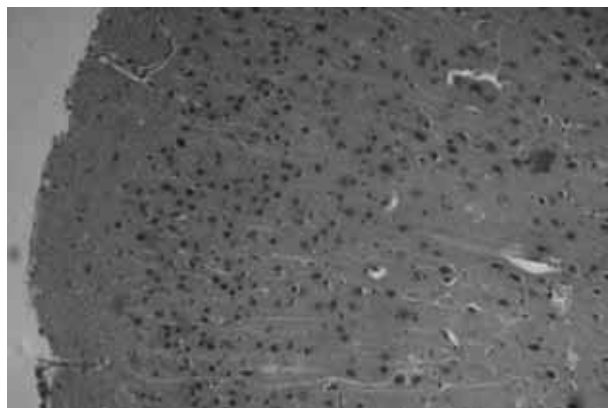


Figure 1. 2.7-year-old child, double hemiplegic cerebral palsy with epilepsy. Atrophy of the cortex, thickening of pia mater, expansion of the acellular layer of the cerebral cortex. Staining with hematoxylin and eosin, 10x10

the cortex of frontal lobe of the affected hemisphere of the brain that indicates the increase in gliosis and atrophy of nerve cells. The densities of neurons in the cortex demonstrate significant atrophy and reduction of their quantities. In this case, there was determined the tendency of uniform reduction of numbers of neurons in almost all layers of the cortex. More significant decrease in the density of

neurons was identified in the internal polymorphous cell layer by 2 times, in the internal pyramidal layer by 1.5 times, in the internal granular layer by 1.7 times and in other layers of the cortex by an average of 1.3 times (Table 1).

In double hemiplegic form of CP, increase of astrocytes density and decrease of neurons density naturally has led to significant changes in the astrocytic index. If in the norm this indicator in all granular layers of the cortex is equal to an average of 1.35, in the pyramidal layers is equal to 1.81 and 2.16, respectively, so in this form of CP there was its increase in all layers, especially in epilepsy, amounting in the internal pyramidal layer to 3.0, in the internal granular layer to 3.19. This trend, the increase in astrocytic index was observed in the hypothalamus. If this index in the norm is equal to 2.0, in this form of CP, especially with epilepsy, it was increased to 3.12 (Table 1).

Thus, significant changes in morphometric indices of the layer thicknesses, the density of astrocytes and neurons of the frontal lobe and the hippocampus of affected hemisphere of the brain in the form of thinning of the layers, increase of astrocytes density, decrease in neurons density and enhance of the astrocytic index indicate dominated atrophic changes of the parenchymatous cells and the development of gliosis. Increase of these indicators in epilepsy proves on the accession of secondary changes in the form of plethora of vessels and edema of brain tissue (Table 1).

Table 1. – Morphometric parameters of thickness of layers, the density of astrocytes and neurons of the central gyrus of frontal lobe and the hypothalamus of the brain hemisphere affected with double hemiplegia (M±m, m, and in pieces)

№	Parameters		Cortical layers						Hypothalamus
			I	II	III	IV	V	VI	
1	Thickness of cortical layers in mkm	Without epilepsy	210,4±6,3	166,5±4,2	126,5±3,8	226,5±6,4	150,4±3,2	167,4±3,9	
		With epilepsy	221,4±4,6 P<0,05	172,5±3,8 P<0,05	132,6±2,8 P<0,01	221,4±5,7 P<0,01	144,8±3,2 P<0,05	174,6±3,6 P<0,05	
2	Density of neurons	Without epilepsy	30,2±1,5	40,3±2,6	32,4±1,7	28,3±1,4	26,6±1,3	22,3±1,2	22,4±1,4
		With epilepsy	28,4±1,3 P<0,01	41,4±2,3 P<0,01	30,6±1,6 P<0,05	26,4±1,4 P<0,05	30,2±2,3 P<0,05	24,5±1,5 P<0,01	20,6±1,6 P<0,01
3	Density of astrocytes	Without epilepsy	44,6±2,8	71,3±4,6	82,4±4,8	94,2±6,3	66,5±3,8	62,6±3,3	66,5±3,2
		With epilepsy	46,5±2,6 P<0,01	80,6±6,9 P<0,01	91,7±7,6 P<0,05	84,3±5,9 P<0,05	68,4±4,7 P<0,01	58,7±3,7 P<0,01	64,3±4,6 P<0,01
4	Astrocytic index	Without epilepsy	1,54	1,76	2,54	3,32	2,50	2,81	2,97
		With epilepsy	1,63	1,93	3,00	3,19	2,26	2,38	3,12

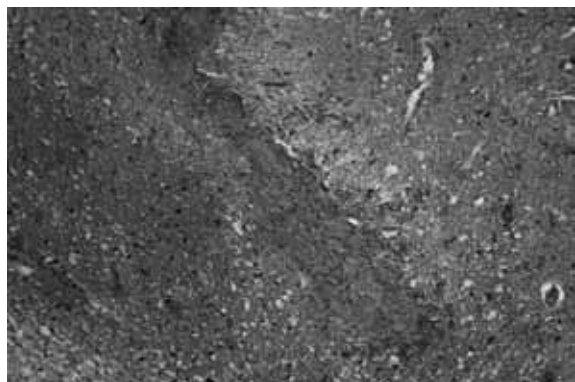


Figure 2. 7-year-old child with hemiplegic form of cerebral palsy. Massive focus of necrosis and diapedese hemorrhage in circle of necrosis. Coloring by Nissle, 10x10

The results of morphometric studies of the brain in hemiplegic form of CP showed significant changes in the form of thinning of the thickness of cortex layers in III, V pyramidal cellular layers, especially in epilepsy the thinning of these layers reached 2 times. The densities of neurons in almost all layers of the cortex somewhat reduced, compared to the norm. If we compare the cases of hemiplegic forms of CP with and without epilepsy, there was more decrease in the density of neurons due to atrophy of neurons of the internal and external pyramidal layers of the cortex. While against this increased density of astrocytes, especially in the external granular, external pyramidal, internal granular and internal pyramidal layers (Photo 2). The abovementioned morphometric changes of the density of neurons and astrocytes were accompanied by significant increase in the astrocytic index. If in the norm this indicator in almost all layers of the cortex averaged 1.35, so in this form of CP, especially with epilepsy, exceeded 2 times (Table 2).

The study of morphometric parameters of the hypothalamus showed that the density of neurons in this form of CP without epilepsy was  $18.2 \pm 1.4$ , with epilepsy —  $14.6 \pm 1.6$  that is lower normal values in 1.4 and 1.6 times, respectively. In the nuclei of the hy-

pothalamus, it is also noted increase in astrocytes density: without epilepsy —  $54.5 \pm 2.2$ , and with epilepsy —  $56.3 \pm 3.6$ . Correspondingly, the astrocytic index increased, amounting to 2.98 and 3.86, respectively (Table 2).

Table 2. – Morphometric parameters of thickness of layers, the density of astrocytes and neurons of the central gyrus of frontal lobe and the hypothalamus of the brain hemisphere affected with hemiplegic form ( $M \pm m$ ,  $m$ , and in pieces)

№	Parameters		Cortical layers						Hypothalamus
			I	II	III	IV	V	VI	
1	Thickness of cortical layers in mkm	Without epilepsy	$217,4 \pm 7,3$	$174,5 \pm 3,2$	$138,5 \pm 3,6$	$234,7 \pm 7,4$	$155,3 \pm 2,6$	$147,4 \pm 2,9$	
		With epilepsy	$211,4 \pm 3,6$ $P < 0,05$	$152,7 \pm 3,2$ $P < 0,05$	$122,6 \pm 1,8$ $P < 0,01$	$231,4 \pm 4,7$ $P < 0,01$	$148,8 \pm 2,9$ $P < 0,05$	$154,6 \pm 2,5$ $P < 0,05$	
2	Density of neurons	Without epilepsy	$28,2 \pm 1,5$	$42,6 \pm 1,6$	$48,4 \pm 2,7$	$54,3 \pm 3,4$	$36,8 \pm 2,3$	$30,3 \pm 1,2$	$18,2 \pm 1,4$
		With epilepsy	$27,8 \pm 1,3$ $P < 0,01$	$40,4 \pm 2,3$ $P < 0,01$	$24,6 \pm 1,6$ $P < 0,05$	$31,4 \pm 2,4$ $P < 0,05$	$32,6 \pm 3,3$ $P < 0,05$	$28,7 \pm 1,5$ $P < 0,01$	$14,6 \pm 1,6$ $P < 0,01$
3	Density of astrocytes	Without epilepsy	$48,3 \pm 1,8$	$61,3 \pm 3,6$	$72,4 \pm 4,8$	$82,2 \pm 5,3$	$63,5 \pm 2,8$	$58,4 \pm 1,9$	$54,5 \pm 2,2$
		With epilepsy	$52,5 \pm 1,6$ $P < 0,01$	$64,2 \pm 3,9$ $P < 0,01$	$66,7 \pm 3,6$ $P < 0,05$	$91,3 \pm 5,3$ $P < 0,05$	$82,4 \pm 4,7$ $P < 0,01$	$64,7 \pm 3,7$ $P < 0,01$	$56,3 \pm 3,6$ $P < 0,01$
4	Astrocytic index	Without epilepsy	1,70	1,44	1,50	1,51	1,72	1,93	2,98
		With epilepsy	1,89	1,58	2,70	2,89	2,52	2,25	3,86

The study of morphometric parameters of the brain in hyperkinetic form of CP showed that, compared with the previous forms, almost all indicators were significantly low, especially in epilepsy. In this case, the thickness of cortex layers reduced, especially in the external and internal pyramidal layers upon accession of epilepsy, and amounted to  $112.6 \pm 2.4$  and  $114.8 \pm 4.2$  mcm, respectively. There was also observed significant reduction of the density of neurons in almost all layers of the cortex, 2-fold reduction in III, IV, V, VI layers. Against these changes was observed increase of astrocytes density in these layers of the cerebral cortex in this form of CP without and with epilepsy. Increase of astrocytes density was accompanied by increase in the astrocytic index of external layer up to internal layer of the cortex in the following values: 1.59, 1.90, 2.73, 3.68,

3.45, 3.59 and in epilepsy 1.60, 1.76, 2.76, 3.46, 2.81, and 2.78, respectively. These parameters are significantly higher than those of the norm (Table 3).

It was mentioned above that in hyperkinetic form of CP the significant pathomorphological changes occur in the subcortical zones of the brain. Accordingly, these changes in morphometric parameters of the hypothalamus were significantly low. Indicators of neurons density upon accession of epilepsy and without it reduced in 2 times and averaged  $12.4 \pm 1.2$  and  $13.8 \pm 1.6$  respectively. In this case, increase of astrocytes density in the nuclear structures of the hypothalamus led to significant increase in the astrocytic index, which amounted to 5.12 and 5.16, respectively, that exceed normal levels in 2–3 times (Table 3).

Table 3. – Morphometric parameters of thickness of layers, the density of astrocytes and neurons of the central gyrus of frontal lobe and the hypothalamus of the brain hemisphere affected with hyperkinetic form ( $M \pm m$ ,  $m$ , and in pieces)

№	Parameters		Cortical layers						Hypothalamus
			I	II	III	IV	V	VI	
1	Thickness of cortical layers in mkm	Without epilepsy	$186,4 \pm 5,3$	$136,5 \pm 3,2$	$117,5 \pm 3,5$	$206,5 \pm 5,4$	$128,4 \pm 3,6$	$147,4 \pm 2,9$	
		With epilepsy	$176,4 \pm 4,3$ $P < 0,05$	$132,5 \pm 3,1$ $P < 0,05$	$112,6 \pm 2,4$ $P < 0,01$	$186,4 \pm 4,7$ $P < 0,01$	$114,8 \pm 4,2$ $P < 0,05$	$144,6 \pm 2,6$ $P < 0,05$	
2	Density of neurons	Without epilepsy	$28,4 \pm 1,5$	$41,3 \pm 2,7$	$34,4 \pm 1,7$	$30,3 \pm 1,4$	$27,6 \pm 1,5$	$23,3 \pm 1,5$	$12,4 \pm 1,2$
		With epilepsy	$26,4 \pm 1,3$ $P < 0,01$	$38,7 \pm 2,3$ $P < 0,01$	$31,6 \pm 1,6$ $P < 0,05$	$27,4 \pm 1,4$ $P < 0,05$	$31,2 \pm 2,3$ $P < 0,05$	$25,5 \pm 1,4$ $P < 0,01$	$13,8 \pm 1,6$ $P < 0,01$
3	Density of astrocytes	Without epilepsy	$45,6 \pm 2,8$	$78,6 \pm 5,6$	$94,4 \pm 5,8$	$112,2 \pm 6,3$	$94,5 \pm 3,8$	$84,6 \pm 3,3$	$64,5 \pm 3,2$
		With epilepsy	$42,5 \pm 2,6$ $P < 0,01$	$68,6 \pm 5,9$ $P < 0,01$	$86,7 \pm 6,6$ $P < 0,05$	$94,8 \pm 5,9$ $P < 0,05$	$88,4 \pm 4,7$ $P < 0,01$	$71,7 \pm 3,7$ $P < 0,01$	$71,3 \pm 4,6$ $P < 0,01$
4	Astrocytic index	Without epilepsy	1,59	1,90	2,73	3,68	3,45	3,59	5,12
		With epilepsy	1,60	1,76	2,76	3,46	2,81	2,78	5,16

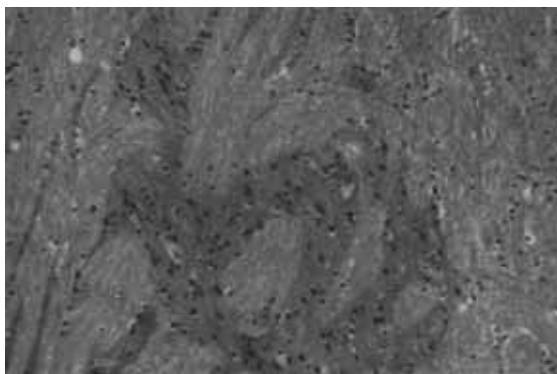


Figure 3. 8.6-year-old patient with cerebral palsy, epilepsy and heterotopia. Extension of the acellular layer in the cortex, reduction of cells in the middle layers, formation of focus of gliosis. Staining with hematoxylin and eosin, 10x10

Thus, results of morphometric studies of the brain in some forms of CP with epilepsy showed a broad scope of significant deviations in the thickness of layers, density of neurons and astrocytes in them and the astrocytic index. Significant reduction of the thickness of pyramidal cell layers of the cortex, the density of neurons and significant increase in astrocytes density indicate the presence of atrophic changes of parenchymatous elements and the development of hyperplasia of glial cells in the cortical tissue. In mostly studied hyperkinetic form of CP significant morphological abnormalities were observed in the hypothalamus with decrease in the density

of neurons in 2 times, increase in astrocytes density in 1.5 times and significant increase of the astrocytic index as at the accession of epilepsy and without it. These morphometric parameters confirmed pathological changes in the form of atrophy, degeneration and gliosis that develop in different forms of CP in the cerebral cortex and subcortical areas of the brain (Photo 3).

#### Conclusions

1. Micropolygyria is the most frequent malformation of the brain in patients with cerebral palsy, morphologically manifested in the form of small, rounded gyrus with deep sulcus. In the presence of epilepsy is marked thinning of the gray matter, expansion of ventricles and occurrence of foci of hemorrhages, which probably are of secondary origin. Micropolygyria with cerebral palsy with epilepsy is manifested by underdevelopment of nerve cells, preserving the signs of neuroblasts, their chaotic arrangement and predominating diffuse gliosis.

2. At the cellular level, microscopic signs appeared as delay of the development and differentiation of nerve cells, appearance of acellular fields, and disorderly arrangement of nerve cells with unequal content of tiger substance. These changes are most pronounced in patients with cerebral palsy, complicated by epileptic seizures.

3. The revealed morphological findings that, in general, shows the most degree of immaturity of the brain of children with cerebral palsy and epileptic seizures may underlie the defect in brake mechanisms of the brain, which causes the appearance of epileptic foci.

#### References

1. К вопросу об эффективности профилактики инвалидности у новорожденных с низкой массой тела при рождении (To the question about the effectiveness of disability prevention in newborns with low body weight at birth)/А. Н. Коломенская, А. В. Ляхович, Ю. А. Долгов [и др.] A. N. Kolomensky, A. V. Lyakhovich, J. A. Dolgov [et al.]//Врач и информационные технологии. Doctor and information technology. – 2011. – № 3. – P. 51–57.
2. Неврология недоношенных детей. Neurology of preterm infants./А. Б. Пальчик, Л. Р. Федорова, А. Е. Понятишин. А. В. Palchik, L. R. Fedorova, A. E. Ponyatishin. – М.: MEDpress-inform, 2010. – 352 p.
3. Развитие нервной системы у детей в норме и патологии. Development of the nervous system in children in norm and pathology./И. А. Скворцов, Н. А. Ермоленко. I. A. Skvortsov, N. A. Yermolenko//М.: MEDpress-inform, 2003. – 368 p.
4. Неврологические проблемы детей, рожденных с экстремально низкой массой тела. Neurological problems of children born with extremely low body weight/Н. Р. Фатыхова, В. Ф. Прусаков. N. R. Fatykhova, V. F. Prusakov.//Практическая медицина. Practical-cal medicine. – 2010. – № 7 (46). – P. 136.
5. Кинестетические характеристики вертикальной устойчивости больных детским церебральным параличом. Kinesthetic characteristics of vertical stability in patients with cerebral palsy/А. Б. Яворский, Е. Г. Сологубов, С. А. Немкова. А. В. Yavorski, E. G. Sologubov, S. A. Nemkova.//Журнал неврологии и психиатрии. Journal of neurology and psychiatry. – 2004. – № 2. – P. 55–58.
6. Functional therapy for children with cerebral palsy: An ecological approach/L. E. Ahl, E. Johansson, T. Granat, E. B. Carlberg//Dev. Med. Child. Neurol.-2005.-Vol. 47, No. 9. – P. 613–619.
7. Ceschin R., Lee V. K., Schmithorst V., Panigrahy A. Regional vulnerability of longitudinal cortical connectivity association: Associated with structural network topology alterations in preterm children with cerebral palsy//Neuroimage Clin. – 2015. – Vol. 9. – P. 322–337.
8. Perivier M., Delion M., Chinier E., Loustau S., Nguyen S., Ter Minassian A., Richard I. M. Dinomais Relationship between somatosensory deficit and brain somatosensory system after early brain lesion: A morphometric study//Eur J Paediatr Neurol. – 2016 May. – Vol. 20 (3). – P. 403–411.
9. Visual performances and brain structures in the developing brain of preterm infants/L. A. Ramenghu, D. Ricci, E. Mercuri et al.//Early Hum. Dev. – 2010. – Vol. 12. – P. 45.
10. Cortical reorganization induced by virtual reality therapy in a child with hemiparetic cerebral palsy/S. H. You, S. H. Jang, Y. H. Kim//Dev Med Child Neurol. – 2005. – Vol. 47, No. 9. – P. 628–635.

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## Monitoring of frequency of sinusitis in diagrams

**Abstract:** In recent years more and more authors indicate an increase in frequency of sinusitis that take first place among ENT diseases. Approximately 5–15% of adults and 5% of children suffer from some forms of sinusitis. Approximately 10–15% of patients with rhinosinusitis, arising on a background of acute respiratory infection, take chronic forms. We analyzed the dynamics and frequency of sinusitis in last 5 years. Data are distributed by periods (years), forms of inflammation, the volume of the inflammatory process. A comparative analysis of the frequency of sinusitis for years, months was carried out. In terms of frequency as in acute as in chronic sinusitis the predominant lesion was in maxillary sinuses and the second place took ethmoid sinuses.

**Keywords:** sinusitis, dynamics, frequency.

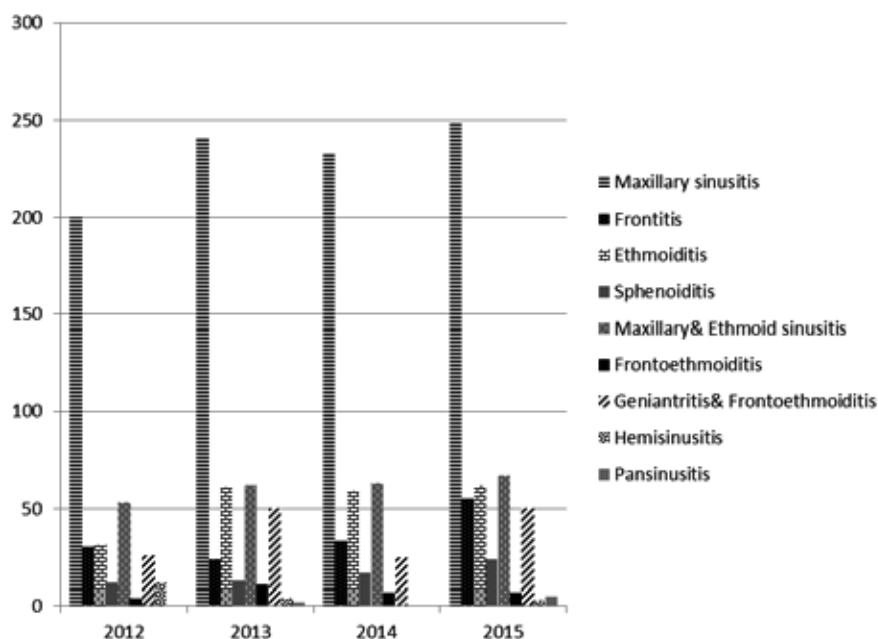
In recent years more and more authors indicate an increase in frequency of sinusitis that take first place among ENT diseases. Nowadays the problem of inflammatory diseases of the paranasal sinuses (PNS) remains relevant and has social importance [3; 8]. According to various epidemiological studies conducted in more than 30 countries, the incidence of rhinosinusitis in recent decades has increased almost 3 times, and the proportion of hospitalized patients increases annually by an average of 1.5–2% [7; 9]. Approximately 5–15% of adults and 5% of children suffer from some form of sinusitis [4]. An increment of inflammatory diseases of PNS is largely due to serious environmental problems, in particular because of significantly increased pollution of the air, growth of the number of respiratory infections, the quantity of inhaled allergens, reducing the reserve capacity of the mucosa of the upper respiratory tract, increasingly growing resistance of microflora as a result of a broad and irrational use of antibiotics [5]. It is believed that from about 0.5% to 2% of the cases of acute respiratory viral infections are complicated by bacterial infection of PNS [11; 12], but there are higher figures — more than 3% [6; 10; 14]. Acute rhinosinusitis characterized by an increasingly growing trend towards prolonged, subacute and recurrent course followed by chronicity of the pathological process of PNS, the spread of infection

within the respiratory tract. Approximately 10–15% of patients with rhinosinusitis, arising on a background of acute respiratory infection, take chronic forms [4]. Despite the development of effective methods of treatment and new broad spectrum antibiotics chronicity of inflammatory process in paranasal sinuses is not reduced.

**The aim of this study.** Analysis of the dynamics and frequency of sinusitis in last 5 years.

**Subject of study.** The study included archival materials of ENT department of clinic hospital in Tashkent where patients were treated with various forms of sinusitis for the period from 2011 to 2015. The number of patients with sinusitis pathology is 1697. All patients passed general clinical and rhinological research methods to establish a final diagnosis. The clinic adheres to the classification of sinusitis by Piskunovs.

**Results and discussion.** Data are distributed by periods (years), forms of inflammation, the volume of the inflammatory process. A comparative analysis of the frequency of sinusitis for years, months was carried out. There was made an attempt to investigate the relationship between the frequency of sinusitis with weather conditions. According to our data sinusitis has not always ascending growth. This is clearly showed in Figure 1.



Graph 1. The frequency of sinusitis for years

In 2011, the number of sinusitis had a tendency to decrease. Reducing of the frequency of sinusitis can be linked to some degree of weather factors. The weather in Central Asia changes often suddenly and this affects acceleration of acute respiratory infections of the upper respiratory tract and other comorbidities. With stable bottom temperature the occurrence of acute respiratory disease, acute respiratory viral infections, therefore, sinusitis decreases. Exactly in 2011 there was the least temperature fall in

autumn-spring periods in comparison to the last 10 years. Sinusitis except previously mentioned classification were assigned to monosinusitis (isolated inflammation of one sinus) and polysinusitis (an inflammation of two and more sinuses).

The number of patients with monosinusitis is 1216, representing 71.66% of the total number of sinusitis. The main part of monosinusitis forms an acute inflammation of the maxillary sinus, followed by frontal sinusitis, further ethmoiditis and sphenoiditis.

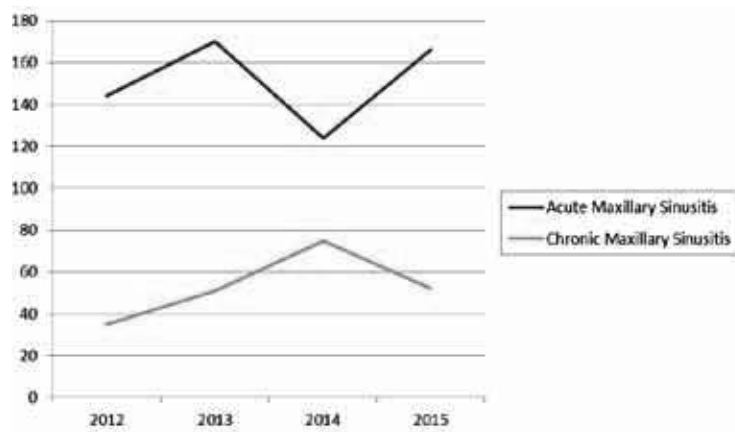
Table 1. – The frequency of sinusitis in nosological forms.

	Maxillary sinusitis		Frontitis		Ethmoiditis		Sphenoiditis		Polysinusitis	
	Ac.	Chr.	Ac.	Chr.	Ac.	Chr.	Ac.	Chr.	Ac.	Chr.
2012	144	36	24	1	6	21	–	1	80	14
2013	170	51	13	2	3	51	3	1	179	12
2014	124	75	27	3	3	52	1	6	84	13
2015	166	52	44	7	2	54	14	6	138	23

As can be seen from the Graph 2, as always, the maxillary sinus leads among the frequency of sinusitis inflammation. In chronic course this pattern persists as chronic maxillary sinusitis takes 20,48% (230 patients) among chronic monosinusitis. Comparatively few cases of isolated inflammation occur in frontal and sphenoid sinuses.

Combined lesion of the paranasal sinuses — polysinusitis are the most common diseases of the paranasal sinuses and has a ten-

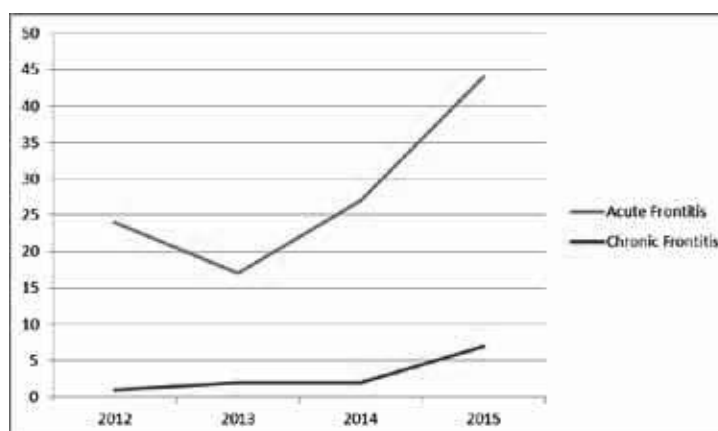
dency to growth not equally but unevenly. In the analysis of the frequency of unilateral or bilateral inflammation of the maxillary sinus we received the following data: acute maxillary sinusitis occurs most of all while chronic inflammation of the maxillary sinus is not frequent. This may be related to the use of rational therapy. According to our data chronicity of inflammation in the sinuses has a tendency to decrease.



Graph 2. The frequency and the form of maxillary sinusitis by periods

Earlier on the second place in frequency of sinusitis was sinusitis of cells of ethmoidal labyrinth, while the last time frontitis is more often revealed in practice. Acute frontitis diagnosed more as it related to the clinical course of frontal sinusitis. As it is known, frontal sinus-

itis occur with bright signs accompanied by pain syndrome. Patients are forced to seek medical advice in the early stages of the disease. A well-designed treatment strategy prevents the development of chronic process in the frontal sinus. It can be seen in Graph № 3.



Graph 3. The frequency and form of frontitis by periods

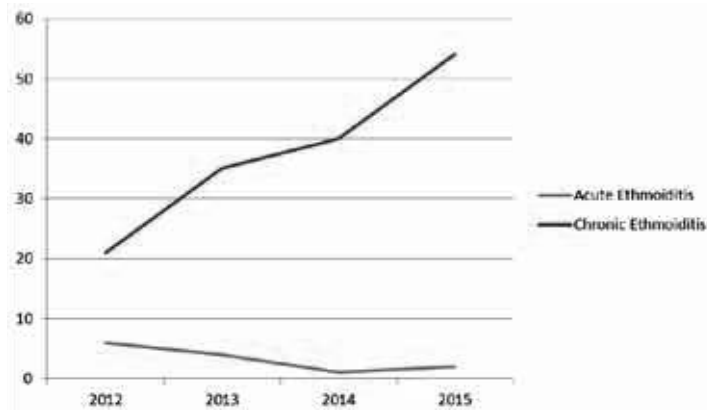
Unlike other sinusitis, chronic ethmoiditis markedly exceeds acute one. In our opinion this is due to the fact that acute ethmoiditis are not always diagnosed. Acute inflammation of the cells

of ethmoidal labyrinth has a poor clinical presentation masked by clinic of acute respiratory viral infection, acute respiratory diseases.



Etmoiditis are often unnoticed and are a random finding on radiologic diagnostic of the paranasal sinuses, brain. Acute inflammation and allergic process untreated in time will undoubtedly lead to chronization and mucosal proliferation of ethmoidal labyrinth

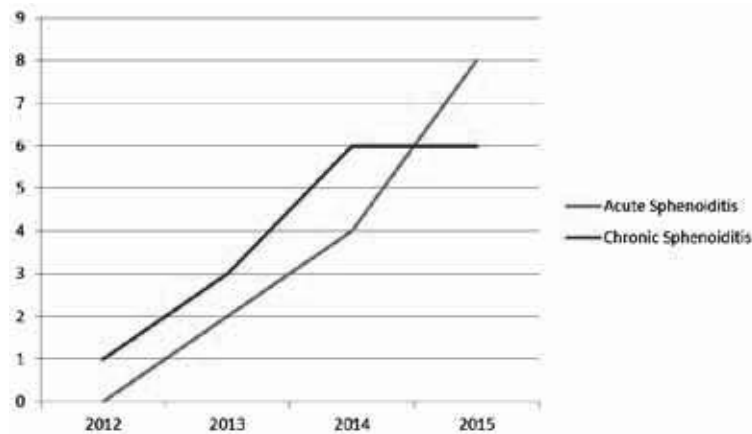
cells. The heading “chronic ethmoiditis” includes also a polypoid inflammation of the cells of the labyrinth, and the percentage of this disease increases significantly (Graph 4).



Graph 4. The frequency and forms of etmoiditis by periods

Deep location of basic sinus does not excludes its inflammation, but in practice sphenoiditis considered a relatively rare disease. As noted by many authors, sphenoiditis has a polymorphic clinic reminding neurological, ophthalmological, neurosurgical diseases. The main methods of diagnosis of sphenoiditis are CT, MRI [1; 2]. Since the introduction of these techniques, the detection of sphenoiditis had

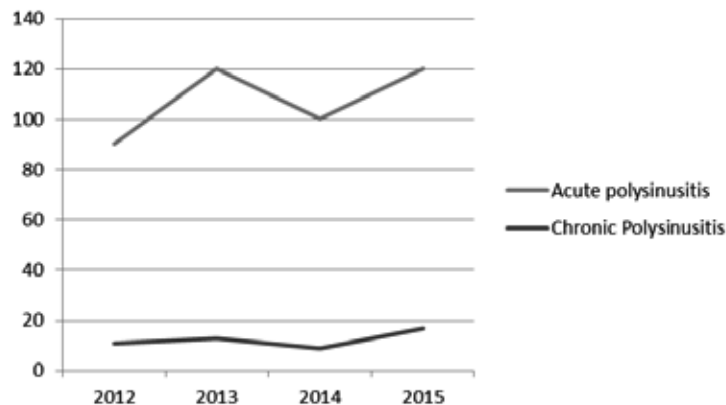
sharply increased. As the Graph № 6 shows the main part of sphenoiditis forms a chronic form of inflammation. This points again to the late diagnosis, frequent recurrence after conservative therapy. As a result, chronicity of inflammatory process in the basic sinus becomes more frequent. Our experience shows that it is needed to treat sphenoiditis surgically, i. e. by expansion of the natural anastomosis.



Graph 5. The frequency and forms of sphenoiditis by periods

According to our opinion, polisinusitis play an important role in increased frequency of sinusitis. The main share of sinusitis comes exactly to polisinusitis. In terms of frequency they ranked the second place after maxillary sinusitis. The modern methods

of investigation of the paranasal sinuses such as computed tomography, magnetic resonance tomography give an objective data of the status of all sinuses simultaneously, and the combined defeat of several paranasal sinuses often detected.



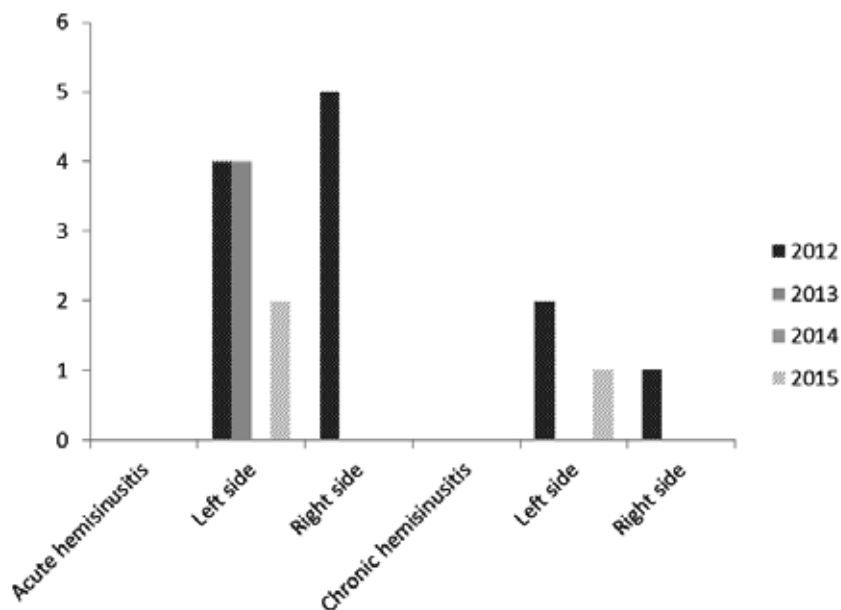
Graph 6. The frequency and forms of polisinusitis by periods

Sphenoethmoiditis and Antrosphenoethmoiditis were not revealed.

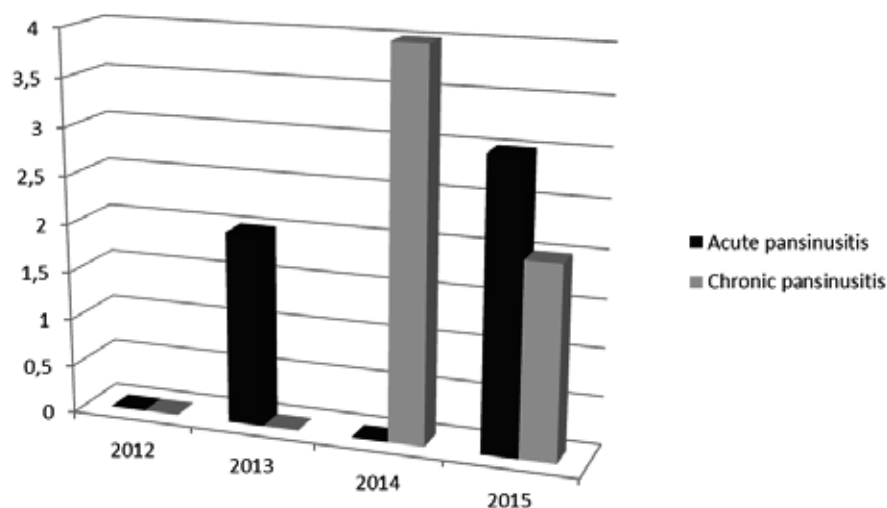
**Conclusion:** The frequency of sinusitis is undoubtedly growing in a large period (5–10 years). In a short period of time

the number of patients with sinusitis may decrease. In terms of frequency as in acute as in chronic sinusitis the predominant lesion was in maxillary sinuses and the second place took ethmoid

sinuses. An increased prevalence of disease of the paranasal sinuses is mainly due to the combined lesions of several cavities simultaneously.



Graph 7. The frequency and forms of hemisinusitis by periods



Graph 8. The frequency and forms of pansinusitis by periods

#### References:

1. Kiselev A. S. Features of high-resolution computed tomography and visualization of anatomic structure of a ethmoidal labyrinth/A. S. Kiselev, D. V. Rudenko, I. F. Fedorova, etc.//Russian Rhinology. –1999. –№ 3. P. 10–15.
2. Kozlov V. S., Shilenkova V. V., Shilenkov A. A. Consilium medicum. 2003; 53.
3. Kozlov V. S. Russian Rhinology. 2003; 3: 20–4.
4. Lopatin A. S. Magnetic resonance imaging and examination of the nasal cavity and paranasal sinuses/A. S. Lopatin, M. V. Artsibashева//Russian rhinology. – 1996. – № 5. – SZ–14.
5. Lopatin A. S. Russian Medical Journal, 2000; 8 (5).
6. Lyutova N. V., Piskunov G. Z. Russian Rhinology. 2008; 2: 17.
7. Morozov S. A., Kaznacheeva S. V., Novikova N. V., Kuznetsova O. N. Russian Rhinology. – 2002; 2: 105–8.
8. Ovchinnikov A. Yu., Ponyakina M. A., Kolbanova I. G. Consilium medicum. – 2005; 7: 10.
9. Piskunov G. Z. Clinical Rhinology – 2002, P. 225–233.
10. Sakovich A. R., Perminov A. B. ARS medica. – 2009; 2: 48–49.
11. Stratchounski L. S., Kamanin E. I. Russian Medical Journal. – 1998; 6: 684–93.
12. Tarasov A. A., Kamanin E. I., Kryukov A. I., Stratchounski L. S. Bulletin of Otorhinolaryngology. – 2003; 2: 47–54.
13. Anand V. K. Annals of Otorhinolaryngology. Suppl. – 2004; (193): 3–5.
14. Durr D. G., Desrosiers, M. Y., Dassa, C. J Otolaryngol – 2001; 30 (2): 93–732.

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## The results of phaco-vitreotomy in patients with proliferative diabetic retinopathy

**Abstract:** In the present research, we considered the effect of diabetic cataract and various variants of its surgical treatment (PHACO+IOL) on structural functional condition of eyes with PDR, which had been subjected to vitreoretinal surgery.

In the process of the research, it was established that the cataract surgery by way of PHACO+IOL, neither isolated, nor in the form of simultaneous operation together with vitrectomy or removal of silicone oil, has no effect on functional outcomes of vitreoretinal surgery of proliferative diabetic retinopathy, level of intraocular pressure and frequency of development of intravitreal hemorrhages.

**Keywords:** proliferative diabetic retinopathy, diabetic cataract, phacoemulsification, vitreoretinal surgery.

One of late ophthalmological complications of diabetes includes opacity of transparent lens — development of diabetic cataract. It is related to both, the change of chemical activity of aqueous humor and phenomenon of «sorbitol shunt», which leads to the increase of osmotic properties of lenticular masses, and, with intraocular hemorrhages, development of intraocular hypertension and different ophthalmological interferences — silicone oil tamponade, intravitreal injection of different drugs etc. [1, 868–73].

**Goal of the research:** study the effect of diabetic cataract and various variants of its surgical treatment (PHACO+IOL) on structural functional condition of eyes with PDR, which had been subjected to vitreoretinal surgery.

**Material and method of research.** The research included 160 patients (200 eyes) with diabetes complicated with grade IV diabetic retinopathy (proliferative diabetic retinopathy — PDR) admitted for surgical treatment at the clinic of eye microsurgery LLC «KuzTibServis» (Tashkent) and Eye center in Samarkand. All patients were divided into two clinical groups depending on the preceding laser coagulation: the PLC+ group included 116 eyes, on which laser photocoagulation was performed at grade III and early IV of PDR; the group PLC- included 84 eyes without preceding laser coagulation. The indications for operative treatment were: intravitreal hemorrhages that did not resolve within 3–6 months without traction retinal detachment (within 4–6 weeks in case of grade I diabetes or bilateral damage); traction retinal detachment; progressing neovascularization despite pan-retinal laser photocoagulation, massive pre-macular hemorrhage, macula detachment, pre-macular fibrosis, combined retinal detachment, media opacity (including cataract, opacity of posterior capsular, vitreous opacity making laser photocoagulation difficult, neovascularization of iris, anterior hyaloid proliferation, macular edema resistant to laser photocoagulation). All patients included in the research underwent vitreal surgical interference.

Complete ophthalmological examination was performed during primary consultation of the patients on 1, 3 and 10 days

post operation. Long-term results were evaluated after 3, 6, 9 and 12 months. The examination included the determination of the sharpness of vision, IOP, conditions of anterior chamber, lens, posterior chamber and retina.

**Results of the research and discussion.** Out of 200 eyes included in the present research, 32 (16%, group IOL) were pseudophakic (operation was performed not less than 2 month prior to the inclusion in the research); 26 eyes (13%, group PS) preserved transparent lens till the end of the research. Other eyes, during the period of observation, were subject to phacoemulsification with IOL implantation: on 100 eyes (50%, group PHACO+IOL+VIT) simultaneously with vitrectomy, on 28 eyes (14%, group PHACO+IOL+RemSO) simultaneously with the removal of silicone oil and on 14 eyes (7%, group PHACO+IOL) in the form of isolated interference.

The comparison of sharpness of vision in the groups of patients divided according to the need for cataract surgery revealed the following regularities: although, initial sharpness of vision was comparable in all groups, the sharpness of vision reduced (n/d compared to the initial data) on the next day post operation in the group PHACO+IOL+RemSO, while it increased in the other groups (accurately with initial data in the group PHACO+IOL+VIT —  $p < 0,001$  and in the group PS —  $p < 0,05$ , n/d in the other groups). As a result, by the 1<sup>st</sup> post-operation day, the sharpness of vision in the patients of the group PHACO+IOL+RemSO was significantly lower than in the other groups ( $p < 0,05$  with the groups IOL and PS and  $p < 0,001$  with the group PHACO+IOL+VIT). Apparently, this difference is explained by the fact that in this group, all patients received silicone oil and in the processes of tamponing, increased intraocular pressure is created. Going forward, the sharpness of vision was progressively increasing in all groups; herewith, in the group PHACO+IOL+RemSO, it remained significantly lower than in the groups PHACO+IOL+VIT and PS. Some reduction was noted by the 3<sup>rd</sup> month of observation in the group of patients, who had cataract surgery against the background of the removal of SO, which is

also related to the increase of IOP and lens opacity, which is proved by the augmentation of vision sharpness in the future after the removal of the second operation.

The analysis of IOP depending on the time of cataract surgery demonstrated that IOP was lower in the patients, who preserved the transparent lens throughout the period of observation, compared to the groups of patients, who underwent cataract surgery: thus, during the different periods, the significance of difference with the group IOL accounted for  $p < 0,05$  initially and  $p < 0,01$  by the end of the 1<sup>st</sup> month, with the group PHACO+IOL+VIT —  $p < 0,01$  initially and  $p < 0,001$  during the rest of the period, with the group PHACO+IOL+RemIOL —  $p < 0,01$  by the end of the first month of observation and with the group PHACO+IOL —  $p < 0,05$  by the end of the 6<sup>th</sup> month of observation.

The share of the patients, who underwent PLC, was comparable in all groups. Also, groups didn't differ in the frequency of occurrence of arterial hypertension, diabetic nephropathy and renal disease, as well as the levels of arterial pressure (SBP and DBP), concentration of urea and creatinine in the peripheral blood and blood sugar concentration. In the group of patients who preserved the transparent lens, the patients with hypertonic crises were slightly rarer. A relatively more stable hypo-dynamics in this group of patients also contributed to the preservation of metabolism of lenticular masses.

Frequency-based comparison of the groups according to the indications for vitreoretinal interference demonstrated the difference in the frequency of occurrence of intravitreal hemorrhages (maximally in patients, who required simultaneous cataract surgery and vitrectomy — 48%). Lens opacity against the background of intravitreal hemorrhages is explained by negative effect of blood components on lens physiology as well as the tendency for the increase of intraocular pressure (ghost-cell glaucoma) against the background of intravitreal hemorrhages. However, one should note paradoxically high frequency of intravitreal hemorrhages that drove the need in vitrectomy in patients, who preserved transparent lens throughout the entire observation period (46%). Taking into

account the fact that in this group of eyes, minimal value of IOP was noted, the possible explanation can be the following scenario: in the eyes with massive non-relapsive hemorrhages due to incontinuous anamnesis of PDR, significant tractions fail to develop and in the process of vitreoretinal surgery, there is a rarer need in tamponade of the vitreous cavity. The most rare cases of intravitreal hemorrhages were observed in the group of patients, on whom PHACO+IOL was performed in isolation (14%), i. e. neither by the time of vitrectomy, nor by the time of removal of SO, significant lens opacity was not noted and the development of cataract was determined by metabolic disruptions of aqueous humor related to the main disease. In respect of the frequency of occurrence of other indications for vitrectomy, the groups didn't differ.

Also, we assessed the frequency of application of vitreous cavity tamponade with silicone oil. It was established that in the group of patients with pseudophakia at the moment of inclusion in the research, SO tamponade was used in 50% of cases; in the group of simultaneous cataract surgery and vitrectomy — in 42% of cases and significantly rarer in patients, who preserved transparent lens (chi-square = 44,68,  $p < 0,001$ ). Otherwise, neither the duration of vitrectomy (in the group IOL —  $79,75 \pm 3,13$  minutes, PHACO+IOL+VIT —  $77,00 \pm 2,34$  minutes, PHACO+IOL+RemSO —  $77,93 \pm 3,69$  minutes, PHACO+IOL —  $70,43 \pm 8,27$ , PS —  $79,15 \pm 4,84$ , differences are insignificant), nor the frequency of intra-operational hemorrhagic complications were different between the groups.

In the process of observation, the shares of patients, who required repeated surgical interference (lavage of anterior chamber or re-vitrectomy), were comparable in all groups divided according to cataract surgery.

Thus, the present research showed that surgery by cataract method PHACO+IOL, neither isolated, nor in the form of simultaneous operation together with vitrectomy or removal of silicone oil, has no effect on functional outcomes of vitreoretinal surgery of proliferative diabetic retinopathy, level of intraocular pressure and frequency of development of intravitreal hemorrhages [2, 31–8; 3, 954–60].

#### References:

1. Park S.P., Ahn J.K., Lee G.H. Morphologic changes in the anterior segment after phacovitrectomy for proliferative diabetic retinopathy//J Cataract Refract Surg. – 2009 May;35 (5): 868–73.
2. Rivas-Aguiño P., García-Amaris R.A., Berrocal M.H., Sánchez J.G., Rivas A., Arévalo J.F. Pars plana vitrectomy, phacoemulsification and intraocular lens implantation for the management of cataract and proliferative diabetic retinopathy: comparison of a combined versus two-step surgical approach//Arch Soc Esp Ophthalmol. – 2009 Jan; 84 (1): 31–8.
3. Shen Y.D., Yang C.M. Extended silicone oil tamponade in primary vitrectomy for complex retinal detachment in proliferative diabetic retinopathy: a long-term follow-up study//Eur J Ophthalmol. – 2007 Nov-Dec; 17 (6): 954–60.

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## Morphometric changes in the central body of immune system after effect of automobile exhaust gases

**Abstract:** We studied influence of the acute, subacute and chronic influence of exhaust gases of engines on the stereometric parameters of volumetric lobes of cortical and medullar matter of the thymus and also change of the volume of lymphocytes' nuclei of the cortical and medullar matter and volume of the cells of thymic reticuloepithelium in the rats. We used 185 white rats of both sexes in the result of research we revealed that acute, subacute and chronic effect of the exhaust gases in the structures of thymus results in impairments, which are expressed in change or decrease in the volumetric-lobular interrelations of the thymic structures and reduction of the lymphocyte nuclei volumes of the cortical and medullar matter.

**Keywords:** LC — lethal concentration, EG — exhaust gases, VS — volumetric share.

The increase of quantity of a vehicle in cities and occupied items results in the appropriate increase in air of exhaust gases rendering negative influence on the human and environment [1; 3; 6; 8; 9; 10].

The exhaust gases contain a plenty of various toxic components, including carbon oxide, nitrogen oxides, numerous groups of carbohydrates, aldehydes etc. In case of application of ethylated benzenes the toxic compounds of lead formed [11; 12].

Influence of all these compounds even in the small concentrations contribute to increase of the special weight of the latent, less symptom forms of intoxication, requiring new approaches to study their pathogenesis and diagnostics [13].

At realization of sanitary — hygienic researches the significant pollution of air of cities by exhaust gases of engines was established. Under these conditions there are often develop acute and chronic intoxications [2; 7]. The deficit state of the immune status seems to be one of the pathogenic reasons of such adverse influence of exhaust gases on the human body. Taking into account, that immunologic function is closely connected to morphology of the immune system, i. e. in many respects is caused by its anatomic-physiological organization, the role of morphological researches of immune system becomes clear [4; 5].

**The Purpose of research.** To reveal morphometric changes in the thymus of rats after acute, subacute and chronic effect of exhaust gases of engines of motor vehicles.

### Materials and methods of research

For the experimental analysis of effect of exhaust gases (EG) on the bodies of immune system there were used 185 white rats of the both sexes, of weight 160–180 gr., of 4–6 months of age. The seeding of animals with EG was made in the chamber of volume 50 litres within 4 hours. The change of a gas mix in the chamber was made every 15 minutes. The acute effect was performed with two seedings of animals during 2 and 5 days in a doze 1/50 of lethal concentration in recalculation per CO. Subacute effect was achieved by monthly seeding of animals every day in a doze 1/100 of lethal concentration. Chronic influence was carried out with seeding for

4 months of animals in a doze 1/200 of lethal concentration. The animals of all groups were studied under the standard conditions of vivarium with free access to water and food.

For researches there were investigated slices of bodies. The isolated slices were fixed in 10% solution neutral formalin and liquid of Carnua. They were studied with use of general common methods with subsequent embedding into paraffin. The paraffin blocks cut on the sled microtome, receiving slices of thickness 4–6 microns. For study of general structure of body the preparations were stained with hematoxiline-eosin. In order to obtain the characteristic findings of spleen structure the share of slice was stained with azur II — eosin by Van Gison.

The measurement of lymphocyte nuclei and cytoplasm of the reticular cells with following calculation of the nuclei volumes of the cells was carried out with use of ocular — of micrometer — 7x with point of division of the ruler 13,3 microns at increase of objective — 9x. There were measured till 25 nucleuses and cells of each type and calculated the mean arithmetic value of their volume. The calculation of nuclei and cells volumes was made by formulae:  $V = LB^2/6$ , where "L" and "B" — are axes of an ellipse of slice of a nucleus or cell.

Definition of the volumetric relations of the thymus tissue components was made with use of ocular measuring mesh for cytological investigations of G. G. Avtandilov (1972). The mesh was applied on the slice calculating per 1000 points, under the formula:  $p = (m 100)/n$ , where "m" — number of points being equal to an investigated component, "n" — number of all points. The value "p" was expressed in percentage.

The mathematical data processing was spent by methods of variational statistics with the help of standard mathematical packages of the applied programs with definition mean value, its error, Student's t-criterion.

### Results of research

In the table № 1 there were presented stereometric data about volumetric shares of the thymus components of cortical and cerebral matters acute effect of the exhaust.

In the cortical matter the volumetric share of lymphocytes in comparison with control group reduced. The significant increase of volumetric share of vessels which accounted for in the control group  $1,85 \pm 0,08\%$ , after acute effect was  $3,85 \pm 0,18\%$  appeared to be of special interest. The volumetric share of stroma expressed some tendency to increase. In the medullar matter of thymus after acute effect of the exhaust gases the volumetric share of lymphocytes in-

crease insignificantly, and the volumetric share of vessels, being in the control group  $2,57 \pm 0,11\%$ , after acute effect it reliably increased and accounted for  $4,38 \pm 0,21\%$ .

Thus, it is possible to note, that the acute effect of exhaust gases insignificantly influencing on volumetric shares of lymphocytes and stroma, resulted in significant increase in volumetric share of vessels in the cortical and medullar matters of thymus.

Table 1. – The stereometric data about volumetric shares of the thymus components of the cortical and cerebral matters in the control, after acute, subacute and chronic effect of exhaust gases (VS, %)

Group	Lymphocytes	Vessels	Stroma
<i>Cortical matter</i>			
Control	$87,24 \pm 4,24$	$1,85 \pm 0,08$	$10,91 \pm 0,55$
Acute effect	$84,17 \pm 4,16$	$3,85 \pm 0,18^*$	$11,98 \pm 0,57$
Subacute effect	$82,47 \pm 3,95$	$2,93 \pm 0,15^*$	$14,60 \pm 0,69^*$
Chronic effect	$86,28 \pm 4,16$	$2,31 \pm 0,11^*$	$11,41 \pm 0,55$
<i>Medullar matter</i>			
Control	$61,73 \pm 3,06$	$2,57 \pm 0,11$	$35,70 \pm 1,75$
Acute effect	$63,25 \pm 3,14$	$4,38 \pm 0,21^*$	$32,37 \pm 1,50$
Subacute effect	$59,48 \pm 2,70$	$3,94 \pm 0,19^*$	$36,58 \pm 1,83$
Chronic effect	$62,26 \pm 3,10$	$2,76 \pm 0,13$	$34,98 \pm 1,72$

Note: \*  $p < 0,05$ , — the reliability is designed in relation to the control

After subacute effect of the exhaust gases in the cortical matter of thymus in comparison with control group the attention is attracted by decrease of a volumetric share of lymphocytes. The volumetric share of vessels, component in control group  $1,85 \pm 0,08\%$ , after effect reliably grows and makes  $2,93 \pm 0,15\%$ . The volumetric share of stroma, making in the control  $10,91 \pm 0,55\%$ , is reliably increased up to  $14,60 \pm 0,69\%$ . In the medullar matter the tendency appeared to lowering of the volumetric share of lymphocytes. The reliable increase of the volumetric share of the vessels, which accounted for  $3,94 \pm 0,19\%$  is of special interest. The volumetric share of stroma changed insignificantly.

Thus, after subacute effect of exhaust gases in the cortical a medullar matters of the thymus there is noted reduction of the volumetric share of lymphocytes and increase of the volumetric shares of vessels and stroma.

After chronic influence of exhaust gases in the cortical matter the volumetric share of lymphocytes changed insignificantly. The volumetric share of vessels grows up to  $2,31 \pm 0,11\%$ . The tendency to increase of a volumetric share of stroma is recorded. In the medullar matter there is found the insignificant increase of a volumetric share of lymphocytes and vessels.

Thus, in the cortical and medullar matters of the thymus after chronic exposure there are noted some changes in the volumetric share interrelations. In this case the increase of a volumetric share of vessels is most expressed.

Table 2. – Volume of lymphocyte nuclei of the cortical, medullar matter and volume of reticuloepithelial cells of the thymus in rats in the control and after acute, subacute and chronic exposure to the exhaust gases ( $\text{mcm}^3$ )

Group	Lymphocytes of the cortical matter	Lymphocytes of the medullar matter	Reticuloepithelial cells
	<i>Acute effect of EG</i>		
Control	$16,12 \pm 0,79$	$33,78 \pm 1,67$	$112,18 \pm 5,57$
2 day killing	$12,56 \pm 0,60^*$	$26,15 \pm 1,27^*$	$103,27 \pm 5,09$
5 day killing	$15,23 \pm 0,74$	$29,68 \pm 1,48$	$114,35 \pm 5,64$
<i>Subacute effect of EG</i>			
Control	$16,78 \pm 0,84$	$32,56 \pm 1,64$	$114,37 \pm 5,73$
Studied group	$11,97 \pm 0,62^*$	$24,75 \pm 1,25^*$	$104,22 \pm 5,23$
<i>Chronic effect of EG</i>			
Control	$16,56 \pm 0,82$	$34,19 \pm 1,62$	$112,78 \pm 5,63$
Studied group	$13,28 \pm 0,65^*$	$31,24 \pm 1,54$	$109,37 \pm 5,37$

Note: \*  $p < 0,05$ ,: the reliability is designed in relation to the control

In the medullar matter of thymus the lymphocyte nuclei volume accounted for  $24,75 \pm 1,25 \text{ mcm}^3$ . Average volume of the reticuloepithelial cells was  $104,22 \pm 5,23 \text{ mcm}^3$ .

Thus, it is noted, that after subacute effect of the exhaust gases there is a decrease of average volume of the lymphocytes nucleuses of the cortical and medullar matters of the thymus, as well of the volume of the reticuloepithelial cells.

After chronic effect of EG it may be noted reliable reduction of the lymphocyte nuclei volume in the thymus cortical matter, which accounted for  $13,28 \pm 0,65 \text{ mcm}^3$ . At the same time there is noted reduction of the volume of the lymphocyte nuclei

of the medullar matter. The volume of the reticuloepithelial cells changed insignificantly.

Thus, after chronic influence of the exhaust gases the decrease of volume of lymphocyte nucleuses of the cortical and medullar matters has been observed.

The research performed has shown that acute, subacute and chronic effect of the exhaust gases in the thymus structure resulted in impairments which were expressed in the change or decrease in the volumetric-share interrelations of the thymus structures and reduction of the volume of lymphocyte nuclei of the cortical and medullar matters.

### References:

1. Antonov K. L., Konstantinova E. D., Varaksin A. N. Effect of emissions of a vehicle on health of children of Ekaterinburg//Hyg. And San. – Moscow. – 2007. – № 5. – P. 28–32.
2. Bogovskiy C., Musika V., Ryazanov V et al. Biomarkers and occupational monitoring of the effect of the exhaust gases of the diesel motors on the body//Medicine of labor and industrial ecology. – 2004. – № 8. – P. 19–22.
3. Bikov A. A., Revich B. A.//Medicine of labor and industrial ecology. – 2001. – № 5. – P. 6–10.
4. Vasendin D. V., Michurina S. V., Ischenko I.Yu. et al. Morphometric research of thymus in rats Wistar after influence of experimental hyperthermia//Lymphologia. Journal after S. U. Djumabyaev. – Novosibirsk. – 2009. – № 1–2. – P. 32–33.
5. Ermolina E. V., Stadnikov A. A., Smolyagin A. I. Morphological features of the immune system bodies under conditions of effect of chromium and benzol//Hyg. And San. – Moscow. – 2012. – № 3. – P. 69–71.
6. Ivanenko A. V., Volkova I. F., Kornienko A. P. Emissions of a vehicle, quality of atmospheric air and health of the population of Moscow//Hyg. and San. – Moscow. – 2007. – № 6. – P. 20–22.
7. Karimova L. K., Gizatullina D. F. Early symptoms of the effect of harmful industrial factors on body of the workers of the modern petrochemical manufactures//Hyg. and San. – Moscow. – 2012. – № 2. – P. 38–40.
8. Kireev G. V., Balenkov O.Yu., Assesorova Yu.Yu., et al. Benzapiren in the atmospheric air of Tashkent and its role in the formation of oncomorbidity of the population//Hyg. And San. – Moscow. – 2008. – № 5. – P. 12–13.
9. Niyazmatov B. I. Questions of hygiene of an environment and ecology at the present stage//Materials of scientific –practical conference. – Tashkent. – 2005. – P. 3–6.
10. Onischenko G. G. Urban environment and human health state//Hyg. And San. – Moscow. – 2007. – № 5. – P. 3–4.
11. Revich B. A., Sharov P. O., Sergeev O. V. Lead and children health –results of some Russian researches of 2000–2009//Hyg. And San. – Moscow. – 2011. – № 6. – P. 12–16.
12. Thomson E. M., Breznan D., Karthikeyan S. et al. Cytotoxic and inflammatory potential of size-fractionated particulate matter collected repeatedly within a small urban area.//Part Fibre Toxicol. 2015 Jul 16;12:24. doi: 10.1186/s12989-015-0099-z.
13. Zhou F, Li S, Jia W. et al//Effects of diesel exhaust particles on micro RNA-21 in human bronchial epithelial cells and potential carcinogenic mechanisms. Mol Med Rep. 2015 Aug; 12 (2):2329–35. doi: 10.3892/mmr.2015.3655. Epub 2015 Apr 22.

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## Smokeless tobacco-associated lesions of the oral cavity

**Abstract:** Oral cancer is one of the most common cancers in Uzbekistan and is appeared to be most common cancers worldwide. All forms of tobacco have been implicated as causative agents including cigarette, cigar and pipe tobacco, as well as chewing tobacco. It is important to differentiate between conventional loose leaf (traditional) forms of smokeless tobaccos and the newer types such as snus, there is a significant difference in risk. Gingival inflammation, periodontal inflammation, and alveolar bone damage, dental caries, tooth abrasion, and dysplasia and oral squamous cell carcinoma (SCC) are all associated with smokeless tobacco use. Tobacco can damage cells in the lining of the oral cavity and oropharynx, causing cells to grow more rapidly to repair the damage. Researchers believe that DNA-damaging chemicals in tobacco are linked to the increased risk of oral cancer. However, the minimal risk for oral cancer is associated with SLT use.

**Keywords:** smokeless tobacco, lesions, naswar, inflammatory response.

### Introduction

Various oral mucosal lesions are associated to tobacco use. In Western countries, cigarettes, cigars and pipes are the major ways in which tobacco is used, but chewing tobacco and snuff (smokeless tobacco) have become more popular in recent years. Oral smokeless tobacco consumption in various forms is highly prevalent among all populations, particularly in the Asian countries [8; 16], and a wide variety of SLT products are available worldwide [17; 18].

Oral smokeless tobacco products available commercially in India and other Asian countries contain more than 4000 toxic ingredients, which can cause tissue injury on account of their mutagenic and carcinogenic properties [20; 47]. These include alkaloids such as nicotine, tobacco-specific nitrosamines, phytosterols such as cholesterol, heterocyclic hydrocarbons, pesticides, alkali nitrites, radioactive substances, and toxic metals such as lead, cadmium, and arsenic [47].

Smokeless tobacco products can be consumed by sucking, chewing or inhaling. These products are less expensive than cigarettes, and are often flavoured and sweetened to improve tastiness. Smokeless tobacco products are potentially addictive, some delivering even higher doses of nicotine than cigarettes [21; 22]. It has been reported, chewing tobacco and snuff contain 28 carcinogens, which potentially can lead to developing cancer predominantly cancer of oral cavity, upper gastro-intestinal track and of head and neck [19]. Lower levels of education, poor socio-economic status, and rural areas of residence have also been identified as factors associated with oral SLT consumption [12; 13; 21].

### Pathogenesis of oral lesions

Naswar is a mixture of substances that is placed in the mouth or actively chewed over an extended period, thus remaining in contact with the mucosa [31]. A variety of oral mucosal lesions and diseases have been described in association with naswar and tobacco use. Use of smokeless tobacco has been linked with risk of oral cancer, long-term use may result in highly undesirable keratotic lesions and associated epithelial abnormalities in the oral cavity. Smokeless tobacco has a high pH and contains unionized nicotine and carcinogenic tobacco-specific N-nitrosamines (TSNAs), which impact negatively on oral and general health. Recent findings showed, smoking was independently associated with Uzbek ethnicity, urban residence, age and occupation, whereas naswar use was linked to rural residence, age, economic and social deprivation [14; 15].

Despite the attention given to tobacco as a major etiologic factor in leukoplakia, epithelial dysplasia and squamous-cell carcinoma, several other tobacco-associated lesions are known. Some oral mucosal lesions and conditions are specifically associated with tobacco-chewing habits. Chewing tobacco is usually placed in the buccal vestibule. It is referred to as a "quid" of chewing tobacco. The quid may be retained in the mouth for hours, and the user expectorates the saliva that mixes with the tobacco extract. Commonly, non-smoking form of tobacco are mostly related to causing of dental caries [3] and demonstrates a significant risk factor for developing dental caries [3].

The chemical carcinogens in smokeless tobacco include polynuclear aromatic hydrocarbons, polonium 210, and N-nitrosamines. Studies have shown an association between the tobacco-specific N-nitrosamines in smokeless tobacco and cancers of the upper digestive tract (esophagus and stomach) and mouth [25; 26; 27].

Naveen-Kumar B and his team studied the various forms of tobacco usage and tobacco-associated oral mucosal lesions among the patients [28]. They explain that smoking induces increased melanin pigmentation in the oral mucosa which might be caused

by irritation due to the effect of nicotine on melanocytes located along the basal cells, which results in basilar melanosis with varying amounts of melanin incontinence. They suggest that the mechanical and chemical irritation from smokeless tobacco may have induced melanin pigmentation [32]. Whereas, emitted smoke contains high concentration of alkaline pH, which facilitates absorption of substances like nicotine alkaloid, reducing sugars, and nitrogen. Apart from this it also causes increase in internal temperature of about 760 °C, and intraoral air up to 120 °C. Temperature variations can act as co-carcinogens, which can trigger changes in tissues where the initiation stage has appeared.

These changes are responsible for increased incidence of carcinoma in the oral cavity when compared with conventional smokers [28].

S. Preethi and his team described the influence of tobacco habits on increase of the generation of free radicals and reactive oxygen species (ROS), explaining that some constituents of tobacco can cause inflammation, DNA damage and cell death. Sequentially, these inflammatory cells serve as source of free radicals. Various innate immune cells together with macrophages, T lymphocytes and natural killer cells stimulate iNOS, which is capable of producing unregulated quantities of nitric oxide relatively long periods of time [46].

Low nitric oxide levels are associated immune reactions, blood flow, platelet aggregation, neurotransmission, and memory, whereas excess nitric oxide production is involved in inflammatory and immunological disorders, pain, neurological diseases, atherosclerosis, and cancer [4]. Nitric oxide plays an important role in the occurrence and progression of tumours, inducing tumour angiogenesis and triggering tumour cell invasion and metastasis [5].

### Lesions and conditions associated with smokeless tobacco

Smokeless tobacco may have potentially harmful effects on the oral cavity, affecting the dental hard tissues, including teeth, supporting periodontium and temporomandibular joint (TMJ) and the soft tissues, which make up mucosal lining of the oral cavity [10,11]. Recent reviews confirm the strong association of use of smokeless tobacco, particularly snuff, with prevalence of oral mucosal lesions [24].

Studies conducted by Naveen-Kumar B and his team presented data regarding association of tobacco products with oral lesions. It has been revealed that most common lesion such as erythroplakia was mostly appeared in conventional smoking group, whereas in smokeless tobacco users group lesions such as leukoplakia, and smokeless tobacco keratosis, quid-induced lichenoid and OSMF were also noticed [28].

Other studies confirmed the high risk of the development of oral lesions associated with tobacco smoking, and chewing. Cross sectional studies revealed that oral mucosal lesions were found in 322 (26.8%) enrolled patients who were using tobacco products, whereas 34 (2.8%) patients without tobacco habit [28]. Oral leukoplakia (8.2%) and oral submucous fibrosis (OSF) (7.1%) took prevalence over oral mucosal lesions found in patients with tobacco habit, although the other lesions (1.7%) i. e.; recurrent aphthous ulcer, oral candidiasis, median rhomboid glossitis, frictional keratosis, and oral lichen planus (0.9%) were frequently related to patients without tobacco habits [9, 28].

It has been shown that smoking detrimentally affects the neutrophils and macrophages, which are important as gingival immunocompetent cells. Particularly, smoking impairs neutrophils chemotaxis and phagocytosis. Ustün K, etc investigated the influence of tobacco on gingival inflammation by causing constriction of the



blood vessels of the gingiva, as well as the coronary arteries [1, 29, 30]. Result of his work showed that gingival crevicular fluid (GCF) volume was higher in tobacco users than in non-smokers. Gingival crevicular fluid is an inflammatory exudate, and appears to be greater when inflammation is present [1].

Sajid, F. presented in his work that answar use causes dyslipidemia and stimulates oxidative stress, leading to alteration in concentration of antioxidant enzymes [31]. They investigated smokeless tobacco products regarding its alteration on lipid profile and antioxidant enzymes. Results showed that naswar decreased the levels of glutathione per oxidase and super oxide dismutase (SOD), as well as serum high-density lipoprotein cholesterol in naswar users. Whereas serum total cholesterol, low density lipoprotein cholesterol (LDL-C), triglycerides and LDL-C/HDL-C ratio were significantly increased compared to controls. They concluded that naswar use causes dyslipidemia and oxidative stress, which are the major key factors for cardiovascular disease (CVD) [31].

It is well known, nicotine, a major component and most pharmacologically active agent in tobacco is tending to be a significant contributing factor for the exacerbation of periodontal diseases. Recent literature presents that nicotine affects gingival blood flow, cytokine production, neutrophil and other immune cells [2, 49]. It has been reported, the relationship between smoking and periodontal diseases by explaining the higher prevalence of acute necrotizing ulcerative gingivitis. Periodontal diseases, including gingivitis and periodontitis, are severe infections whereas untreated conditions can lead to tooth loss. The risk for periodontitis is significantly greater for tobacco users, with estimated ratios in the range of 2.5–7.0 or even higher for smokers comparing to nonsmokers [32; 48].

According to the most recent studies, a variety of oral mucosal lesions and conditions have association with naswar and tobacco use. Lesions induced by smokeless tobacco characteristically have a wrinkled surface that ranges from opaque white to translucent and are located in the area where the naswar is held [33]. Such lesions usually resolve within a week of cessation of tobacco use.

It has been shown, studies conducted in the US and Sweden revealed no evidence for association between SLT habits and periodontal changes such as gingival recession, attachment loss, or bone loss [34–36]. Nonetheless, Asian populations have shown that oral smokeless tobacco habits are associated with destructive periodontal disease. The results had been confirmed by Indian studies, which showed that oral SLT users tend to have higher scores and risk for periodontal disease [37–39]. Al-Tayar B in his work described the association of smokeless tobacco and periodontal pocket among adult males. The results showed that

periodontal pockets were associated with age (30 years old and above), socioeconomic status, oral hygiene practice and smokeless tobacco use [40]. The mechanisms in which tobacco use contributes to the pathogenesis of periodontitis are not yet clearly understood. It has been suggested that duration of SMT use, the participants who have been smokeless tobacco users for more than 10 years periodontal pockets become deeper (64.1%) compare to the participants in other groups. In terms of frequency and duration of smokeless tobacco use, the patients who placed SMT in their mouths for more than 5 min had deeper periodontal pockets (92.3%) in comparison with other groups [41].

The other lesions commonly associated with tobacco use is tooth abrasion. Abrasion from smokeless tobacco usually occurs on the vestibular surface opposite the wad of smokeless tobacco, but may implicate the occlusal surfaces if the tobacco is chewed [42].

Leukoplakia is the most common potentially malignant condition of the oral cavity. The relationship between tobacco usage and leukoplakia is not always clear. Leukoplakia of the oral mucosa can occur in patients who have never smoked. Recent studies revealed, buccal mucosa is the most common site of leukoplakia comprising 81% of all cases. Another report showed, buccal mucosa and commissure were the most frequently involved site for leukoplakia followed by alveolar mucosa, tongue, hard palate, and soft palate [43].

The histopathology of oral leukoplakia varies widely from a benign to carcinomatous state in situ. These forms are usually characterized by a hyperkeratotic thickening of the prickle cell layer of the epithelium, acanthosis, corium infiltration by the plasma cells, and cellular atypia. From 3 to 13.8% of all the oral leukoplakia cases undergo malignant transformation [44].

#### Conclusion

Worldwide, smokeless tobacco causes 250,000 deaths a year, with prevalence rate of 74 percent in India [23]. Study conducted in 2010 revealed, smokeless tobacco caused more than 200,000 deaths from heart disease compared to more than 62,000 deaths due to cancers of the mouth, pharynx, and esophagus [6, 10]. Recent findings indicated three out of four daily users of smokeless tobacco had non-cancerous or pre-cancerous lesions in their mouth [45]. Gingival inflammation, periodontal inflammation, and alveolar bone damage, dental caries, tooth abrasion, and dysplasia and oral squamous cell carcinoma (SCC) are all associated with smokeless tobacco use. Further studies need to be carried out in high-risk populations with implementing new preventative strategies in order to better understand the relationship between oral smokeless tobacco use and associated lesions.

#### References:

1. Ustün K., Alptekin N.: The effect of tobacco smoking on gingival crevicular fluid volume, *European journal of dentistry*. vol: 1 (4) P. 236–9, 2007.
2. Malhotra R., Kapoor A., Grover V., Kaushal S.: Nicotine and periodontal tissues. *Journal of Indian Society of Periodontology*. – 2010 – Vol: 14 (1) P.: 72–9, 2010.
3. Bisht Ravindra, S. Singh, Amit K., etc: Study over the clinical picture and histopathology of leukoplakia and to establish the correlation between causative factors in the patients of Garhwal hill region. *National journal of maxillofacial surgery* vol. 4 (2) P. 177–80, 2013.
4. VellaP.ally S: Influence of tobacco use in dental caries development. *Cent Eur J Public Health*, vol: 15 (3) P.: 116–121, 2007.
5. Hoffmann D., Brunnemann K.D., Prokopczyk B., Djorkjevic M.V.: Tobacco-specific N-nitrosamines and Areca-derived N-nitrosamines: chemistry, biochemistry, carcinogenicity, and relevance to humans. *J. Toxicol Environ Health* 1994; 41:1–52.
6. The Health Consequences of Using Smokeless Tobacco: A Report of the Advisory Committee to the Surgeon General. Washington, DC. US Dept. of Health and Human Services, 1986.
7. Winn D.M. Surveillance of and knowledge about cancer associated with smokeless tobacco use. In: *Smokeless Tobacco or Health: An International Perspective*. Bethesda, Md: National Cancer Institute, National Institutes of Health, 11–18. DHHS Publication NIH 93–3461. NCI Smoking and Tobacco Control Monograph No. 2., 1993.

8. Nelson D.E., Tomar S.L., Mowery P., Siegel P.Z.: Trends in smokeless tobacco use among men in four states, 1988 through 1993. *Am J. Public Health* (1996) 86:1300–3. 10. 2105.
9. Sreeramareddy C.T., Ramakrishnareddy N., Harsha Kumar H., Sathian B., Arokiasamy J.T.: Prevalence, distribution and correlates of tobacco smoking and chewing in Nepal: a secondary data analysis of Nepal demographic and health survey-2006. *Subst Abuse Treat Prev Policy* (2011) 6:33.10.1186.
10. Giovino G.A., Mirza S.A., Samet J.M., Gupta P.C., Jarvis M.J., Bhala N., et al.: Tobacco use in 3 billion individuals from 16 countries: an analysis of nationally representative cross-sectional household surveys. *Lancet* (2012) 380: 668–79.10.1016.
11. Palipudi K.M., Gupta P.C., Sinha D.N., Andes L.J., Asma S., McAfee T.: Social determinants of health and tobacco use in thirteen low and middle income countries: evidence from global adult tobacco survey. *PLoS One* (2012) 7: e33466.10.1371.
12. Prabhakar B., Narake S.S., Pednekar M.S.: Social disparities in tobacco use in India: the roles of occupation, education and gender. *Indian J. Cancer* (2012) 49: 401–9.10.4103.
13. Sinha D.N., Gupta P.C., Ray C., Singh P.K.: Prevalence of smokeless tobacco use among adults in WHO South-East Asia. *Indian J. Cancer* (2012) 49: 342–6.10.4103.
14. Usmanova G., Neumark Y., Baras M., Mckee M.: Patterns of adult tobacco use in Uzbekistan. *Eur J. Public Health* (2012) 22:704–7.10.1093.
15. Bhawna G.: Burden of smoked and smokeless tobacco consumption in India –results from the global adult tobacco survey India (GATS-India) – 2009 – 201. *Asian Pac J Cancer Prev* (2013) 14:3323–9.10.7314.
16. Agaku I.T., Ayo-Yusuf O.A., Vardavas C.I., Connolly G.: Predictors and patterns of cigarette and smokeless tobacco use among adolescents in 32 countries, – 2007–2011. *J. Adolesc Health* (2014) 54:47–53.10.1016.
17. Piano M.R., Benowitz N.L., Fitzgerald G.A. et al.: Impact of smokeless tobacco products on cardiovascular disease: implications for policy, prevention, and treatment: a policy statement from the American heart association. *Circulation* (2010) 122:1520–44.10.1161.
18. Stanfill S.B., Connolly G.N., Zhang L., et al: Global surveillance of oral tobacco products: total nicotine, unionised nicotine and tobacco-specific N-nitrosamines. *Tob Control* (2010) 20 (3): e2.10.1136.
19. Critchley J.A., and Unal B.: Health effects associated with smokeless tobacco: A systematic review. *Thorax*, 58, 435–443, 2003.
20. Bhisey R.A.: Chemistry and toxicology of smokeless tobacco. *Indian J. Cancer* 49: 364–72.10.4103, 2012.
21. Centers for Disease Control and Prevention. Differences by sex in tobacco use and awareness of tobacco marketing –Bangladesh, Thailand, and Uruguay, 2009. *MMWR Morb Mortal Wkly Rep* (2010) 59:613–8.
22. Rooban T., Joshua E., Rao U.K., Ranganathan K.: Prevalence and correlates of tobacco use among urban adult men in India: a comparison of slum dwellers vs non-slum dwellers. *Indian J. Dent Res* 23: 31–8.10.4103, 2012.
23. Thakur J.S., Prinjal S., Bhatnagar N., Rana S., Sinha D.N.: Socioeconomic inequality in the prevalence of smoking and smokeless tobacco use in India. *Asian Pac J. Cancer Prev.* 14: 6965–9.10.7314, 2013.
24. Singh G., Rizvi I., Gupta V., Bains V.: Influence of smokeless tobacco on periodontal health status in local population of north India: A cross-sectional study. *Dental research journal.* – vol: 8 (4) P: 211–20, 2011.
25. Chu Y.H., Tatakis D.N., Wee A.G.: Smokeless tobacco and periodontal healthy in a rural male population. *J Periodontol.* 2010; 81:848–54.
26. Sinha D.N., Gupta P.C., Pednekar M.S.: Use of tobacco products as dentifrice among adolescents in India. *Questionnaire study. BMJ.* 2004; 328: 323–4.
27. Bergstrom J., Keilani H., Lundholm C., Radestad U.: Smokeless tobacco (Snuff) use and periodontal bone loss. *J Clin Periodontol.* 2006; 33: 549–54.
28. Naveen-Kumar B., Tatapudi R., Sudhakara-Reddy R. et. al.: Various forms of tobacco usage and its associated oral mucosal lesions. *Journal of clinical and experimental dentistry.* 2016 – vol: 8 (2) P: e 172–7.
29. Mavropoulos A., Aars H., Brodin P.: Hyperemic response to cigarette smoking in healthy gingiva. *J. Clin Periodontol.* 2003; 30: 214–221.
30. Morozumi T., Kubota T., Sato T., Okuda K., Yoshie H.: Smoking cessation increases gingival blood flow and gingival crevicular fluid. *J. Clin Periodontol.* 2004; 31: 267–272.
31. Sajid F., Bano S.: Effects of smokeless diPing tobacco (Naswar) consumption on antioxidant enzymes and lipid profile in its users. *Pakistan journal of pharmaceutical sciences.* vol: 28 (5 SuP.I) P: 1829–33, 2015.
32. Salvi G.E., Lawrence H.P., Offenbacher S., Beck J.D.: Influence of risk factors on the pathogenesis of periodontitis. *Periodontol* 2000. 1997 Jun; 14 ( ): 173–201.
33. Usmanova G, Neumark Y, Baras M, et.al: Patterns of adult tobacco use in Uzbekistan. *European journal of public health.* – vol: 22 (5) P: 704–7, 2012.
34. Hugoson A., Rolandsson M.: Periodontal disease in relation to smoking and the use of Swedish snus: epidemiological studies covering 20 years (1983–2003). *J. Clin Periodontol* (2011) 38:809–16.10.1111.
35. Wickholm S., Soder P.O., Galanti M.R., Soder B., Klinge B.: Periodontal disease in a group of Swedish adult snuff and cigarette users. *Acta Odontol Scand* (2004) 62:333–8.10.1080.
36. Bergstrom J., Keilani H., Lundholm C., Radestad U.: Smokeless tobacco (snuff) use and periodontal bone loss. *J. Clin Periodontol* (2006) 33: 549–54.10.1111.
37. Parmar G., Sangwan P., Vashi P., Kulkarni P., Kumar S.: Effect of chewing a mixture of areca nut and tobacco on periodontal tissues and oral hygiene status. *J. Oral Sci* (2008) 50: 57–62.10.2334.
38. Sumanth S., Bhat K.M., Bhat G.S.: Periodontal health status in pan chewers with or without the use of tobacco. *Oral Health Prev Dent* (2008) 6: 223–9.
39. Kamath K., Mishra S., Anand P.: Smokeless tobacco use as a risk factor for periodontal disease. *Frontiers in public health.* 2014 – vol: 2 P: 195.

40. Fisher M., Taylor G., Tilashalski K.: Smokeless tobacco and severe active periodontal disease, NHANES III. *J Dent Res.* – 2005; 84 (8): 705–10.
41. Al-Tayar B., Tin-Oo M., Sinor M., et. al.: Prevalence and association of smokeless tobacco use with the development of periodontal pocket among adult males in Dawan Valley, Yemen: a cross-sectional study. *Tobacco Induced Diseases.* 2015 – vol: 13 (1) P.: 35.
42. Greer R.O. J.r: Oral manifestations of smokeless tobacco use. *Otolaryngol Clin North Am.* Feb;44 (1): 31–56, 2011.
43. Bisht R., Singh A., Sikarwar V., Darbari A.: Study over the clinical picture and histopathology of leukoplakia and to establish the correlation between causative factors in the patients of Garhwal hill region. *National journal of maxillofacial surgery,* 2013 – vol: 4 (2) P.: 177–80.
44. Starzyńska A., Pawłowska A., Renkielska D. et. Al: Oral premalignant lesions: epidemiological and clinical analysis in the northern Polish population. *Postepy dermatologii i alergologii.* 2014 – vol: 31 (6) P.: 341–50.
45. Gupta S., Singh R., Gupta O., Tripathi A.: Prevalence of oral cancer and pre-cancerous lesions and the association with numerous risk factors in North India: A hospital based study. *National journal of maxillofacial surgery.* 2014 – vol: 5 (2) P.: 142–8.
46. Preethi S., Jose J. Sivapathasundharam B., Sabarinath B.: Evaluation of Salivary Nitric Oxide Levels in Smokers, Tobacco Chewers and Patients with Oral Lichenoid Reactions. *Journal of clinical and diagnostic research: JCDR* 2016 – vol: 10 (1) P.: ZC63–6.
47. Nair U., Bartsch H., Nair J.: Alert for an epidemic of oral cancer due to use of the betel quid substitutes gutkha and pan masala: a review of agents and causative mechanisms. *Mutagenesis* (2004) 19: 251–62.10.1093.
48. VellaPally S.: Influence of tobacco use in dental caries development, *Cent Eur J Public Health,* 2007 – vol: 15 (3) P.: 116–121.
49. Malhotra R., Kapoor A., Grover V., Kaushal S.: Nicotine and periodontal tissues. *Journal of Indian Society of Periodontology.* – vol: 14 (1) P.: 72–9, 2010.

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## Comparative analysis of the immune system at often and chronically patients preschool children

**Abstract:** The article is devoted to the study of the immune system (IS) and cytokine status in frequently ill children (FIC) in the acute phase and remission in comparison with that rarely ill with children (RIC). The sample of 158 preschool children (PC) with abnormalities of the upper respiratory tract. Revealed at FIC features of cellular and humoral immunity, as well as an imbalance in the cytokine status indicate stress the IS and the possible depletion of the reserves of antiresistance in this group of children as a result of a long and massive antigenic effects on the child.

**Keywords:** children, immune system, cytokine status, respiratory diseases, immune cells.

There are two main points of view on the causes of repeated and so frequent respiratory infections in FIC. The first — a violation of the IS manifested in adverse environmental impacts. The second — a genetic predisposition as implemented under the influence of adverse environmental conditions. It is possible that both of these factors play a role in the occurrence of frequent incidence of acute respiratory disease in FIC. But in recent years, special attention is paid to the researchers of the IS in FIC.

In the formation of the immune response involved a complex of interacting immune cells, resulting in the production of IS mediators involved in intercellular relationships, body resistance to various exogenous and endogenous factors [1; 2].

In connection with the above, the **purpose** of research is to study the IS and often have long ill PC in comparing them with those suffering from RIC.

**Material and methods.** We carried out a study on the state of the IS in the examinees: 90 — FIC, 40 — RIC and 28 healthy children of the same age in the control group.

Immunological studies were performed at the Institute of Immunology of the Academy of Sciences of Uzbekistan. The main parameters of cellular and humoral immunity was determined by identifying the cell surface cluster of differentiation of CD3, CD4, CD8,

CD16, CD19 with monoclonal antibodies series LT (LLC “Sorbent Service”, Russia). The study of the concentration of serum immunoglobulin A, M, G in peripheral blood was performed according to the method Mancini G. et al (1965). Levels of cytokines (IL-1b, IL-4 and TNF $\alpha$ ), IgE and sIgA in nasal washes were determined by ELISA (cytokines produced by “cytokine”, St.-Petersburg). Statistical analysis of the data obtained by the methods of variation statistics, Fischer-Student.

**Results and discussion.** The study of cellular immunity showed a manifestation of immune deficiency with symptoms of chronic intoxication in a group FIC. When analyzing the relative performance of T-lymphocytes, showed a significant decrease in activity CD3+ cells ( $48.2 \pm 1.3\%$  vs  $55.6 \pm 1.4\%$  in controls,  $p < 0.05$ ); group RIC also showed a reduction, but the values are not statistically reliable ( $53.8 \pm 1.5\%$ ). A similar pattern was observed in the dynamics of the level of CD4+ ( $29.6 \pm 1.5\%$  in group FIC vs.  $37.8 \pm 1.3\%$  in healthy children,  $p < 0.05$ ), and RIC —  $34.2 \pm 1.2\%$ .

A significant decrease in the value of cytotoxic T lymphocytes ( $19.2 \pm 1.3\%$  at FIC and  $20.4 \pm 1.3\%$  at RIC versus the control group —  $21.3 \pm 1.1\%$ ,  $p < 0.05$ ) impact on the immunoregulatory index (IRI). So, he is RIC averaged  $1.68 \pm 0.03$ , while in the group of sickly level IRI was significantly reduced —  $1.54 \pm 0.01$  ( $p < 0.05$ )

versus  $1.72 \pm 0.06$  in the control group. In general, these changes contribute to the longer immunograms antigenemia, unfinished process of phago-cytosis, more protracted clinical course with the basic pathology later readjustment of the body. Nonspecific factors represented by the number of NK cells (CD16+-cells) and phagocytic activity (PhA) of neutrophils, were changed depending on the status of children. At FIC in the peripheral blood of 12 or 20% of the relative number of CD16+—  $16.2 \pm 1.2\%$ , which was significantly higher than the values of the indicator in the group RIC and healthy children ( $12.9 \pm 1.1\%$  and  $11.5 \pm 0.9\%$ ) ( $p < 0.01$ ).

In general, these changes contribute to the longer immunograms antigenemia, unfinished process of phagocytosis, more protracted clinical course with the basic pathology later readjustment of the body. Nonspecific factors represented by the number of NK cells (CD16+-cells) and PhA of neutrophils, were changed depending on the status of children. At FIC in the peripheral blood of 12 or 20% of the relative number of CD16+—  $16.2 \pm 1.2\%$ , which was significantly higher than the values of the indicator in the group RIC and healthy children ( $12.9 \pm 1.1\%$  and  $11.5 \pm 0.9\%$ ) ( $p < 0.01$ ).

Due to its non-specificity of the PhA of highly labile, so quickly and visibly reacts to different pathogens even before the detailed characteristics of the disease [4; 5]. The quantitative study of the PhA showed that in the blood of healthy children are between 52% to 62% of phagocytic cells —  $57.8 \pm 1.4\%$ . In RIC PhA was slightly reduced —  $53.8 \pm 1.3\%$ . And FIC figure was 1.3 times lower than the control values and averaged  $45.4 \pm 1.2\%$  ( $p < 0.05$ ). Consequently, the FIC showed significant inhibition of neutrophil PhA by an increase in the number of natural killer cells.

During the immune response of B-lymphocytes differentiate into plasma cells that secrete antibodies. In the system presented in our studies, the quantitative content of CD20+ and the level of IgG, IgA and IgM. Exacerbation of a chronic process often accompanied by increase in the proportion of activated cells in the peripheral circulation, including CD20+. In the group FIC relative content of B-lymphocytes was  $29.5 \pm 1.1\%$  ( $p < 0.01$ ), in the group RIC —  $23.7 \pm 1.4\%$  ( $p < 0.05$ ), which significantly higher against the values of the control group —  $22.6 \pm 1.3\%$ . Integral indicator of the functional activity of B-lymphocytes is the content of the main classes of IgG, IgA, IgM. The study of the concentration of Ig in the serum of healthy children showed that IgG is synthesized from 860 to 1320 mg% with an average  $1090.7 \pm 31$  mg%. At RIC IgG concentration was slightly reduced, while SC — compared with FIC — significantly increased —  $1320.6 \pm 47.4$  mg% with a range from 1080 to 1550 mg% ( $p < 0.05$ ).

The children of the control group IgA levels in the serum of 110 to 170 mg%, on average —  $145.3 \pm 6.4$  mg%. In peripheral blood serum IgA concentration RIC slightly reduced, while SC — significantly reduced and averaged  $97.3 \pm 7.3$  mg% ( $p < 0.01$ ).

The most important from the point of view of the state of the local immunity is the full production sIgA on the mucosal surface. As it turned out, the process is in a group FIC significantly disrupted, which can cause frequent erosive and ulcerative lesions of the mucous in these children ( $312 \pm 10$  mg% in FIC and  $502 \pm 20$  mg% at RIC,  $p < 0.05$  against values of the control group —  $589 \pm 0.07$  mg%).

All the children in the group frequently and chronically ill was an increase in the number of IgE ( $3.29 \pm 0.47$  pcg/ml — in the study group;  $1.15 \pm 0.23$  pcg/ml- in the control group,  $p < 0.001$ ), the there is a lack of mucosal immunity. Thus remains unclear what comes first: dys-biosis mucosa or impaired immunity. Definitely have to reckon with the fact that the relationship between the immune system and infectious agents are interdependent.

We conducted a study to determine the levels of IL-1 $\beta$  production as an important neurotransmitter, which is one of the most versatile regulators of immunity and inflammatory reactions with a wide range of biological effects, which include the proliferation of T- and B- cells, antibody, induction of synthesis of other cytokines. Our results showed significantly higher values of IL-1 $\beta$  in the group FIC compared to RIC ( $22.9 \pm 1.6$  pcg/ml vs  $16.6 \pm 1.12$  pcg/ml.

$p < 0.01$ . A very important immunoregulatory cytokine is IL-4. It is believed that its main biological role is to suppress IFN- $\gamma$ . According to our data, the level of production of IL-4 increased in sickly children by almost 1.5 times compared to those suffering from rare children ( $p < 0.001$ ).

TNF- $\alpha$  is aimed at recognition and elimination of foreign genetic information and is an important mediator of immunity, which allows it to be attributed to the family of regulatory cytokines. Our results show that the main group of children TNF- $\alpha$  level in almost two times the value of comparison group ( $4.42 \pm 0.3$  pcg/ml vs  $2.34 \pm 0.25$  pcg/ml), ( $p < 0.001$ ).

These facts underscore the multidimensionality of the structural and functional organization of the IS, we studied the example of FIC otorhinolaryngology type.

#### Conclusions:

1. In the study of the IS in a FIC sinus pathology observed decrease in the total pool of T- lymphocytes, T-helper cells and PhA of neutrophils from 1.15 to 1.3 times. At this level of CD16+-cells, B-cells and IgG were significantly elevated 1.3–1.4 fold.

2. The study of humoral immunity IgE — shows a significant increase of 2.9 times, and the suppression of secretion of sIgA — 1.8 times, indicating a reduction of local immunity and increase sensitization by prolonged antigenemia.

3. In the study of cytokine status of children surveyed showed a sharp increase in the local concentration of IL-1 $\beta$  by 1.4 times, IL-4—1.7 times, TNF- $\alpha$  — 2.1 times in RIC compared with FIC.

#### References:

1. Abdulkirimov H. T., Sali O. V., Davydov R. S. et al Morphological characteristic mucosal changes sphenoid sinus inflammatory processes.//Proceedings of the VI Congress of otolaryngologists N. Novgorod (Russia). – 2006. 4; 241 p. (In Russian).
2. Aripova T. U., Umarov A. A., Petrova T. A. Diagnostic value cytokine in clinical practice.//Journal of Theoretical and Clinical medicine (Tashkent, Uzbekistan). – 2006; 5: 21–7. (In Russian).
3. Balyasinskaya G. A., Bogomilsky M. R. Antibacterial Topical preparations in the treatment of inflammatory diseases of the nasal cavity, paranasal sinuses and nasopharynx of children.//Russian herald Perinatology and Pediatrics (Moscow). – 2003; 2: 48–9. (In Russian).
4. Lopatin T. K., Blyakher M. S., Arkhipov S. N. et al. Laboratory diagnosis of the state of interferon in sickly children and correction of violations of his preparation “atsilakt”//Clinical Laboratory Diagnostics (Moscow). – 2002; 10: 26–7. (In Russian).
5. Lysikova M., Wald M., Masinovsky Z. The mechanisms of the inflammatory response and the impact on them using proteolytic enzymes//Cytokines and inflammation (St.-Peterburg, Russia). – 2004; 3 (3): 48–53. (In Russian).

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## The quality of life of women with subclinical hypothyroidism, depending on the level of thyroid stimulating hormone

**Abstract:** 81 women of 20 up to 57 years were included in the investigation. We have observed the fall of physical and psychic components of life quality in women with SH living in Andijan region by the questionnaire SF-36, it was highly expressed in patients with 10,0 mU/l level of TSH. The evaluation of the readings of women's QL enables to evaluate the clinical picture of the disease objectively at the beginning and the dynamic study of the readings of QL will give the opportunity to determine the effectiveness of the therapy in the future.

**Keywords:** subclinical hypothyroidism, Thyroid Stimulating Hormone, quality of life.

The destruction of the function of thyroid glands relates to highly spread endocrine diseases in Uzbekistan. The spread and the structure of the disease of thyroid glands depends on the sex, age, ethnic and geographic factors, and mainly iodine supply of the organism [11].

Subclinical hypothyroidism (SH) — is a rather spread disease of thyroid glands that are accompanied with the increase of the level of Thyroid Stimulating Hormone (TSH) when the normal level is free  $T_4$  [5]. In most cases SH is often met among women [3; 8].

According to the data of different researchers the spread of SH among the population ranges in a wide diapason: 4–10% in the population and 7–26% among grown-ups [4; 7; 9].

A cross-section, multi centre, epidemiological research was carried out in 8 big cities of India with the aim of studying the spread of SH among grown-up population, Unnikrishnan A. et al, 2013 [15]. The spread of SH (the normal level of which is  $fT_4$  and  $TSH > 5.50 \mu IU/ml$ ) is 8,02% in India (95% **Index of Correctness (IC)** 7,29–8,74). In women (8,73%) SH occurred more often than in men (7,17%,  $p = 0,0358$ ). The highest point of frequency of SH (8,93%) was met in the group of over 55 years and the lowest point of the age group was met in the age group of 18–35 years (6,91%). The increased level of antibodies of thyroid peroxidase (anti-TPO) was determined in 21,85% (95% **IC** 20,74–22,95) cases. High readings of anti-TPO are often marked in women (26,04%), than in men (16,81%,  $p < 0,05$ ).

The spread of thyroid pathology among women of 18 up to 65 of Andijan region of the Republic of Uzbekistan composes 69,8%, subclinical hypothyroidism composes 12,4%. When the level of upper limit of TSH norms ( $> 2,5 \text{ mME/l}$ ) falls, the frequency of SH really increases up to 28,3%, and this state is kept not depending on the age of the investigated women [10].

The destruction of the function of thyroid glands leads to the fall of the quality of life of patients (QL). «Quality of Life» is determined as integral characteristics of physical, psychological, emotional and social functioning of patients, and is based on his subjective understanding [6].

**Aim of the research:** to evaluate the life quality of women with subclinical hypothyroidism depending on the level of TSH.

### Patients and methods.

81 women of 20 up to 57 years were included in the investigation. The average age composed  $40,4 \pm 10,1$  years. The basic group was composed of 60 women with subclinical hypothyroidism, the average age composed  $42,0 \pm 10,4$  years. Depending on the level of

TSH, the patients are divided into 2 groups: the 1<sup>st</sup> group consisted of 39 women with TSH level was determined for the first time and the normal level was free  $T_4$ , a second research of both data was made after 2–3 months, and also the degree of anti corpuscles of thyroid peroxidase was determined (anti-TPO).

The level of TSH, free  $T_4$ , anti-TPO in the plasma of the blood were determined by radio immune method with using commercial complex of the firm “Immunotech” (the Czech Republic) on the base of RCSPMCE the Ministry of Health Care of the RU.

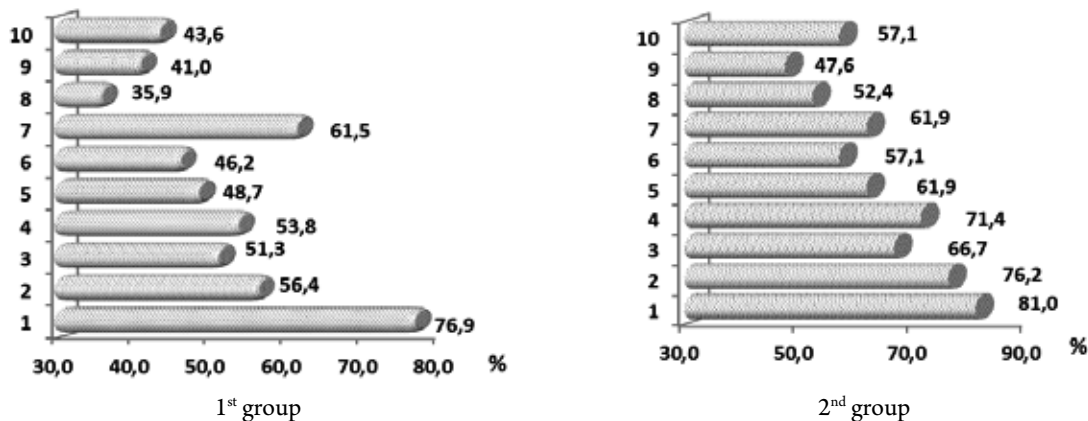
For the evaluation of lives of patients a short version of the questionnaire of health (MOS 36-Item Short-Form Health Survey — MOS SF-36) was used [17]. 36 parts were grouped in 8 scales: physical functioning (PF), role functioning (RF), body ache (B), general condition of health (GH), life activity (LA), social functioning (SF), role emotional functioning (REF) and psychic health (PH). The data of each scale vary between 0 and 100, where 100 presents full health. All the scales form 2 readings: physical (PCH) and psychological component of health (PCH). The readings of each sub scale were counted by using a special key, defended by an International author's right [16]. The results are presented as the ball marks of 8 scales. They are composed in such a way that a higher mark points to a higher level of quality of life (QL).

The received data were worked out with the help of computer program STATISTICA 6 and Biostat. Quantity readings were presented in the form of  $M \pm SD$ . The difference between the groups were considered as statistically valuable when  $P$  is  $< 0,05$ .

### Results

Auto immune thyroids, associated with thyroid peroxidase carrying anti corpuscles is one of the frequent causes of SH development. SH usually comes without symptoms, but some patients can complain to unspecific complaints of malaise, exhausting, gaining weight, occlusions in intestines, that are characterized to hypothyroidism [1; 2].

Analysis of patients' complaints of the 1<sup>st</sup> and 2<sup>nd</sup> groups didn't reveal considerable differences (Picture 1). However the women with the level  $> 10,0 \text{ mU/l}$  TSH complained of increased exhausting more often (76,9% and 81,0% in accordance with the 1<sup>st</sup> and 2<sup>nd</sup> groups), malaise (56,4% and 76,2%), heartbeat (51,3% and 66,7%), the sense of sadness and alarm (53,8% and 71,4%), headache (48,7% and 61,9%), dryness of the skin (46,2% and 57,1%), worsening of the memory and attention (61,5% and 61,9%), the feeling of numbness (35,9% and 61,9%) bad tolerance to cold (41,0% and 47,6%) and destruction of Menstrual Cycle (43,6% and 57,1%).

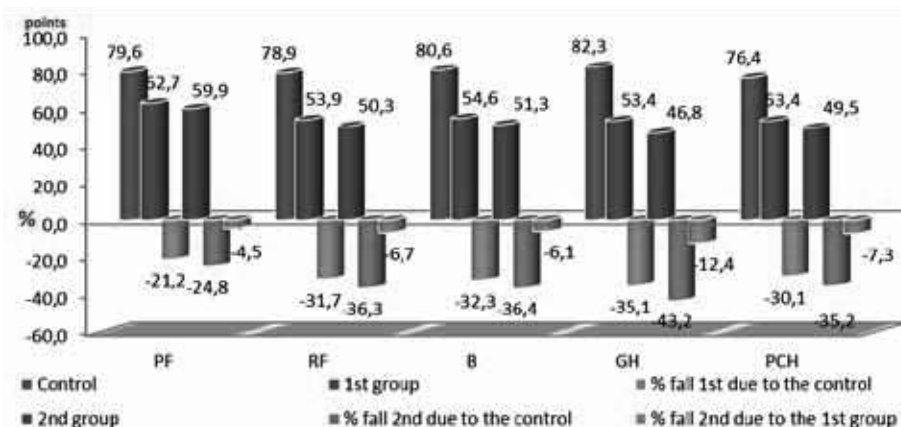


Picture 1. The frequency of the symptoms of hypothyroidism in the examined patients

1. – Increased exhausting; 2. – malaise; 3. – Heartbeat; 4. – the sense of sadness and alarm; 5. – headache; 6. – dryness of the skin; 7. – worsening of the memory and attention; 8. – the feeling of numbness; 9. – bad tolerance to cold; 10. – destruction of Menstrual Cycle.

The presence of subclinical hypothyroidism resulted in the worsening of the life quality. Especially, the analysis of physical components of health showed, that SH influenced on the ability of accomplishment of different physical exertion (the decrease of PF compared to the readings of control group of the 1<sup>st</sup> and 2<sup>nd</sup> groups

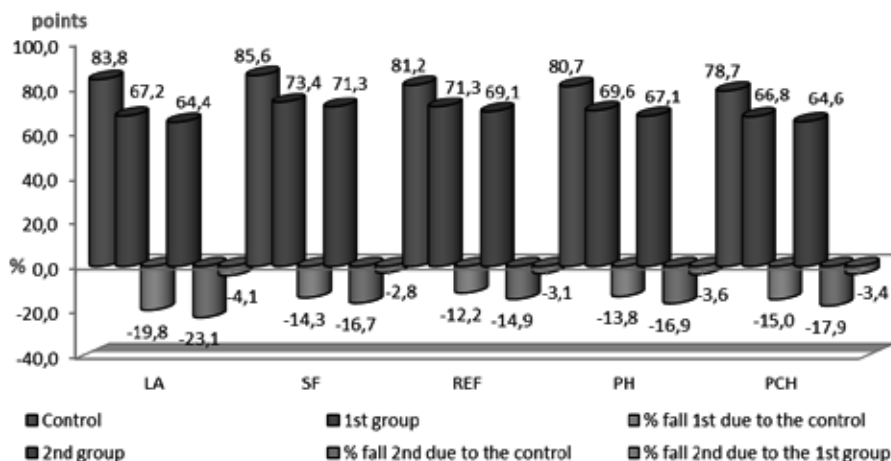
and 21,2% and 24,8% in accordance), daily role activity (RA — 31,7% and 36,3% in accordance), the ability of doing daily chores –B 32,3% and 36,4% in accordance), that reflected the decrease of subjective self evaluation of the patients’ health (PCH — 30,1% and 35,2% in accordance) (Picture 2).



Picture 2. Readings of physical component of health quality of women’s lives with SH

So, half of the patients with SH (51,3% and 52,4% in accordance with the 1<sup>st</sup> and 2<sup>nd</sup> groups) pointed out that they are not able to do all the household affairs with the connection of their bad physical condition (tidying the room, ability to go to a grocery, walking down the stairs, transferring heavy things). comparative analysis of Quality of Life (QL) of women in the 1<sup>st</sup> and 2<sup>nd</sup> groups had statistically important differences by parameters of general health (p=0,01) and PCH (p=0,001).

When analyzing the psychological components of health we have observed low quality of life (falling to 15% in the 1<sup>st</sup> group and 17,9% in the 2<sup>nd</sup> group) (Picture3), it shows the limit of social contacts, decrease of the level of dealing with others with the connection of worsening of emotional and physical state, limit in daily household chores, causative worsening of emotional state.



Picture 3. Readings of psychological components of health of women’s life quality with SH

The readings of the scale (19,8% and 23,1% in accordance with the 1<sup>st</sup> and 2<sup>nd</sup> groups) initially was lower than the average norm in the control, it means the decrease of life activity of the patients, i. e. women do not think themselves strong and fully energetic. Low balls by the component of SF (14,3% and 16,7% in accordance) means considerable limit in social contacts, decrease of the level of dealing due to the worsening of the emotional and physical state. Average readings of REF (12,2% and 14,9% in accordance) were also lower comparing to clinic control and speaks about the presence of women's problems (worry about their health, bad mood). They result in considerably negative influence on their social activity and daily role activity. The reading of PH (13,8% and 16,9% in accordance) was initially low comparing to the control, it means about the lability of the mood and presence of alarm-depressive state of the examined women. Comparative analysis of the readings of the 1<sup>st</sup> and 2<sup>nd</sup> groups didn't reveal any differences.

### Discussion

The problem of life quality of patients is studied in most works and multicentre investigations all over the world. The level of QL leads to position by the quantity and questionnaires. It enables widening the abilities of doctors in order to evaluate the state of patients much clearer [14]. A. V. Podzolkov and V. V. Fadeev (2010) decided to try evaluating the QL of the patients with high normal (2,0–4,0 mU/l) and low normal (0,4–2,0 mU/L) of TSH. It was showed that average readings of life quality of the examined women are in the middle and high levels. However there is a considerable difference of readings of QL between the women from the group with high and low normal intervals of TSH. In spite of the fact that

summary levels of QL between 2 groups were close enough, it was determined that the patients from the group with high normal TSH had the worst readings. While investigating a statistically important difference between some parameters such as life activity, physical functioning, general condition of health and others were revealed.

According to the data of Madiyarova M.Sh. and others [12], differences, practically by none of the investigated parameters, including readings of QL, level of alarm and depression, cognitive functions, symptoms of hypothyroidism, lipid specter, between the patients with different level of TSH inside of any group was revealed. Only the level of TSH ( $p < 0,05$ ) was differentiated.

We all know that both manifesting and subclinical development of hypothyroidism is accompanied with the fall of the QL of patients. Morgunova T.B. and others [13] determined that the readings of QL (except general health and role emotional functioning) in patients with hypothyroidism were statistically considerably lower than the group with healthy people. It is supposed that one of the causes is higher rate of depressing disturbances in patients with hypothyroidism comparing to general population.

### Conclusion

1. We have observed the fall of physical and psychic components of life quality in women with SH living in Andijan region by the questionnaire SF-36, it was highly expressed in patients with 10,0 mU/l level of TSH.

2. The evaluation of the readings of women's QL enables to evaluate the clinical picture of the disease objectively at the beginning and the dynamic study of the readings of QL will give the opportunity to determine the effectiveness of the therapy in the future.

### References:

1. Baumgartner C., Blum M., Rodondi N. Subclinical hypothyroidism: summary of evidence in 2014//Swiss Med Wkly. – 2014. – Vol. 23. – P. 144: w14058.
2. Biondi B., Cooper D. The clinical significance of subclinical thyroid dysfunction//Endocr Rev. – 2008. – Vol.29 (1). – P. 76–131.
3. Brabant G., Beck-Peccoz P., Jarzab B. et al. Is there a need to redefine the upper normal limit of TSH?//Eur J Endocrinol. – 2006. – Vol. 154. – P. 633–637.
4. Canaris G., Manowitz N., Mayor G., Ridgway E. The Colorado thyroid disease prevalence study//Arch Intern Med. – 2000. – Vol.160. P. 526–534.
5. Cooper D. Subclinical hypothyroidism//N Engl J Med. – 2001. – Vol. 345 (4). – P. 260–265.
6. Fairclough L. Design and analysis of quality of life studies in clinical trials. – Charman et Hall/CRC. – 2002. – P. 164–177.
7. Feskova A. A., Kaverzina M. Yu. Peculiarities of clinical picture, instrumental readings and life quality of the patients with subclinical hypothyroidism and pathology of cardiovascular system/Young scientist. – 2014. – № 17. – P. 210–213.
8. Gibbons V., Lillis S., Conaglen J., Lawrenson R. Do general practitioners use thyroid stimulating hormone assay for opportunistic screening?//N Z Med J. – 2009. – Vol.12. – P. 25–30.
9. Hollowell J., Staehling N., Flanders W. et al. Serum TSH, T4 and thyroid antibodies in the United States population (1988–1994): National Health and Nutrition Examination Survey (NHANES III)//J. Clin. Endocrinol. Metab. – 2002. – Vol. 87. – P. 489–499.
10. Ismailov S. I., Abdurazzakova D. S. The rate of occurrence of anti corpuscle concentration of thyroid peroxidases in women who live in Andijan region/J. of theoretical and clinical medicine. – 2014. – № 6. – P. 9–12.
11. Ismailov S. I., Rashitov M. M., Atadjanova M. M., Allayarova G. I., Muratova Sh. T., Yuldasheva F. Z., Elov A. A. Results of epidemiological studies of prevalence of iodine deficiency disorders in Uzbekistan//European Applied Science. – 2016. – N1. – P. 24–27.
12. Madiyarova M.Sh., Morgunova T. B., Fadeev V. V. and others. Peculiarities of clinical picture, readings of life quality and cognitive functions of the patients with hypothyroidism of different etiology/Clinical and experimental thyroidology. – 2014. – T. 10, № 1. – P. 44–54.
13. Morgunova T. B., Manuylova Yu. A., Madiyarovaa M.Sh. and others. The life quality of the patients with hypothyroidism//Clinical and experimental thyroidology. – 2010. – T. 6, № 4. – P. 58–68.
14. Podzolkov A. V., Fadeev V. V. High and normal level of TSH: clinical picture, pschyo emotional sphere and life quality of patients with hypothyroidism/Clinical and experimental thyroidology. – 2010. – T. 6, № 2. – P. 62–67.
15. Unnikrishnan A., Kalra S., Sahay R. et al. Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India//Indian J Endocrinol Metab. – 2013. – Vol.17 (4). – P. 647–652.
16. Ware J., Kosinski M., Gandek B. SF-36® Health Survey: Manual & Interpretation Guide. – Lincoln, RI: QualityMetric Incorporated, 2005. – 312 p.
17. Ware J., Sherbourne C. The MOS 36-Item short-form health survey (SF-36): conceptual framework and item selection. Med. Care, 1992, – Vol. 30, N 6, P. 473–483.

## Damages to hypothalamus vessels in various types of blood loss on the background of acute alcohol intoxication

**Abstract:** Hypothalamus of people died of acute, massive blood loss and hemorrhagic shock on the background of alcohol intoxication (47 cases) and without it (50 cases) has been studied by histological methods. In acute blood loss on the background of acute alcohol intoxication spasm of hypothalamus arteries is less marked but anemic vessels of microcirculatory bed occurred more often than without alcoholemia.

**Keywords:** alcohol intoxication, hypothalamus vessels, massive blood loss.

Blood loss on the background of acute alcohol intoxication is a wide-spread variant of traumatizing effects [9, 10]. In damage to the heart and large vessels resulting in massive blood loss thanatogenesis most probably is associated with anemia of microcirculatory bed vessels (MCB) in the brain. Dystonia of vessels and impairment of rheological features of the blood in the brain are most significant in multiple damages to peripheral vessels [2]. Ethanol intoxication produces impairment of vascular wall permeability and its metabolic disturbances which result in marked edema of the brain, dura mater and pia mater [1; 6]. Simultaneously with disturbance of the brain vascular system following acute intoxication caused by ethyl alcohol (ethanol content in the blood and urine makes 4.1–8.9%) high degree of damage to neurons in the brain trunk is noted [4; 5]. Morphofunctional insolvency of the brain vessels and strengthening of thanatogenetic vascular — coagulopathic component are observed in the brain in blood loss on the background of AAI. Detailed study of arteries and MCB vessels condition in hypothalamus in various types of blood loss on the background of alcohol intoxication will make it possible to reveal additional aspects of thanatogenesis.

**Aim:** to evaluate thanatogenesis in various types of blood loss and hemorrhagic shock (HSh) on the background of alcohol intoxication by studying morphological condition of hypothalamus vascular system.

**Material and methods.** The wall of ventricle III with hypothalamus area has been studied in 47 corpses of persons who underwent forensic medical expert examination for death caused by acute (ABL) (3 cases), massive (MBL) blood loss due to impairment of the heart and magistral vessels (14), MBL caused by impairment of peripheral vessels (22) and in persons who died at the in-patient department in clinically made diagnosis of HSh caused by MBL following the impairment of peripheral vessels (8 cases). Blood loss and hemorrhagic shock were caused by impairments of vessels, organs and tissues by sharp (cut-stab) instruments. In all observations in forensic chemical study presence of ethyl alcohol in amount to 3% was determined in the blood of died people. Hypothalamus of the people died of similar types of blood loss and HSh has also been studied without presence of alcohol in their blood (50 cases). The pieces of the brain were fixed in 10% of neutral formalin, carried through alcohol battery, poured over with paraffin and colored by hematoxylin and eosin, resorcin-fuxin according to Veigert' method, with Shiff-reactive, Mallory and Nissle's method. In all types of blood loss and HSh functional condition of arteries is determined by quantity. With this arterial tonus is estimated in conditional units: spasm- 0,0, normotony — 0,5, atony — 1,0. Average indexes on the whole material give quantitative characteristics which expresses

functional condition of muscular type arteries of a certain caliber [7]. In addition the content of blood filled MCB vessels was determined on hypothalamus sections with application of a large quadrat of measuring net of G. G. Avtandilov (25 points) in all types of blood loss and HSh. The study was carried out on two levels of hypothalamus — inner (the 1<sup>st</sup> level) and outer (the 2<sup>d</sup> level) layers. For mathematic processing of the data the Student's method with determination of arithmetic mean  $M$ , average error of relative values  $m$  and coefficient of difference reliability  $t$  was employed; applied subprograms of Microsoft Excel 97 program product were used in the part of descriptive statistics, determination of standard deviations and comparison of extracts.

**Results and discussion.** The study of hypothalamus in various types of blood loss on the background of alcohol intoxication of slight and moderate severity made it possible to determine the changes of morphofunctional condition of hypothalamus vessels in comparison with blood loss without alcoholemia. In ABL on the background of alcoholemia spasm of various caliber arteries is noted in hypothalamus. Tonus condition of large and small arteries on the 1<sup>st</sup> level of hypothalamus makes 0,2, average — 0,1 conditional units. On the 2<sup>d</sup> level of the organ tonus of large arteries makes 0,2 conditional units, average and small ones — 0,1. In ABL without alcoholemia spasm of arteries is marked in a greater degree and makes 0,1 for the most of hypothalamus vessels excluding average arteries on level 1 (0,2). In MBL caused by single impairment of the heart and magistral vessels on the background of alcoholemia, tonus of arteries of large, average and small caliber makes 0,3, 0,4, 0,5 conditional units. However in a deep hypothalamus layer the vessels appear to be sharply spasmodic, their tonus makes 0,2, 0,2, 0,1 in conditional units accordingly. These indexes in the given type of blood loss without alcoholemia after a single injury make 0,1, 0,2 and 0,3 on level 1 of hypothalamus for large, average and small arteries and 0,1, 0,3, 0,7 conditional units on level 2 that can be estimated as dystonia of the organ vascular system. Less marked spasm of intracerebral arteries is observed in multiple injuries of the heart and magistral vessels resulting in MBL on the ground of alcoholemia. On level 1 of hypothalamus tonus of arteries of large, average and small caliber makes 0,5, 0,5 and 0,4 conditional units and 0,5, 0,4, 0,2 accordingly. In similar types of blood loss without AAI the indexes are 0,5, 0,5 and 0,3 on level 1 and 0,4, 0,2 and 0,3 conditional units. In MBL caused by single impairment of peripheral vessels on the background of AAI spasm of small arteries (0,2 conditional units) is observed. Large and average arteries are being in the condition of a slight spasm (0,4 and 0,4 cond. un.) on level 1 of hypothalamus, normotonia or spasm on level 2 (0,5 and 0,3 cond. un.). In multiple injuries of peripheral vessels on the background of alcoholemia



arterial spasm is more clearly marked, on level 1 arterial tonus of large, average and small caliber makes 0,2, 0,3 and 0,1 of cond. un., on level 2–0,2,0,2 and 0,1. For hypothalamus vessels after similar type of blood loss without AAI in single injury the signs of dystonia are typical, as the tonus of large, average and small arteries on level 1 makes 0,4,0,2 and 0,6 and on level 2–0,5,0,4 and 0,2 cond. un. In multiple injuries of peripheral vessels a similar picture is observed, as arterial tonus of different caliber makes 0,4, 0,3 and 0,2 on level 1 and 0,6,0,4 and 0,2 on level 2. In HSh caused by MBL after injury of peripheral vessels on the background of AAI spasm of small arteries is more typical. Tonus of large, average and small arteries makes 0,4,0,4 and 0,2 cond. un. on level 1 and spasm of vessels is more clearly marked on level 2 making 0,2,0,2 and 0,1. In HSh caused by a single injury of peripheral vessels without alcoholemia spasm of different caliber arteries occurs rarer: 0,4, 0,2 and 0,6 cond. un. on level 1 and on level 2 their atonia is noted (0,7, 0,6 and 0,6 cond. un.). Probably in ABL, MBL and HSh on the background of AAI and without it dissociated spasm of arteries is often observed as it does not occur equally in the vessels of different caliber. However in blood loss without alcoholemia tendency of vessels to atonia is often observed that is not marked in different types of blood loss on the background of AAI. In hypothalamus (level 1) the number of blood filled vessels in ABL on the background of AAI and without it is not significantly different but on level 2 in alcoholemia their number is 3.8 times less than only in blood loss. In MBL due to single or multiple injuries of the heart and magistral vessels on the background of AAI marked blood filling of hypothalamus is marked and these indexes are much higher than the similar ones without alcoholemia. In a single injury of peripheral vessels resulting in MBL anemia of MCB vessels is determined in hypothalamus of persons' group with AAI and it is decreased in comparison with the group without alcoholemia 1.5 times on level 1 and almost 7 times on level 2. In multiple injuries in alcoholemia the number of blood filled MCB vessels is larger in hypothalamus on level 1 whereas on level 2 their number is reliably less than in comparative group without alcohol in blood. In comparison of two subgroups of persons with HSh caused by a single injury of peripheral vessels on the background of alcoholemia and without it we revealed that the number of blood filled vessels of MCB is also less particularly in a deep layer of hypothalamus (2.4 times). Thus, in ABL on the background of AAI spasm of hypothalamus arteries is less marked but anemic MCB vessels were more often observed than without alcoholemia. It can be caused by disturbance of redistribution of blood in the brain in alcoholemia. In ABL having the course of rapid loss of relatively small blood volume death is caused by heart failure [9]. In MBL caused by a single or multiple impairments of the heart and magistral vessels on the

background of alcohol intoxication of mild or moderate severity less marked arterial spasm is marked in hypothalamus in comparison with similar blood loss but without alcoholemia. In these terminal conditions in alcoholemia blood filling of MCB vessels is better marked. In MBL caused both by single and multiple injuries of peripheral vessels in presence of alcohol in the blood spastic conditions of arteries and anemia of MCB vessels is marked more often. The same phenomenon is noted in HSh. According to some authors opinion in alcohol intoxication of a mild degree impairment of the brain is less in blood loss that can be associated with pain-killing effect of alcohol [14]. In our observations arterial dystonia in hypothalamus in blood loss on the background of preceding AAI was not observed. Vascular dystonia is considered as manifestation of vascular decompensation, that is confirmed by frequent diapedetic blood loss [12; 13]. However in blood loss on the background of AAI there is no circulation improvement in hypothalamus as difference of arterial tonus of large, average and small caliber persists. There is a complex, multi-link regulation in the vascular system of the brain which determines interaction of different histological structures in arteries, capillaries and veins joining them on blood flow realization, providing metabolism and neurons function [11]. Probably in blood loss both without alcoholemia and on the background of AAI disturbance of coordinated activity of hypothalamus vessels takes place, i. e. dystonia of vascular system on the whole. In HSh there is also no tonus improvement of intracerebral vessels on AAI background. In MBL taking place on AAI background tonus condition correlate with blood filling condition of MCB vessels. In MBL caused by injury of the heart and magistral vessels in less arterial spasm blood filled MCB vessels occur more often. Constant anemia of MCB vessels is observed in MBL caused by injuries of peripheral vessels and also in HSh. In these blood loss types arterial spastic condition is observed more often. The revealed features of tonus condition of different caliber arteries and blood filling of MCB vessels in hypothalamus in different blood loss types and HSh serve as additional criteria for evaluation of thanatogenesis.

**Conclusions:** 1. In acute blood loss on the background of alcohol intoxication spasm of hypothalamus arteries is less marked but anemic MCB vessels occurred more often than without alcoholemia. 2. In massive blood loss caused by single or multiple impairments of the heart and magistral vessels on the background of alcohol intoxication of mild and average severity less marked arterial spasm, better blood filling of MCB vessels are noted in comparison with a similar blood loss but without alcoholemia. 3. In massive blood loss caused by both single and multiple injuries of peripheral vessels and also in hemorrhagic shock spastic arterial condition and MCB vessels anemia are noted more often.

#### References:

1. Babahanyan R. V., Petrov L. V. Principles of postmortal diagnostics of acute poisonings: Manual for physicians/Edited by prof. G. B. Kovalevsky. – Saint-Petersburg, 2002. – Pub. 47. P. 48.
2. Bogomolov D. V. et al. Pathology and clinical features of poisonings by alcohol substitutes//Narcology. – M., 2006. – N.3 (51). – P.42–46.
3. Bogomolov D. V. et al. Thanatological evaluation of morphological brain changes in alcohol disease.//Narcology. – M., 2006. N. 11 (N.59). – P. 45–47.
4. Indiaminov S. I. Medicolegal characteristic of the cerebrum in casw of hemorrhagic shock//Буковинський медичний вісник. – 2013. – С. 70.
5. Indiaminov S. I. Forensic medical evaluation of vascular and neuronal damages to the brain in acute blood loss and anemia//Forensic medical expert examination. – Moscow, 2010. – N. 1 (53) P. 5–7.
6. Indiaminov S. I. Morphological features of the human brain in different variants of fatal blood loss on the background of alcohol intoxication//Herald of Russian State Medical University. – Moscow. 2011. N.5. – P. 63–66.
7. Kalayev A. A. et al. Microcirculatory bed of dura mater encephali in conditions of alcohol intoxication//Morphology. 2006. – V. 129, N. 4. – P. 57.

8. Klevno V.A. et al. Actual and perspective scientific studies of forensic medicine.//Forensic med. expert exam. – 2007. – V.50, N.1 – P.3–8.
9. Kryukov V.N., Sarkisyan B.A. et al. Diagnosticum of death causes in mechanic impairments. – Novosibirsk: Science, 2003. – V.7. – P. 131.
10. Molina P.E. et al. Alcohol's Burden on Immunity Following Burn, Hemorrhagic Shock, or Traumatic Brain Injury//Alcohol research: current reviews. – 2015. – T. 37. – №. 2. – C. 263.
11. Moreno M. C. et al. Alcohol Intake and Apoptosis: A Review and Examination of Molecular Mechanisms in the Central Nervous System. – 2016.
12. Popov V.L. Solved and unsolved problems of forensic medicine.//Forensic med. expert exam. – M, 2011. N.1 – P. 4–9.
13. Tõnisson M. Clinical picture and biochemical changes in blood in children with acute alcohol intoxication: дис. – 2015.
14. Yang J.Y. et al. Role of microglia in ethanol-induced neurodegenerative disease: Pathological and behavioral dysfunction at different developmental stages//Pharmacology & therapeutics. – 2014. – T. 144. – №. 3. – C. 321–337

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## **Characteristic of physical activity of young athletes of the Syrdarya region of Uzbekistan**

**Abstract:** 746 young athletes, 538 (72,1%) from them boys and 208 (27,9%) girls, in aged from 7 to 17 years were examined, living in the Syrdarya region of Uzbekistan Republic. It was defined that girls playing sports were 2,6 times less, than their peers athletes. More than 50% of boys-athletes were engaged in team sports, 32% — different types of single combats; about 9% — complicity coordinated types of sports, 3,5% — acyclic high-speed and strength oriented and about 3% of boys-athletes were engaged in chess. Among girls-athletes, distribution about classification of sports, had been presented by following groups: 76,4% were complicity coordinated types of sports, 12,9% — team sports, 4,8% — different types of single combats, 3,4% — acyclic high-speed and strength orientation and 2,4% of girls-athletes were engaged in chess. Examined pupils of the Syrdarya region who are regularly attend systematic sports activities within 4 years; an average duration of one training occupation was 2 hours, from 3 to 5–6 times a week.

**Keywords:** young athletes, sports educational institutions, different types of sport, systematic sports activities, physical activity, motive mode.

Physical activity are primary communication facility and interaction with environment, household, labor, sports and other types of activity having important social issues. Systematic physical training and going for sport are trained and enhanced physiological functions regulation mechanisms, increased the level of capacity to be act of an organism and its nonspecific resistance. There is a big and irreplaceable role of physical activity for growing organism as natural stimulator of its growth and development. Standard sizes of physical activity for various age periods and different social national groups cannot be same that should be changed with age, as in quantitative, and in a qualitative terms [1, 19–29].

“Upbringing of the healthy and harmoniously developed generation means formation of state base with a great future, achievement of high authority in the world” is a priority task. Government of the republic has been set for itself the task of consecutive children's sport development in close connection with process of education and upbringing, realization of a large-scale work in this direction.

Creation according to Presidential Decree of Uzbekistan Republic in 2002 the Children's sport development Fund has been served as an important step on the way of children's sport development. The fund acts as an effective mechanism of realization of the purposes and tasks in children's sport field. The main objectives of the Fund — to promote of realization the state policy in the physical activity and

sport development field among children, awakening of interest in sport at younger generation, protection of youth against various adverse effects, upbringing them in the spirit of a patriotism.

Government of Uzbekistan Republic has been developed and adopted the state social programs which are directed to strengthening of children health state of and diseases prevention, by general promotion of healthy lifestyle, instilling of interest in physical activity and sport. In evidence of this are realized Resolutions of the President of RUz №PP-2221 from 8/1/2014. “About the State program on further strengthening of population reproductive health, mothers health protection, children and teenagers in Uzbekistan for 2014–2018” and №PP-2487 from 2/9/2016 “About the State program “The year of healthy mother and child”.

To realize the tasks for further strengthening of youth interest in sport, approval of healthy lifestyle principles in society, system organizations of the sports competitions directed to continuous involvement of pupils and students to sports activity according to national model and the education program, and also ensuring effective functioning of this system the three-stage sports competitions “Umid Nihollary”, “Barkamol Avlod” and “Universiada” among pupils of comprehensive schools, academic lyceums and professional colleges, and also students of higher educational institutions are held in republic.

Keeping of the healthy lifestyle principles, physical exercises and sport positively influence strengthening of health, rising of physical development level and physical capacity, carry out such important functions as educational and cognitive, spiritual and moral also social and biological adaptation, decrease of social tension, prevent diseases and offenses, fight against addictions [4, 23–35; 5, 207–258]. Therefore many processes and phenomena are occurred in the physical and sports activities make deep social meaning.

Positive nation health is well affected to culture, education, health care, science and economy [2, 10–35].

Goal: to study physical activity of sports schools pupils of the Syrdarya region of the Republic of Uzbekistan.

**Materials and methods:** Total surveyed were 746 young athletes, 538 (72,1%) of them boys and 208 (27,9%) girls, in aged from 7 to 17. Study has been conducted in 49 sports educational institutions of the Syrdarya region of Uzbekistan Republic, including Gulistan, Syrdarya and Bakht cities, and also regional centers and settlements. For studying purpose of physical activity of young athletes, individual survey by specially developed questionnaire which included passport part (birth date, residence, sex, number of the sport-school), sport type, durations of occupations in this sport and durations of one occupation (training) were conducted. Questionnaires have been distributed by age and sex accessory of pupils' athletes.

The study material analysis was carried out with calculation of the main statistical sizes of variation ranks. By using of the Microsoft Excel program calculation of an average arithmetic quantity ( $M_{av}$ ) characterizing the typical quantity of a sign has been made; errors of an average arithmetic quantity ( $m$ ) characterizing reliability of collected material and its uniformity; an average quadratic deviation ( $\delta$ ) characterizing variability of a sign and being a conditional criterion of a sign deviation from its average arithmetic quantity.

The studies were conducted within framework of the State grant ADSS-15.17.1 and ATSS-24.3 projects.

Results and discussions: the interview result analysis has been shown that from total number of the examined young athletes, boys-athletes were 2,6 times more, than girls-athletes (538 against 208 people).

It was revealed that among children athletes of the Syrdarya region 18 sports were popular. So, boys were engaged in 15, and girls — in 11 types of sports. It is demonstrated that favorable conditions for realization children and teenagers potential abilities, according to their tendencies to a certain specialization (type athletics, game function, etc.) and to interests are created in the republic.

General quantitative distribution of the boys who are engaged in main types of sport had following character: soccer (45,5%), free-style wrestling (17,5%), table tennis (8,5%), kickboxing and boxing (4,8 and 4,5% — respectively), chess (3%), basketball and handball (by 2,6%), volleyball (2,2%), a kernel throwing (2,0%), an arm wrestling (1,9%), Greco-Roman wrestling and athletics (by 1,5%), taekwondo and big tennis (by 1%). Girls-athletes distribution by sports types were rhythmic-sportive gymnastics (63,9%), table tennis (9,6%), basketball (5,3%), soccer (3,8%), athletics (3,7%), synchronized swimming (2,9%), volleyball, big tennis, national wrestling and chess (by 2,4%), handball (by 1,4%).

According to the modified classification of sports, based on manifestation features of physical and technical athletes abilities taking into account popular sports in the republic [3, 30], examined pupils were distributed by groups (acyclic high-speed and power orientation, combat sport, precise sports, shooting disciplines, managerial sports, cyclic sports requiring preferential manifestation of endurance and cyclic sprint sports). Thus, more than 50% of boys-athletes were engaged in team sports, 32% — different types of combat sports; about 9% — precise sports, 3,5% — acyclic high-speed and power orientation and about 3% of boys-athletes were engaged in chess. Among girls-athletes, distribution by the sports classification have been provided on the following groups: 76,4% were precise sports, 12,9% — team sports, 4,8% — different types of combat sports, 3,4% — acyclic high-speed and power orientation and 2,4% of girls-athletes were engaged in chess. Therefore, choosing of a sport depends not only on interests, but also psychophysiological features of pupils-athletes. Thus, popular sports among boys and girls of the Syrdarya region playing systematically sports were determined.

An important issue in formation of the rational active regime of children and teenagers is played by duration of sports activities and length of workout session. Duration of sports activities up to 1 year were at 11% of boys-athletes and 42,8% of girls-athletes, from 1 year to 2 years — 43,1% of boys-athletes and 33,7% of girls-athletes, from 2<sup>nd</sup> to 4<sup>th</sup> years — 33,6 and 17,3% respectively, of the 4<sup>th</sup> and more years — attended systematic sports activities of 12,3% of boys-athletes and 6,2% of their contemporaries. From the provided data it is possible to conclude that at 91% of children-athletes of the Syrdarya region duration of sports activities were up to 4 years. It can be said, that young sportsmen understand an importance of systematic sports activities.

The data analysis has been shown that an average length of workout session among children athletes were 2 hours, and maximum — 4 hours. 94% of boys-athletes were engaged in systematic sport training session from 3 to 6 times a week while most of girls-athletes (85%) attended — from 3 to 5 times a week. It demonstrates that regular physical exercises and sports activities make an integral part of children activity of the Syrdarya region.

#### Conclusions:

1. As, number of girls playing sports were 2,6 times less, than their peers-athletes, it is necessary to strength work among health workers, teachers, trainers and physical education teachers by involvement of girls to systematic sport activity.

2. As a result of carried-out work in the field of children's sport development, in the republic favorable conditions for the choice of a certain sport according to age and sex are created to accessory, specific features, tendencies and interests of children and teenagers.

3. An important role in formation of physical activity of children athletes of the Syrdarya region plays physical exercises and sports activities. The examined pupils of the Syrdarya region regularly attend systematic sports activities within 4 years; an average length of workout session was 2 hours, from 3 to 5–6 times a week.

#### References:

1. Алимов А. В., Камилова Р. Т., Исакова Л. И., Абдусаматова Б. Э., Мамадалиев А. А. Методы определения физического развития и функционального состояния юных спортсменов // Учебная программа. – Ташкент, 2013. – 56 с.
2. Галкин В. В. Экономика спорта и спортивный бизнес // Учебное пособие для высших и средних учебных заведений физической культуры. – Воронеж, 2005. – 324 с.
3. Камилова Р. Т., Исакова Л. И. Организация физкультурно-спортивной профориентации, профотбора и врачебной профконсультации детей и подростков // Учебно-методическое пособие. – Ташкент, 2016. – 71 с.

4. Никитушкин В. Г. Современная подготовка юных спортсменов // Московский справочник и методическое пособие. – Москва, 2009. – № 1. – С. 22–41.
5. Погадаев Г. И. Настольная книга учителя физической культуры. – Москва: Физкультура и спорт, 2000. – 496 с.

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## **The estimation of the variability of the taxonomic characteristics of pathogens of urinary tract infections in women**

**Abstract:** The aim was a comparative study of the variability of taxonomic characters of *E. coli* strains from women with acute and chronic cystitis. It was found that *E. coli* strains isolated from different habitats of the body of healthy and sick women with varying frequency detected taxonomic characteristics, which are associated with the adhesiveness of the pathogen. Strains were found in women with acute and chronic cystitis, variability exhibited by fermentation of mannitol, sucrose, arabinose, glucose, sodium citrate, hemolytic activity.

**Keywords:** taxonomic characteristics, variability, urinary tract infections, pathogens, *E. coli*.

Many of the major taxonomic characteristics (TCh) of organisms do not change in normal growth conditions, but under the influence of various unfavorable factors the properties change [1]. Many opportunistic pathogenic bacteria (OPB) were acquired pathogenic properties namely under these conditions [5]. It is proved that the long persistence of the pathogen in the body leads to a chronic process of infectious-inflammatory process and change some of the properties of this organism [2; 6; 7].

The researchers note that the leading causative agents of urinary tract infections (UTI) are the *E. coli* [3; 8].

In uropathogenic *E. coli*, isolated from women with acute cystitis virulence was, the higher was the most resistant to ciprofloxacin and of *E. coli*, associated with cystitis women, in contrast to of *E. coli*, isolated from healthy individuals treated particularly severely limited clonal group A-CGA [9].

At the same time, according to other authors, there is a shift in the etiology of acute (AC) cystitis in recent years. Thus, some authors believe that there is replacement of *E. coli* to other Enterobacteriaceae, with an increase in their share to 21.8% [2] and even up to 60.8%.

It is still not resolved is the degree of changes of taxonomic characteristics of uropathogenic microorganisms. In this regard, the study of basic taxonomic features of human pathogens of UTI, including women of childbearing age in the dynamics of the disease, monitoring inoculation of OPB is relevant.

**Aim of the study.** Comparative study and evaluation of the variability of the main taxonomic *E. coli* signs that were found by women of childbearing age with UTI.

**Materials and methods.** To accomplish this goal were studied 1026 women's urine samples of UTI patients (age 18–49 years), of which  $27.1 \pm 1.4\%$  ( $n=278$ ) cases of urine samples collected from women of AC and chronic cystitis (ChC). Of these,  $69.8 \pm 2.8\%$  ( $n=194$ ) of women diagnosed with AC and  $30.2 \pm 2.8\%$  ( $n$

$= 84$ ) ChC. The diagnosis was verified by modern clinical and instrumental, laboratory methods and confirmed by bacteriological examination.

After the identification of isolated cultures for further in-depth research on bacteriological variability taxonomic features 29 *E. coli* strains were used (15 from women with AC and 14 from women with ChC) at  $> 10^5$  CFU/ml in urine. For comparison, 21 *E. coli* strain is seeded from the feces of healthy women (control group).

All bacteriological tests for the identification and differentiation of strains were performed in the same conditions using conventional bacteriological methods [4].

Statistical processing of the obtained materials was performed by variation statistics using the application package for biomedical research. When organizing and conducting research using the principles of evidence-based medicine.

**Results and discussion.** We found that out of 278 AC and ChC *E. coli* female patients urine samples were found in  $73.9 \pm 2.6\%$  of patients. However, often plated with *E. coli* other representatives of the family Enterobacteriaceae, genera *Staphylococcus* spp, *Streptococcus* spp, *Enterococcus* spp, *Pseudomonas* spp and *Candida* spp.

Further identification of crops showed the homogeneity of microbial genera *Escherichia* spp., *Pseudomonas* spp., *Staphylococcus* spp. on the main TCh. Due to the fact, that often plated *E. coli*, the special microbiological studies were carried out with the strains of these microorganisms.

It is known, that the hemagglutinating strains activity characterizes their adhesiveness, as one of the bacterial pathogenicity factors [1]. Study of the total activity hemagglutinating strains of *E. coli* seeded from urine of patients with ChC showed that  $85.7 \pm 9.3\%$  of cases ( $n = 12$ ), they possess these properties. This parameter was significantly superior parameters strains ( $P < 0.002$ ) seeded

from urine of women with AC ( $53.3 \pm 12.9\%$ ;  $n=8$ ) and control group ( $23.8 \pm 9.3\%$ ;  $n=5$ ) ( $P<0.001$ ).

Received respectively 1.6 and 3.6 fold increase in total hemagglutinating activity of *E.coli* cultures obtained from women with ChC indicates increased pathogenicity of these strains in comparison with AC and the control group ( $P<0.05$ ).

In addition, there were significant differences in the amount of *E.coli* strains isolated from urine of women AC and ChC ( $n=15$ , respectively, and  $n=14$ ) and control group ( $n=21$ ) having only mannoza resistant haemagglutinin ( $P<0.001$ ), and the combination mannoza re-sistant and mannoza sensitive hemagglutinin ( $P<0.05$ ), where the rates were greater in the strains from patients sown. Mannoza sensitive hemagglutinin study showed that their presence between strains of *E.coli*, isolated from urine of women and female patients in the control group were observed significant differences ( $P>0.05$ ).

Further studies have been devoted to the study of the biochemical properties of strains seeded from patients and healthy women.

It established that *E.coli* strains fermented carbohydrates in different: glucose, lactose, mannitol, maltose, arabinose, glucose Na citrate by  $93.3 \pm 6.5\%$  ( $n=14$ ) to 100% but not fermentation (0%), inositol, sorbitol and malonate Na. According to these indicators, reliable differences in the compared groups of women was observed ( $P>0.05$ ).

There were differences in the ability to utilize sucrose. Strains of healthy women  $95.2 \pm 4.7\%$  ( $n=20$ ) cases, the strains from women patients with BMP in  $97.4 \pm 7.8\%$  ( $n=14$ ) of cases ( $P>0.05$ ) strains of female patients with ChC in  $35.7 \pm 12.8\%$  ( $n=5$ ) of cases ( $P<0.01$ ) had the ability to utilize sucrose.

In other studied biochemical parameters revealed differences were small and statistically no significant difference ( $P>0.05$ ) the studied strains, for this reason, we do not mark them as a distinct taxonomic characteristics of the strains.

Indicators of the proteolytic activity of strains studied differed from the above-mentioned parameters of carbohydrate utilization (biochemical markers). It was found that, regardless of the origin of all isolated *E.coli* strains did not produce hydrogen sulfide, lacked argininedegidrolase, fenilalanindezaminase, and urease-galactosidase activity.

All *E.coli* strains were not possess hemolytic activity than strains isolated from urine of women with ChC ( $28.6 \pm 12.1\%$ ;  $n=4$ ).

Thus, it is revealed that the strains of *E.coli* seeded from urine of women patients with AC and ChC were exhibited a variability by the following taxonomic characteristics: fermentation of mannitol, sucrose, arabinose, glucose with Na citrate, Education indole, hemolysin and antigenic properties with respect to strains of the control group.

Apparently, the variability of taxonomic characters *E.coli* strains isolated from the urine of women with AC and ChC depended on getting this pathogen in other biotope (genitourinary tract), adaptation to these conditions and the long persistence in the body.

The obtaining results in the process of in-depth research uropathogenic bacteriological results are of great importance in diagnosis, predicting outcomes and assessing the occurrence and course of UTI in women of childbearing age due to *E.coli*.

#### Conclusions:

1. Respectively 1.6 and 3.6 fold increase in total hemagglutinating activity of *E.coli* cultures obtained from women with ChC indicates increased pathogenicity of these strains in comparison with AC and the control group ( $P<0.05$ ).

2. *E.coli* strain seeded from urine of women patients with AC and ChC were exhibited variability by the following taxonomic characteristics: fermentation of mannitol, sucrose, arabinose, glucose with Na citrate and hemolytic activity.

#### References:

1. Gritsenko V.A., Deryabin D.G., Brudastov YU.A., Bukharin O.V. Mechanisms of bacterial pathogenicity uro//Journal of Microbiology, Epidemiology and Immunology (Moscow). 1998; 6: 93–8. (In Russia).
2. Dyadyk A.I., Kolesnik N.A. Kidney and urinary tract infections. Donetsk: KP "Region", 2003; 400 p. (In Russia).
3. Kondratova Sh.Yu., Duschanov B.A. The study of the production probability of spread spectrum betalactamase some representatives Enterobacteriaceae family//Journal of Theoretical and Clinical Medicine (Tashkent). 2006; 2: 99–102. (In Russia).
4. The determinant of bacteria Burgi. Edited by Khoulta D., Krigan A.P., Steyli D., Williams S. – Moscow: «Mir». 1997; 1–2. (In Russia).
5. Sultanova Ye.A., Grigoryan V.A., Amosev A.V. et al. Treatment is not complicated infections of the lower urinary tract caused by conditionally pathogenic flora in women//Russian Medical Journal (Moscow). 2005; 13 (27): 1846–9. (In Russia).
6. Yakovlev S.V., Yakovlev V.S. Asymptomatic infection//Practical Guiding the American Society of Infectious Diseases for the diagnosis and treatment of asymptomatic bacteriuria in adults//Consilium medicum. 2005; 7: 32–7. (In Russia).
7. Arakawa S., Nakano Y., Miura T. et al. Clinical study of complicated urinary tract infection using "The UTI Criteria (Draft Fourth Edition)": Measurement methods for pyuria//Int J Urol. 2006; 13: 1484–7.
8. Emody L., Kerényi M., Nagy G. Virulence factors of uropathogenic *Escherichia coli*//Int J Antimicrob Agents. 2003; 22: 29–33.
9. James R.J. Phylogenetic and Pathotypic Comparison of Concurrent Urine and Rectal *Escherichia coli* Isolates from Men with Febrile Urinary Tract Infection//Journal of clinical microbiology. 2005; 43 (8): 3895–900.

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## Morphological condition of the thymus in neonatal sepsis

**Abstract:** In this paper it's conducted a study of clinical and anamnestic data and features of morphological and morphometric changes of the thymus in infants who died from various forms of sepsis. Morphologically it's marked metaplasia of reticuloepithelium to reticulosis and sclerosis, the disappearance of lymphocytes and cell-nannies from the parenchyma of the thymus. As a result of prolonged exposure to infectious agents in the thymus completely blocked all the morphological and functional elements and occurs in the thymus immunogenesis paralysis.

**Keywords:** sepsis, newborn, thymus, immune deficiency, morphology.

The essence of sepsis is the body's inability to destroy microbes, primarily associated with immunodeficiency condition (IDC) [1; 2; 3]. The condition may be a background, i. e. to available in the body prior to infection, as well as naturally occurring in it as a result of pathogens and their toxins, and due to therapy. Thus, sepsis almost always occurs in a child with any background state, which is usually accompanied by a IDC. Infectious diseases in immunodeficiency conditions are especially gravity and duration of the current, the development of unusual complications, often sepsis [2; 3; 4]. Thus, in the etiology of infectious processes the primary role usually belongs to microorganisms with low pathogenicity. If the defect of cell-mediated immunity infectious diseases are mainly caused by fungi, viruses and gram-negative flora, with defect of humoral immunity — gram-positive bacteria.

Until now is still little studied morphofunctional state organs of immunity, in particular the central organ — thymus in sepsis in newborns [5; 6]. Particularly, these morphological changes in the thymus, resulting in various infectious diseases remains controversial. In recent years in pediatrics is a particularly urgent problem of the growth of immunodeficiency conditions, developing under the influence of environmental, genetic and infectious factors.

Given the above, this paper studied the clinical and anamnestic data and features of morphological and morphometric changes of the thymus in infants who died from various forms of sepsis. Clinical and morphological analysis was performed taking into account the state of term and preterm, malnutrition and premorbid background diseases.

**Material and methods.** The object of the study were 36 thymus of newborn infants who died in infancy from sepsis. During the autopsy of corpses was isolated thymus, were weighed and determined by the weighting factor of the thymus (WFT). For histological examination of the thymus slices were fixed in 4% formalin solution, phosphate buffer and then dehydrated in alcohols embedded in paraffin. Slicers 5–8 micrometers of thickness were stained with hematoxylin and eosin, Van Gieson and Schick reaction. To unify accounting thymus morphological changes in the conditions of the newborn and various pathologies developed an algorithm for evaluation of morphological characters.

The results of clinical and morphological analysis of observations with sepsis showed that the disease as the most severe form of the infection is common in children, developed in preterm (34.7%), malnutrition (64.3%), in the presence of premorbid background (rachitis, anemia) — 51.5%. Great importance in the development of sepsis it took place different birth defects of organs and tissues, including congenital heart disease (23.8%), the brain (14.6%), kidney and liver (7.3%) and other congenital malformations (13,1%). These defects are more common in young infants, and often leads to septic lesions of the lung, colon, brain, and serous cavities.

Pathomorphological it's revealed bilateral macrofocal pneumonia with abscess formation and necrosis of the lesion areas, ulcer-necrotic, fibrotic and ulcerative enterocolitis, sometimes with metastatic abscesses in the liver. Purulent metastases were also found in the brain, the epicardium, in rare cases, there was purulent peritonitis. In the age group of 7–12 months sepsis met as in the previous groups, children with artificial or mixed feeding, and as a complication of viral and bacterial pneumonia, enterocolitis caused by pathogenic microbes occurring in the form of septicemia.

Thus, sepsis develops in frail children in a reduced immunological reactivity of the microorganism in the presence of premorbid background, runs hard, with polymorphic lesions of the internal organs, as pointed out by other authors (2,4). It should be emphasized that very often immunodeficiency child's development even sepsis caused by opportunistic microorganisms. Our studies have shown that sepsis in one year-old children is caused mainly by opportunistic microbes (75.7%), such as *E. coli*, *klebsiella*, *pseudomonas aeruginosa*, *staphylococcus epidermidis*, *proteus*, joined viral infection, yeast and molds.

Immunological study found that the content of immunoglobulins and T- and B-lymphocytes fluctuated depending on the degree of prematurity and sepsis severity. Pyosepticemia on the background of prematurity, premorbid conditions and congenital malformation characterized by a significant decrease in the level of immunoglobulins of all classes. Also lowered blood cortisol level and immunoglobulin E. In septicemia accession viral infection marked increase in levels of immunoglobulin G to 16.7 g/l, cortisol up to 10,256.31 nmol/l. In the age group 7–12 months in almost

all cases, elevated levels of immunoglobulin M, on average —  $4,03 \pm 0,19$  g/l and the level of immunoglobulin A ( $0,31 \pm 0,05$ ) and G ( $6,55 \pm 1,33$ ) g/l relatively low.

In the diagnosis of secondary immunodeficiency in children, we take into account the clinical history, when there is the presence of the primary infectious diseases caused by viruses, virulent bacteria, parasites, and also when there are metabolic diseases, such as thesaurismoses and nutrition — malnutrition, anemia etc.

Pathomorphologically secondary immunodeficiencies manifest IV–V phases of accidental transformation, the acquired atrophy of the thymus. In peripheral organs immunogenesis — devastation not functionally zones, and their replacement by the reticular connective tissue, as well as the absence of lymphocyte activation, bright breeding centers.

When infectious diseases according to the statute of limitations of the disease observed in the thymus various phases of accidental transformation. In the initial stages of viral infection, influenza and more adenoviral infection, thymus somewhat increased and edematous. Microscopically observed loosening of the layers due to swelling of the thymus, lymphocytes and a massive collapse of reticuloepithelial cells. Especially pronounced decay of lymphocytes was located in the subcapsular zone macrophages appeared larger and nurse cells, a large number of phagocytic cells. The medulla also lymphocytes are able to karyolysis and karyopyknosis; Hassall's corpuscles are increased, they are adjacent disintegrated lymphocytes and macrophages. In this layer, there are large cells with hyperchromatic nuclei, resembling viral metaplasia cells of other organs.

In later stages of the disease is marked decrease in the volume of the cortex and medulla of the expansion. This process is accompanied by a thickening of the interstitial tissue by reticulosis and sclerosis. In the cortex, reticular cells predominate over the lymphocytes, the latter are located primarily in the cytoplasm of cells nurses. Reticuloepithelial cytoplasm undergoes dystrophic changes and breaks. Intercellular distance extended.

In subsequent stages begins lobules collapse of the thymus, the lymphocytes in the cortex almost disappear reticuloepithelium breaks, sometimes there are giant cells with large hyperchromatic

nuclei. In this phase accidental transformation of lymphocytes predominate in the medulla and are active in blasttransformed state. On the part of the interstitial tissue fibrosis is marked with a predominance of connective layers of fibrous structures; lymphatic vessels subsides. Reticuloepithelial cells that lie on the basement membrane, in metaplasia reticulum, then the connective tissue cells become spindle-shaped and grow in the direction of the parenchyma of the thymus. First, they take the cortical layer, and then in the form of strands enter the medulla between Hassall's corpuscles. In the thymus lymphocytes almost determined Hassall's corpuscles consist of scaly calcined mass. The ratio of the thickness of the parenchyma of the thymus and the interstitial tissue favors the stroma.

Thus comes the acquired atrophy of the parenchyma of the thymus with complete metaplasia reticuloepithelium in reticulosis and sclerosis, the disappearance of the parenchyma of the thymus lymphocytes and cells — nurses, breach the basement membrane of the cortex, consisting of reticular tissue, obliteration of the lymphatic vessels and cracks interlobular space and lobular perivascular space, where it occurs in normal lymphocyte recirculation, sclerotherapy of postcapillary venules of the parenchyma of the thymus. In short, as a result of prolonged exposure to pathogens in the thymus completely blocked all the morphological and functional elements and occurs in the thymus paralysis immunogenesis. Consequently occurs delymphotisation T-dependent areas of peripheral lymphoid organs, disturbed relationship of T and B lymphocytes occurs hypoplasia and second B-dependent areas.

#### Conclusions

Histological measurements study of the thymus with acquired immunodeficiency showed that its mass is reduced by half compared with the control group and averaged  $6,4 \pm 0,8$  g, its weight index was also significantly below normal ( $1,03 \pm 0,17$ ). Slices thymus evenly collapsed, their diameter was  $1164 \pm 87$  micrometers, of which accounted for  $497 \pm 53$  micrometers for cortex,  $667 \pm 71$  micrometers — on the brain. There is thickening of the stroma —  $288 \pm 23$  micrometers and the coefficient of correlation of the stroma and the parenchyma was  $0,24 \pm 0,04$  micrometers, which is significantly higher than the norm.

#### References:

1. Беянин В. Л., Рыбакова М. Г. Сепсис. Патологическая анатомия. – СПб., 2004.
2. Самсыгина Г. А., Яцык Г. В. Сепсис новорожденных. В кн. «Руководство по педиатрии. Неонатология» – М.: 2005, Династия, – С. 337–352.
3. Септицемия на фоне иммунодефицита // А. Л. Авцин, Ю. Г. Пархоменко, И. Н. Емельяненко, С. С. Матюшков // Арх. патологии. – 1987. – № 6. – С. 54–58.
4. Соболюк Н. В. и др. Иммунный статус доношенных и недоношенных новорожденных от матерей с неблагоприятно протекающей беременностью в онтогенезе. – Морфология, – 2000, Том 118. – № 15, С. 44–47.
5. Ткаченко Е. Г. Морфометрическое исследование тимуса детей при внутриутробном и постнатальном инфицировании // Междуна. Симпозиум. – Львов. – 2000. – С. 10–12.
6. Чехович Г. И., Петухова Н. М., Шербаков Д. В., Григорьева А. А., Павловец Л. П. Роль вилочковой железы в структуре заболеваемости неонатального периода // Астана медициналык журналы. – 2000. – № 4. – С. 78–80.

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## Prevention of paralytic ileus in acute diffuse peritonitis

**Abstract:** Many years of experimental and clinical research staff of the department of surgical diseases of the Andijan State Medical Institute provided the basis for a new way to fill a regional lymph drugs for various diseases. During the period from 2005 to 2012. in Andijan State Medical Institute was under the supervision of 89 patients with acute peritonitis. Assessing the prevalence of inflammation in the abdominal cavity is one of the crucial importance in determining the course of treatment. According to the classification V.D. Federova (1974), localized peritonitis was diagnosed in 41 (58.6%) patients, of whom 14 (34.1%) — unlimited, 27 (65.9%) — are limited. Peritonitis was observed in 29 (41.4) patients, of whom 9 (31.3%) — diffuse, with 20 (68.7%). We have studied the best way to saturation lymphatic system of the abdomen in acute peritonitis and invented a method lymphotropic administration of antibiotics in the mesentery of the small intestine in the postoperative period. It turned out that this method is more rapidly produce high levels of antibiotics in the mesenteric lymph nodes, as evidenced by observations in experimental studies. Endomesenteria endolymphatic antibiotic therapy, conducted in all 70 patients with peritonitis, was a significant addition to the complex events in the postoperative period.

**Keywords:** peritonitis, lymphotropic, endomesenteria endolymphatic.

### Introduction

Conducting lymphotropic therapy in acute surgical diseases has advantages over traditional methods of drug administration, especially antibiotics [1; 3; 5].

It is proved that in acute intestinal obstruction, peritonitis complicated in animals occurs expressed intoxication, and especially changes in the gastrointestinal tract in the form of paralytic ileus. With the development of peritonitis decreases the formation of lymph edema observed abdominal, lymphovenosus stasis. In this state is more efficient administration of various drugs in the lymphatic system [2; 4].

Another positive features of the lymphatic therapy through the mesentery of the small intestinal is to maintain a high concentration of antibiotics in the lymph nodes of the abdomen. When compared with other methods of administration at 3 and 6 hours of antibiotics in 3–7 times greater in the mesenteric lymph nodes. Long (with a single dose) for 24 hours or more, the finding of antibiotics in the lymphatic channel creates the conditions for a permanent proceeds of the drug into the bloodstream through the mouth of the thoracic duct.

### Materials and Methods

During the period from 2005 to 2012. in Andijan State Medical Institute was under the supervision of 89 patients with acute peritonitis. Assessing the prevalence of inflammation in the abdominal cavity is one of the crucial importance in determining the course of treatment. According to the classification V.D. Federova (1974), localized peritonitis was diagnosed in 41 (58.6%) patients, of whom 14 (34.1%) — unlimited, 27 (65.9%) — are limited. Peritonitis was observed in 29 (41.4) patients, of whom 9 (31.3%) — diffuse, with 20 (68.7%).

In order to determine the most effective strategy in patients with peritonitis, we studied the microflora in different parts of the abdomen and determined its sensitivity to antibiotics.

In 70 patients with peritonitis used endolymphatic antibiotic therapy in the mesentery of the small intestine. 19 patients in the control group received standard treatment.

### Results and Discussion

During the operation, all patients of the main group laparoscopic readjustment abdominal dissection of adhesions and eliminate the source of infection. Between the sheets of serous mesentery microirrigator installed and fixed to the mesentery. Other end of the catheter is removed from the abdominal cavity through a separate incision and immediately injected with 0.5% procaine 20ml for leakage control catheter. Lymphotropic therapy through microirrigator begins on the operating table. Lymphatic therapy involves lymphostimulator and lymphotropic injection of antibiotics. As lymphostimulator was used glucose-novocaine mixture in the ratio of 1:1 at a dose of 4 ml/kg body weight of the patient with the additional lidazy (0.5 U/kg), heparin (80 U/kg, with the patient's blood clotting) and mannitol (2.5 ml/kg). in the postoperative period through a catheter inserted in the bowel mesentery, drip immediately after lymphostimulate starting antibiotics in the usual single dose given the sensitivity of the microflora of the abdominal cavity. Endolymphatic antibiotics depending on the severity of the disease and the patient performed once, sometimes twice a day for 3–5 days. The results of treatment were compared with a control group of patients (19) with peritonitis treated in the postoperative period in the traditional way. The criteria for evaluating the effectiveness of the therapy were objective and subjective data of the patient, laboratory and instrumental studies.

During the postoperative period endomesenteria lymphotropic antibiotic therapy (70 patients) compared to the conventional methods of treatment (19 patients), peritonitis, complicates dynamic ileus, leucocytosis in the blood was significantly reduced by day 4, and in the control group — 6 days after treatment, the ESR is reduced by day 4 at lymphotropic therapy, whereas in the control group — in 6 days. In addition, we have a great attention was paid to the restoration of the function of the gastrointestinal tract in the postoperative period. A sign of the functioning of the gastrointestinal tract is the amount of aspirated fluid from the stomach into the postoperative period.



Table 1 shows that during lymphotropic therapy in the mesentery of the small intestine in patients in the postoperative period on the 2<sup>nd</sup> day auscultated intestinal peristalsis, and the third day is celebrated independent carminative and normalization of stool. In the control group only on the third day of treatment appear peristaltic noises for 4–5 days reduced functional capacity of the gastrointestinal tract. When aspirating gastric contents into the postoperative period of diminishing its scope in the recovery of functional activity of the digestive tract.

With widespread purulent peritonitis were impaired absorption of fluid from the abdominal cavity, which contributes to its accumulation. It is promoted as congestion in the lymphatic and venous system of the abdominal cavity. Conducted endolymphatic antibiotic in the postoperative period, especially with lymphostimulate, improves microcirculation and reduce the accumulation of fluid in the abdominal cavity. Table 1 presents data on the amount of fluid released from the abdominal cavity through the drainage in the postoperative period.

#### Conclusion

As a result of lymphotropic therapy of released fluid from the abdominal cavity was significantly reduced compared with the control group, starting from the 2<sup>nd</sup> day of treatment in the postoperative

period, indicating and early recovery of the gastrointestinal tract. With this method of treatment also was a decrease in spending, especially in connection with a reduction in the dose and dose frequency of antibiotics. Along with the improved of the patient and normalization of parameters is achieved by reducing the frequency of various complications and reduced mortality in the postoperative period.

In the complex treatment of peritonitis lymphatic therapy through the use of bowel mesentery is pathogenetically substantiated method of therapy and significantly improves the function of the gastrointestinal tract in the postoperative period, reduces the incidence of complications and reduces the average stay of patients in hospital.

We have studied the best way to saturation lymphatic system of the abdomen in acute peritonitis and invented a method lymphotropic administration of antibiotics in the mesentery of the small intestine in the postoperative period. It turned out that this method is more rapidly produce high levels of antibiotics in the mesenteric lymph nodes, as evidenced by observations in experimental studies.

Endomesenteria endolymphatic antibiotic therapy, conducted in all 70 patients with peritonitis, was a significant addition to the complex events in the postoperative period.

Table 1. – Dynamics of recovery of intestinal peristalsis and volume aspirated gastric contents during treatment

Day treatment	Appearance peristalsis		Volume stomach contents (ml)	
	lymphotropic	Traditions	lymphotropic	Traditions
1	–	–	1325,7 34,7	1209,2 35,1
2	++	–	843,6 25,0	1158,9 36,9
3	+++	+	107,9 10,7	793,5 31,0
4	+++	++	no	250,4 15,8
5	+++	+++	no	no

\*) the significance of differences in rates 1 day ( $P < 0,05$ )

Symbols: – lack of intestinal peristalsis

+poorly articulated

++ moderate

+++ hypercatharsis

It significantly reduces the complications of the underlying disease, promotes early recovery of the gastrointestinal tract, reduce postoperative dynamic obstruction the possibility of intestinal obstruction in late postoperative period.

All the patients treated after the operating wound “Dermobacter” During smooth joints removed the wound healed with primary intention.

Thus, in the complex prevention and treatment of postoperative ileus dynamic acute peritonitis lymphatic therapy through mesentery is the most effective treatment.

#### References:

1. Ahuntov I. T. Lymphogenetic surgical treatment of endotoxemia due to peritonitis. Author. Dis. on competition. Kazan. step. Dr. med. Science. – Saratov – 2001. C. 15.
2. Bilyaltsev V. N., et al laparoscopic abdominal rehabilitation in the treatment of peritonitis // Surgery. – 2002. – № 6. P. 30–33.
3. Vtorenko V. I. clinical and experimental validation of nodal methods in treatment of peritonitis // abstract. Dis. On competition. Kazan. Step. Dr. med. – M. – 2002. C. 64.
4. Evdokimov V. V. Pathogenetic criteria for diagnosis and comprehensive treatment of diffuse peritonitis with inclusion lymphologic methods: Dis. on competition exercises. step. Dr. med. Science. – M.: 2002. P. 356.
5. Bohnen J., Bjulanger M., Meakins J. L., Molean F. P. / prognosis in generalized peritonitis. // azch. Surg. 1983. Vol. 119. number 3 – P. 285–290.

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## Prevention of complications following operating Adhesive Peritonitis

**Abstract:** Most intra-adhesive complications require repeated surgery, which is much more traumatic and dangerous than the primary operation. Defining the phenotype of acetylation was carried out in 36 patients with peritonitis and 42 patients with OSKN aged 16 to 84 years admitted to hospital Andijan Medical Institute from 2007 to 2012. Used method for determining free and acetylated sulfosalazina 6 hour urine sample after of test dose per os. The amount of free and acetylated sulfosalazina determined by Prebstringa and Gavrilov in modification Timofeeva (1971). To significantly reduce the incidence of postoperative complications in the adhesive early and late periods after the most frequent primary surgical operations on the abdominal organs to the wider use of the techniques of modern videolaparoscopic sparing surgery. After operating the wound treated with medication "Dermobacter" undiluted. After operating for a conference run smoothly, the stitches removed for 6–7 day, with the wound healed by first intention.

**Keywords:** peritonitis, acetylation, rapid acetylators

### Introduction.

Prevention of adhesion formation after operations on the abdominal organs is traditionally the most difficult section of abdominal surgery [1–3].

Conventional methods of clinical diagnosis of adhesions does not allow us to estimate the direction and intensity of the process of restructuring the connective tissue (collagen) in the abdomen after surgery. Consequently, it is not possible to objectively assess the disease, predict complications and effectiveness of their treatment. To date, none of the existing methods of preventing postoperative adhesions do not reliably prevent the formation of adhesions in the abdominal cavity. In this regard, an important focus is to find new, more effective ways to prevent pathogenetic adhesive postoperative complications.

The causes of abdominal adhesions, most researchers consider a mechanical failure of the peritoneum during the operation, the presence of abdominal infection and prolonged intestinal paresis. Also important to give the individual predisposition adhesions.

In recent years has been associated with postoperative complications adhesive type of acetylation. Found that after surgery for peritonitis different genesis of pathological process occurs only in patients with the fastest type of acetylation [2; 4; 5; 6].

The aim of the study was to determine the phenotype of acetylation in patients with various forms of peritonitis and acute adhesive intestinal obstruction (OSKN) to study its relation to the incidence of adhesive complications.

### Materials and Methods.

Defining the phenotype of acetylation was carried out in 36 patients with peritonitis and 42 patients with OSKN aged 16 to 84 years admitted to hospital Andijan Medical Institute from 2007 to 2012.

Used method for determining free and acetylated sulfosalazina 6 hour urine sample after of test dose per os. The amount of free and acetylated sulfosalazina determined by Prebstringa and Gavrilov in modification Timofeeva (1971).

By "rapid acetylators" patients were referred to the level of acetylation of more than 76%. Found that in these patients the inflammatory process is productive as before surgery and in the postoperative period, which leads to the formation of adhesions and complications infiltrates.

In contrast to this "slow acetylators" (less than 76 percent acetylation) on mild otgranichitelnye repair processes, they were more typical complications associated with poor wound healing.

Therefore, the phenotype may acetylator life used as a screening test to select patients at risk for the development of adhesive surgical complications.

Studies were performed in patients with peritonitis of various origins and OSKN operated traditional (open) and laparoscopic. In the postoperative period, patients received drugs that slow down the collagen and accelerate its utilization. Along with their usual therapy administered per os Kuprino with 7–10 days after the operation, 1 time a day for 10–15 days. This drug is able to cleave the unstable cross-links and thus contribute to the accumulation of soluble collagen and inhibit the formation of insoluble collagen.

For the purpose of destruction and recycling of collagen fibers at the same time held 10–15 sessions electrophoresis contrast tubs and vitreous body 64 units. After discharge from the hospital, all patients were placed on the dispensary registration with regular inspection at least 2 times a year. If necessary, repeat the treatment.

### Results and Discussion.

After verifying the effectiveness of the definition of the phenotype of acetylation in predicting adhesive complications, we performed phenotyping in 36 patients with peritonitis of various origins. Slow "acetylators" were 24 (66.6%) patients, a "fast" — 12 (33.4%).

To evaluate the effectiveness of treatment protivospaehnogo 36 operated patients with peritonitis were divided into 3 subgroups. 14 patients the main group in the postoperative period than conventional treatment (infusion and antibiotic therapy, topical treatment) treated with a course of therapy protivospachnoy. 10 patients the operation was performed with laparoscopic protivospachnoy subsequent course of therapy. 12 patients of the control group did not receive protivospachnuyu therapy and treatment for the rest of them did not differ from that of the main group.

Relative frequency of adhesive complications in three groups depending on the phenotype of acetylation is presented in Table. Number 1.

Table 1.

Group	Complications of adhesions		The total number of patients
	«Slow acetylator»	«Fast acetylator»	Abs.
Summary (n=14)	1 (7.1)	2 (14.2)	3 (21.4)
Laparoscopic (n=10)	0	1 (10)	1 (10)
Control (n=12)	1 (8.3)	4 (33.3)	5 (41.6)
Total.	2 (5.5)	7 (9.4)	9 (25)

*The frequency of complications in patients with adhesive peritonitis, depending on the method of treatment and acetylation phenotype (n=36)*

As can be seen from Table 1 in three groups of commissural complications occurred mainly in patients with rapid acetylation phenotype. At the same time, the frequency of these complications was significantly lower in the intervention group than in the control, where the anti-inflammatory treatment was carried out.

Analysis of the results of different treatments peritonitis showed convincingly that developed a new set of clinical interventions for the treatment of this severe disease reduces the likelihood of the formation of adhesions in the abdominal cavity. Accounting acetylation phenotype and preventive measures provide an opportunity to reduce the frequency of the formation of intra-abdominal adhesions in this group of patients.

#### Conclusion.

However, these measures do not fully address this complex problem of abdominal surgery.

Most of the traditional open trauma laparotomic access violation of the integrity of the skin, muscle, arrays, aponeurosis, parietal peritoneum and removing intestinal loops from the abdominal cavity causing intestinal paresis and contribute to the strengthening of adhesions.

To significantly reduce the incidence of postoperative complications in the adhesive early and late periods after the most frequent primary surgical operations on the abdominal organs to the wider use of the techniques of modern videolaparoscopic sparing surgery.

After operating the wound east rated with medication "Dermobacter" undiluted. After operating for a conference run smoothly, the stitches removed for 6–7 day, with the wound healed by first intention.

#### References:

1. Babajanov B.D., Beketov G.I. Teshaev O.R./New approaches to the treatment of postoperative peritonitis. Journal of Surgery – 2002. T. 161. Number 4. 25–28.
2. Biryaltsev V.N., et al/Laparoscopic abdominal rehabilitation in treatment of peritonitis. Surgery. – 2002 – № 6. from 30–33.
3. Karimov S.I., Babajanov B.D., O.P. Teshaev/Modern aspects of the treatment of acute purulent peritonitis. Surgery – Uzbekistan. – 2005. – № 3. 12–14.
4. Rozanov V./Using videolaparoscopic technology for the treatment of posttraumatic peritonitis. Military Medical Journal. – 2006. T327. Number 12. with 32–33.
5. CHernov V./Videolaparoscopic role in the diagnosis and treatment of complex rasprastrannogo peritonitis. Endoscopic surgery. – 2005. Number 1. with 163.
6. Gies W.P., Kim H. C. Use of laparoscopy in the diagnosis and treatment of patients with surgical abdominal sepsis. SurgEndosc – 1995, 9, 2 178–182.

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## Immunological markers of juvenile Rheumatoid Arthritis in children

**Abstract:** It was proven that high level of ACCP had an impact on clinical progress of JRA in children. The obtained results can serve for the assessment of the therapy efficiency.

**Keywords:** juvenile rheumatoid arthritis, diagnosis, children.

There is a groups of diseases the development of which occurs due to the immune system secretion of antibodies against some proper proteins, as if these were alien ones. In other words, protective system of organism plays a role of aggressor against its own organism. These diseases are called autoimmune ones, and juvenile rheumatoid arthritis (JRA) is one of them [1; 2].

In JRA, especially its early stages, there is a significant diversity of immunological disorders. It is related both to rheumatoid factor [4; 7] and its isotypes [6], and new immunological markers such as anti citrullin antibodies [5]. Antibodies to citrullin peptides, and, particularly, to cyclic citrullin peptide (ACCP) should be considered

to be one of the most perspective (diagnostically and prognostically) markers nowadays [3].

In case of JRA in synovial membrane of a joint there is an inflammatory process, as a result of which arginin amino acid is converted to citrullin. In other words, in a pathologic joint there is a process of citrullination of proteins considered alien by immune system. For the struggle with the assemble of citrullinated proteins an organism secretes specific antibodies, by these means promoting auto immune inflammation. The exact pathogenic role of auto antibodies is not studied well yet [4; 7].

Statistics demonstrates, that the result of ACCP and rheumatoid factor test of many patients is positive 10 years prior to manifestation of painful symptoms in joints [7]. A doctor can prescribe therapy before the start of destructive process in joints on the basis of high values of ACCP. From the other side on the basis of the same analysis a doctor can start prophylactic therapy of rheumatoid arthritis [2; 5]. The aforesaid statements are more actual in pediatrics, particularly for the children with JRA.

The significance of JRA in the early diagnostics of rheumatoid arthritis was subject to several researches; and, particularly, quite high values of sensitivity and specificity of that test were determined for Russian population of patient [5]. Clinical importance of the definition of that type of antibodies for early diagnostics of JRA in children dependent on environment was not studied yet.

**The object of the research:** was to study the possibilities of the application of the modern diagnostic test of antibodies to cyclic citrullinated peptide (ACCP) in JRA in children for early diagnostics and prediction of the further progress of the disease.

**The results of the research:** the data of checking of 70 children with JRA living in various ecological regions of the republic of Uzbekistan served the basis of the research. The age of children varied from 3 to 16 year old. Most of the children were from 10 to 14 years old (46.2%). The average duration of the disease was  $57 \pm 20$  years.

Criteria of inclusion to the research were the following:

- age <16 years old,
- duration of articulate syndrome >3 months,
- primary character of articulate process (other nosologic forms such as lupus, rheumatism, septic arthritis, tumors, etc).

Analysis of clinical data of the patients showed that articulate-visceral form of the disease was observed in 12 children (17.1%), prevailing articulate form was observed in 58 children (82.9%).

Within the period of the study in 38 (54.3%) patients we observed exacerbation, moderate activity degree was observed in 19 (27.1%) children, and in 13 children (18.6%) there was low activity of the process.

Concentration of ACCP was determined in 46 patients with JRA duration less than 6 months (1 group), 24 patients with JRA for more than 12 months (2 group). The control group involved 20 almost healthy children of the same age.

Antibodies to cyclic citrullinated peptide were determined by means of enzyme immunoassay with the help of commercial sets (Axis-Shield Diagnostics Limited, Great Britain), in compliance with the instructions of the manufacturer with the upper normal border equal to  $5.0 \text{ U/ml}$ .

The obtained data were statistically processed on Pentium-4 EXCEL software, using the library of statistical functions.

**The results of the research:** The analysis of clinical progress of juvenile rheumatoid arthritis revealed that the onset of the pathology was acute in 48% of the examined children. We observed the rise of body temperature, appearance of pain, and then edema in one or several joints, more often symmetric ones. Though symmetric lesion was observed in 34% of the examined children; the lesion became noticeable gradually within several days or weeks from the onset of the disease. As a rule, the process was observed in large joints such as knee (36%), ankle (28%), radial-carpal (32%); but in some patients (22%) starting from the onset of the disease small joints of arms and legs (metatarsus, interphalangeal) also were involved in the process. The lesion of the joints of cervical spine was observed in 37% of the examined children. The joints were very painful, edematous, and in rare cases (12%) the skin around was hyperemic. Body temperature was increased in 98% of the children, and it reached  $38\text{--}39^\circ\text{S}$ . Often the skin of body and limbs had polymorphic allergic rash, there was enlargement of lymphatic nodes, liver and spleen. In common blood analysis we revealed neutrophilic leukocytosis with the shift of leukocyte formula to the left and increase of ESR to  $40\text{--}60 \text{ mm/h}$ .

The level of ACCP in blood serum of the patients of the 1 and 2 groups was higher than in the control ( $r < 0.001$  for both comparisons) (Table 1).

Positive results of ACCP test ( $>5.0 \text{ U/ml}$ ) were observed in 36 out of forty six (78.3%) children with early JRA and 22 out of 24 (91.7%) cases of long-term JRA.

The analysis of ACCP dependent on the form of the disease in children did not reveal reliable differences. As it is seen from the chart data, the level of ACCP did not depend on clinical form of the disease. So, we revealed that in case of systemic variant there was notable rise of ACCP level 22.6 folds ( $R < 0.001$ ) in comparison with the control and 23 folds ( $R < 0.001$ ) in articulate variant of JRA.

Table 1. – ACCP concentration in JRA

Groups	The frequency of positive results ( $>5.0 \text{ U/ml}$ )	Quantitative value
1 group (n=46)	36 (78.3%)	$73.3 \pm 3.4 \text{ U/ml}^*$
2 group (n=24)	22 (91.7%)	$79.6 \pm 2.2 \text{ U/ml}^{*\wedge}$
Control group	0	$3.4 \pm 0.1 \text{ U/ml}$

Note: \* — reliability of the data in the control group ( $R < 0.001$ );  $\wedge$  — reliability of the data between 1 and 2 groups ( $R < 0.05$ )

We determined reliable differences of ACCP level dependent on the process activity degree. The highest values ( $R < 0.01$ ) were observed in case of JRA exacerbation. In the study of ACCP dependent on the activity of inflammatory reaction we revealed the following alterations: its concentration in low activity rheumatoid process was reliably lower than in exacerbation and was equal to  $26.9 \pm 5.6 \text{ U/ml}$  and  $84.4 \pm 6.9 \text{ U/ml}$ , respectively ( $R < 0.01$ ).

Thus, ACCP level has a direct impact on the clinical progress of JRA, and it can serve to be marker for early diagnostics of JRA in children.

#### Conclusions:

1. We detected 25 folds increase of ACCP in children with JRA compared with the results in the control group.
2. Increase of ACCP is a marker for early diagnostics of JRA.
3. It was proven that high level of ACCP had an impact on clinical progress of JRA in children. The obtained results can serve for the assessment of the therapy efficiency.

#### References:

1. Aleksandrov A. V., Shilova L. N. Immune pathogenic aspects of modern laboratory diagnostics of lupus, systemic scleroderma, and juvenile rheumatoid arthritis // International Journal on Immunorehabilitation, – 2010. – V. 12. – № 2. P. 150a.
2. Demidova N. V. Clinical and immune genetic characteristics of early rheumatoid arthritis: thesis ... cand. Med. scien. – Moscow, – 2010. P. 103.

3. Clinical guideline on laboratory tests/N. U. Tiitsa rev. – M: Unimed-press, 2003. P. 942.
4. Rheumatology: National manual/Y.L. Nasonova, V.A. Nasonova rev. – M.: GEOTAR-Media, 2008. – P. 720.
5. EUROIMMUN Medizinische Labordiagnostika AG. Anti-CCP ELISA (IgG). 2009 god (ACCP definition guideline).
6. Nasonov E. L., Karateev D. E. Early rheumatoid arthritis: value of anti-cyclic citrullinated peptide (ACCP) antibodies and early referral recommendations of EULAR//Annual European Congress of Rheumatology. – EULAR, 2005. – R. 9–10.
7. Yasui K., Sakata S., Ochi H., Itamura S., Hirai K., Takenaka M., Mitani O., Ogawa K., Iyoda K. Onset of polyarticular juvenile idiopathic arthritis with both anti-cyclic citrullinated peptide antibodies and rheumatoid factor in a 3-year-old girl. *Pediatr Rheumatol Online J.* 2012 Dec 13; 10 (1): 41.

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## Association of MTHFR and MTRR genes with the development of antiphospholipid syndrome in pregnant women of Uzbek population

**Abstract:** By comparing the frequencies of genotypes studied polymorphic markers were installed by us the genetic association of folate cycle genes to the development of antiphospholipid syndrome. The results of this study demonstrate the relationship risk of antiphospholipid syndrome in the Uzbek population with carriage of the G allele of rs180139 polymorphism, and AG genotype of rs180139 polymorphism of MTRR gene. According to the allelic variants of MTHFR gene of rs1801133 polymorphism was significantly significant differences in the distribution of genotype frequencies were found.

**Keywords:** Pregnancy complications, antiphospholipid syndrome (APS), folate cycle genes, allele frequency, polymorphism of genes, genetic association.

The pregnancy complications, according to the report of the WHO Study Group, are one of the most important health problems and often the direct cause of maternal and perinatal morbidity and mortality. Received to date data on the molecular mechanisms of this disease development allow us to consider it as a multifactorial condition, the development of which is determined by the interaction of certain hereditary and environmental factors. Numerous studies on this issue have shown that the basis of many types of obstetric pathology is a generalized microangiopathy and thrombophilia associated with autoimmune disorders, defects of angiogenesis and invasion of trophoblast, hyperhomocysteinemia and hereditary disorders of hemostasis [1–7].

In the last decade attention of scientists and clinicians turned to the problem of development of antiphospholipid syndrome — an autoimmune disease characterized by recurrent thrombosis, initial miscarriage, thrombocytopenia and persistent antiphospholipid antibodies [10].

Among the many risk factors for APS, open today, an important role in the pathogenesis of this disease takes a genetic component, and in particular antigen HLA system (Human Leucocytes Antigen), a gene factor 5 (FV, 1691G> A, rs6025) and prothrombin (FII,

20210G> A, rs1799963), and the C677T polymorphism (rs1801133) of methylenetetrahydrofolate reductase gene (MTHFR) [11].

The MTHFR gene encodes N5, N10-methylenetetrahydrofolate reductase — a key enzyme in folate cycle, catalyzing the recovery of N5, N10-methylenetetrahydrofolate to N5-methyltetrahydrofolate, which is a donor of the methyl group in the reverse conversion reaction (remethylation) of homocysteine to methionine.

The polymorphism of C677T (rs1801133) methylenetetrahydrofolate reductase (MTHFR), located in the coding region of the gene MTHFR corresponding amino acid substitution of alanine residue for a valine residue at amino acid position 222 of the amino acid sequence of the protein. The peculiarity of this amino acid substitution is to reduce of thermostability MTHFR, whereupon its enzymatic activity decreases. Deficiency of MTHFR enzyme activity leads to a deficiency N5-methyltetrahydrofolate, resulting in decreased speed remethylation homocysteine, and as a result, developing hyperhomocysteinemia. Accumulating in the circulating blood, homocysteine due to its cytotoxicity strikes the inner wall of the blood vessel that ultimately leads to the activation of the coagulation cascade reactions and hemostasis system to increase the risk of atherosclerosis and thrombosis. Along with this, the

MTHFR deficiency contributes to teratogenic (damaging the fetus) and mutagenic (DNA damaging) action due to violations of the processes of methylation [11–14].

The MTRR gene encodes a cytoplasmic enzyme methionine synthase reductase takes part in the biochemical reactions involving the transfer of a methyl group, and including, in the inverse transformation (remethylation) homocysteine to methionine. The function of the MTRR reductive methylation-dependent methionine synthase cobalamin (MTR), which catalyzes the methyl group transfer reaction with N5-methyltetrahydrofolate to homocysteine.

The Polymorphism of A66G (rs180139) metioninsintazareductse (MTRR) in the coding region of the gene corresponds to the replacement of MTRR residue isoleucine (Ile) at methionine residue (Met) at position 22 the amino acid sequence of the protein.

As a result of such changes in the primary structure of protein conformational rearrangement occurs which results in a decrease in enzymatic activity. As a result, the efficiency falls reductive methylation methionine synthase, which for its part, leads to a decrease in the efficiency remethylation homocysteine. Thus, MTRR deficiency contributes to teratogenic (damaging the fruit) and mutagenic (DNA damaging) action due to violations of methylation processes [12–14].

However, it should be noted that the results of studies on this issue, often contradictory, that may be due to ethnic heterogeneity and/or clinical heterogeneity of the patient population, the small number of samples, incorrect selection of the control group, as well as the ethnic specificity of hereditary predisposition to the disease. The frequency of polymorphisms related to the metabolism of folate and homocysteine levels, varies considerably among different ethnic groups, which can currently be validated population screening using genotyping. So far, I have not been analyzed, which would estimate the frequency of polymorphisms of genes involved in the metabolism of folate and homocysteine in the Uzbek population. The present study is an attempt to estimate the frequency of polymorphic gene MTHFR and MTRR in the Uzbek population to find out the existence of a legitimate connection between the development of antiphospholipid syndrome and impaired DNA methylation due to deficiency of folate cycle enzymes.

#### Material and methods

The study included 62 subjects of the Uzbek population of both sexes aged 20 to 65 years. The test persons conditionally divided into

2 groups: a group with APS (28 people) and a group of healthy subjects (34 pers.), Matched by age and sex.

Isolation of DNA from peripheral blood leukocytes was performed by the standard method. Genotyping was performed by amplifying the relevant regions of the genome methods qPCR (RG-6000, Australia) and pyrosequencing PyroMark Q24 (Qiagen, Germany).

Statistical results of the study treatment was carried out with the help of software packages «SPSS 13», «PLINK» and «Haploview 4.2», forming haplotypes and evaluate their association with APS syndrome was carried out using «THESIAS» program (version 2.0)

#### Results and discussion

The distribution of the genotypes studied polymorphisms were tested for compliance with the expected Hardy-Weinberg equilibrium using Fisher's exact tests (Weir, 1995). For comparison, the allele and genotype frequencies between the groups analyzed using Pearson criterion  $\chi^2$  adjusted Ieytsa or Fisher's exact test. To assess the association of polymorphisms of genes with the pathological phenotype calculates «odds ratio» — OR. To determine the nature of the data distribution using the Shapiro-Wilk test statistics. For the analysis of quantitative traits when comparing two independent samples with normal distribution using analysis of variance, with deviation from the normal distribution — Mann-Whitney (Glanz, 1999). For each polymorphism and haplotypes were calculated OR, the magnitude P, and the 95% confidence interval. Differences were considered statistically significant at  $P < 0.05$ .

Among 2 studied polymorphisms the deviation from Hardy-Weinberg equilibrium among both cases and was not found among controls (Table 1).

The analysis of the frequency distribution of alleles for polymorphisms rs1801133 and rs180139 gene folate cycle in a group with APS and in the control sample revealed a statistically significant difference (table 2) between them. The frequency of the G allele polymorphism rs180139 MTRR gene was significantly higher in patients with APS compared to the control group ( $\chi^2 = 19.51$ ; OR = 2.41;  $P = 0.02$ ), which may be considered in the development of its risk APS syndrome (table 2). The analysis of allelic frequencies of polymorphisms of MTHFR gene rs1801133 was significantly significant differences were not found.

Table 1. – Hardy-Weinberg equilibrium test for cases and controls in the APS Group “+” (28 people) and APS “-” (34 people)

CHROM	SNP	GROUP	A1	A2	$\chi^2$	p
1	rs1801133	Case	T	C	0.04	0.85
1	rs1801133	Control	T	C	0.21	0.64
17	rs180139	Case	G	A	0.2	0.66
17	rs180139	Control	G	A	2.94	0.09

Table 2. — Distribution of allele frequencies of rs1801133 and rs180139 polymorphisms Group APS “+” (28 people) and APS “-” (34 people)

	Alleles	Cases	Controls	$\chi^2$	p	OR	95% CI
		n = 28	n = 34				
rs1801133	Allele C	0.661	0.794	2.80	0.09	0.50	0.23–1.13
	Allele T	0.339	0.206			1.98	0.88–4.44
rs180139	Allele A	0.554	0.750	19.51	0.02	0.41	0.19–0.88
	Allele G	0.446	0.250			2.41	1.13–5.18

When comparing the frequencies of the genotypes studied polymorphic markers were installed by us the genetic association of folate cycle genes to the development of antiphospholipid syn-

drome. Analysis of genotypic associations showed that the greatest risk of antiphospholipid syndrome is caused by heterozygous AG genotype of rs180139 polymorphism MTRR gene ( $\chi^2 = 6.92$ ; OR

= 3.21; P = 0.03). According to the allelic variants of MTHFR gene polymorphism rs1801133 was significantly significant dif-

ferences in the distribution of genotype frequencies were not detected (Table 3).

Table 3. — distribution of genotypes frequency of rs1801133 and rs180139 polymorphisms Group APS "+" (28 people) and APS "-" (34 people).

SNP	Genotypes	Cases	Controls	$\chi^2$	p	OR	95% CI
		n = 28	n = 34				
rs1801133	Genotype C/C	0.429	0.618	2.94	0.23	0.46	0.17–1.29
	Genotype C/T	0.464	0.353			1.59	0.57–4.42
	Genotype T/T	0.107	0.029			3.96	0.39–40.38
rs180139	Genotype A/A	0.286	0.618	6.92	0.03	0.25	0.08–0.72
	Genotype A/G	0.536	0.265			3.21	1.11–9.29
	Genotype G/G	0.179	0.118			1.63	0.39–6.76

The Haplotypic analysis of the studied loci showed fairly significant association with the development of the APS.

Thus, the results of this study demonstrate the relationship risk of antiphospholipid syndrome in the Uzbek population with carriage of the G allele of rs180139 polymorphism ( $\chi^2 = 5.29$ ; OR = 2.42; P = 0.02), and AG genotype of rs180139 polymorphism of MTRR gene ( $\chi^2 = 6.92$ ; OR = 3.21; P = 0.03). Statistically significant associations rs1801133 polymorphism of the gene has been identified MTHFR c development of antiphospholipid syndrome.

#### Conclusions:

1. The greatest risk of antiphospholipid syndrome in the Uzbek population is due to carriage of the G allele polymorphism rs180139 ( $\chi^2 = 5.29$ ; OR = 2.42; P = 0.02) and genotype AG rs180139 polymorphism of MTRR gene ( $\chi^2 = 6.92$ ; OR = 3.21; P = 0.03).

2. Statistically significant associations of rs1801133 polymorphism of MTHFR gene development of antiphospholipid syndrome have been identified.

#### References:

1. Ailamazyan E. K., Mozgovaya E. V. Preeclampsia: Theory and Practice. – M.: Med press-inform, 2008. – 272 p.
2. Baranov V. S., Ailamazyan E. K. Determining genetic predisposition to certain diseases common in pregnancy. – SPb.: H-L, 2009. – 66 p.
3. Bepalov O.N., Genetics miscarriage//Journal. Obstetrics and women diseases – 2007. – Vol. LVI. – № 1. – P. 81–95.
4. Thrombophilia in obstetric practice: teaching aid/M. S. Zaynulin, E. A. Korniyushina, M. L. Mozgovaya, etc.; ed. E. K. Ailamazyan, N.N. Petrishcheva. SPb.: Publishing house of the N-L, 2005. – 46 p.
5. Karthik P. Pathogenesis of the late pregnant gestosis//International Journal of Medicine. – 2010. – № 1. – S. 62–66.
6. Makatsaria A. D., Bitsadze V. O. Thrombophilia and antithrombotic therapy in obstetric practice. – M.: Triad-X, 2003. – 904 p.
7. Homocysteine, MTHFR gene polymorphisms and complications of pregnancy/EA Trifonova, T.V. Gabidulin, T.A. Agarkova, N.A. Gabitova, V.A. Stepanov//Obstetrics and Gynecology. – 2011. – № 2. – P. 8–15.
8. Bailey L., Gregory J. Polymorphisms of methylenetetrahydrofolatereductase and other enzymes: metabolic significance, risks and impact on folate requirement//J. Nutr. – 1999. – № 129. – P. 919–922.
9. Cummings A. M., Kavlock R. J. Gene-environment interactions: a review of effects on reproduction and development//Crit. Rev. Toxicol. – 2004. – V. 34 (6). – P. 461–485.
10. Levine J., Branch D.W., Rauch J. The antiphospholipid syndrome. N. Engl. J. Med. – 2002; 346: 752–763.
11. Fetisov I. N., Dobrolyubov A. S., Lipin M. A., Polyakov A. V. Gene polymorphism folate metabolism and human disease.//Herald of new medical technology. – 2007. – T. H. – № 1.
12. Gvozdev V.A. Regulation of gene activity due to chemical modification (methylation) of DNA//Soros Educational Journal. 1999. – № 10. S. 11–17.
13. Golyshev S.A., Vikhreva P.N., Sheval E. V., Kiryanov G. I., Polyakov V.Yu. The role of DNA methylation and histone post-translational modifications in the organization and maintenance of heterochromatin domain structure (chromocenters)//Cytology. – 2008. – T. 50, – № 11. – S. 972–982.
14. The regular relationship between the development of some diseases and disorders of epigenetic DNA methylation enzymes due to deficiency of folate cycle/EY Grechanina, V.N. forests, V.V. Myasoedov [et al.]/The ultrasonic perinatal diagnostika. – 2010. – N 29. – S. 27–59.

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## Analysis of association of polymorphism rs1045642 of *mdr1* gene with development of myeloproliferative diseases

**Abstract:** The authors to evaluate the role of C3435T polymorphism of MDR1 gene in the pathogenesis of chronic myeloid leukemia (CML) and erythremia observed the 138 patients with CML and erythremia. The investigation has showed that rs1045642 polymorphism of MDR1 gene is associated with a risk of MPD developing. The prognostic value of genotyping of rs1045642 polymorphism of -MDR1 gene demonstrates a high level of efficiency by classifier as an independent gene-determinant in developing MPD, at significantly higher values.

**Keywords** polymorphism, MDR1 gene, myeloid leukemia, erythremia.

**Introduction.** Myeloproliferative diseases (MPD) are clonal diseases arising at the hematopoietic stem cell level [2]. Etiological factors and mechanisms, which provoke MPD development, are not still fully studied. The leading hypothesis is that, there are multiple stages in the development of the disease, where the predisposition to the disease emerges under the effect of external carcinogens, damaging by gene of normal cells, and causes to its malignant transformation [3]. Nowadays the facilities of basic study of MPD are not limited to the research diagnostic genetic mutations, such as BCR/ABL, JAK2, MPL and others. At the same time, over recent years, there is paid more attention to polymorphic variants of genes of xenobiotics biotransformation system. Determination of correlation between detection of the specific genotype of these genes and definite forms of MPD may lead us to better understand and comprehend the mechanisms of formation of various forms of diseases [4].

MDR1 gene with length of 209660 p. n. is localized at the short seventh chromosome's arm (7q21.1). It contains 29 exons and is expressed by formation of the transcript with length of 4916n [5]. The MDR1 gene encodes synthesis of P-glycoprotein transfer protein, which is involved in biotransformation of xenobiotics, protecting by this way cells from the toxic effects of various compounds [6]. At the present time, there have been several polymorphous types of MDR1 gene investigated, but the preference is given to C3435T polymorphism (rs1045642) in investigation of associations with cancer pathology [7].

In world literature there is evidence of the involvement of MDR1 gene in the development of malignant diseases, such as various types of leukosis, rectal cancer, endometrial cancer, Hodgkin's diseases (lymphoma) and so on [8–10; 11; 13].

In spite of this, it is not yet completely clear functional and clinical significance of the different polymorphic variants of the gene under the distribution of toxic substances and, as a consequence, the occurrence of susceptibility to development of malignant neoplasms. In addition, to date, yet there is no consensus about the role of rs1045642 polymorphic marker of MDR1 gene with manifestation of the different options of MPD.

**The aim of the study** is evaluation of the role of C3435T polymorphism of MDR1 gene in the pathogenesis of chronic myeloid leukemia (CML) and erythremia.

**Materials and methods.** The study is performed on DNA samples purified from the peripheral blood of patients, who were observed at the clinic of Scientific research institute of hematology

and blood transfusion of Uzbekistan. There have been 138 patients (109 patients with CML, 29 ones with erythremia) observed and studied. The control group was 86 persons of Uzbek nationality, without any cancer.

DNA purification from whole blood was performed using a standard set of Ribosorb production (AmpliSens®, Russia). The concentration and purity of the purified DNA was determined by the apparatus of NanoDrop 2000 (USA). Genotyping (genetic typing) of rs1045642 polymorphic variant of MDR1 gene was performed by standard PCR using primers structures that were described on the website <http://www.ncbi.nlm.nih.gov/SNP> (Table 1).

Table 1. – The structure of oligonucleotide primers

No.	Localiza- tion of the gene	Polymor- phism	Structure of oligonucleotide primers
1	MDR1	rs1045642	F: 5'-AGAGAGACTTA- CATTAGGCAG-3' R: 5'-R SAGTGGCTCCGAGCA- CACC-3'.

Testing was conducted on a programmable thermal cyclor of "Applied Biosystems" company (USA), using the test-kit of "Litech" company (Russia), according to manufacturer's instructions (Fig. 1).

Statistical analysis of the results was carried out using statistical software package OpenEpi 2009, 2.3 Version.

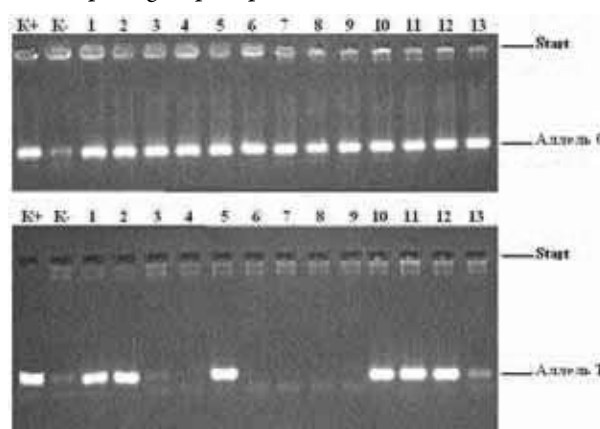


Figure 1. Electrophoregram for detection of rs1045642 polymorphism of MDR1 gene

**Results and discussion.** According to NCBI data MDR1 gene has more than 50 polymorphisms (SNPs). Among them, the great



est interest was shown to the polymorphic marker C3435T. According to the authors' data, the frequency of heterozygous genotypes of this polymorphism in the European population was 48.3% and homozygotes in the same group — 23.9% [1, 12].

Tables 2 and 3 demonstrate the findings of comparative studies on the genetic structure of rs1045642 polymorphism of MDR1 gene in samples of patients with MPD and control. The frequency distribution of genotypes of rs1045642 polymorphic

locus of MDR1 gene among patients group and control group complied with the estimated results when Hardy-Weinberg equilibrium ( $P > 0.05$ ). There was found high rate of estimated heterozygosity (0.47%) in a population sampling. At diallel polymorphism this index is an indicator of significant diversity of the population, equal to the maximum (0.5%). This means that about 50% of individuals in our population carry T –allele in hetero or homozygous state.

Table 2. – Estimated and observed distribution frequency of genotypes for Hardy-Weinberg principle of rs1045642 polymorphism -MDR1 gene in the main group of patients:

Genotypes	Genotypes frequency		$\chi^2$	P
	observed	estimated		
C/C	26.81	25.00	0.181	<b>0.3946</b>
C/T	46.38	50.00	0.362	
T/T	26.81	25.00	0.181	
Total	100.00	100.00	0.725	

Table 3. – Estimated and observed distribution frequency of genotypes for Hardy-Weinberg principle of rs1045642 polymorphism -MDR1 gene in population group

Genotypes	Genotypes frequency		$\chi^2$	P
	observed	estimated		
C/C	39.53	39.43	0.000	<b>0.9658</b>
C/T	46.51	46.73	0.001	
T/T	13.95	13.85	0.001	
Total	100.00	100.00	0.002	

As regards the effectiveness of this locus as an independent marker, it must be noted the relatively high level of specificity with the index  $SP = 0.73$  with  $SE = 0.39$  (95% CI 1.006–3.166). The calculated ratio AUC (0.73) demonstrates the high level of efficiency on classifier of this polymorphism as an independent gene-

candidate, at significantly high values ( $OR = 1.8$ ;  $P < 0.05$ ). The Comparison of frequencies of rs1045642 alleles and genotypes of MDR1 gene among patients with MPD and comparison groups was conducted by the randomized controlled method.

Table 4. – Distribution frequency of alleles and genotypes of rs1045642 polymorphism of MDR1 gene among studied patients group and population sampling.

No.	Group	N	Alleles				Distribution frequency of genotypes					
			C		T		C/C		C/T		T/T	
			n	%	n	%	n	%	n	%	n	%
1	Main Group	138	138	50,0	138	50.0	37	26.8	64	46.4	37	26.8
1.1	CML	109	106	48.6	112	51.4	28	25.7	50	45.9	31	28.4
1.2	Erythremia	29	32	55.2	26	44.8	9	28.1	14	43.7	6	18.7
2	Control group	86	108	62.8	64	37.2	34	39.5	40	46.5	12	13.9

The analysis revealed significant differences in the distribution frequencies of occurrence of genotypes and alleles of rs1045642 polymorphism of MDR1 gene in patients with MPD and in the control group (Table 4). The combined sample of patients displayed significantly more frequent occurrence of T allele compared to the control group (50.0% and 51.4%, respectively;  $\chi^2 = 6.5$ ;  $p = 0.01$ ;  $OR = 1.9$ ; 95% CI 1.144, 2.49). The frequency of this allele is 1.8 times substantially higher in CML patients subgroup than in the in healthy donors ( $\chi^2 = 7.8$ ;  $p = 0.005$ ;  $OR = 1.8$ ; 95% CI 1.186, 2.68). At the same time the difference in frequency of this allele between erythremia patients and control subgroups was unessential (44.8% and 37.2%, respectively;  $p > 0.05$ ).

In the combined sample and in CML patients subgroups the frequency of unfavorable genotype T/T also significantly dominated over its level in the control group (26.8% and 28.4% vs. 13.9% respectively). According to the calculated odds ratio the presence of the present genotype 2.3 times increased the risk of MPD development ( $\chi^2 = 5.1$ ;  $p = 0.02$ ;  $OR = 2.3$ ; 95% CI 1.103, 4.626). It was noted a slight increase in the frequency of occurrence of the present genotype in the subgroup of patients with erythremia as

well, in comparison with the control group, that indicates the availability of a trend towards association of unfavorable genotype with MPD formation (18.7% vs. 13.9%, respectively;  $p > 0.05$ ). Homozygous genotype frequency for allele-C, in contrast was significantly lower in the group of patients (26.8%) than in the control group (39.5%), that is an evidence of a favorable protective effect of present genotype on the development of disease ( $\chi^2 = 3,9$ ;  $P = 0.046$ ;  $OR = 0.6$ ; 95% CI 0.3158, 0.994).

There was the tendency to reduce the frequency of this genotype in erythremia patients subgroup revealed compared to the control group (28.1% vs. 39.5%, respectively). At the same time, the differences did not reach the threshold level of significance ( $\chi^2 = 0.6$ ;  $P = 0.4$ ;  $OR = 1.4$ ; 95% CI 0.5922, 3.565).

Also it is worth noting that when comparing patients subgroups and control groups there was a significant increase in the frequency of genotype C/C in a population sampling revealed in comparison with the subgroup of patients with CML (39.5% vs. 25.7%, respectively;  $\chi^2 = 4.2$ ;  $P = 0.04$ ;  $OR = 0.5$ ; 95% CI 0.2874, 0.9725).

Moreover, the frequency of heterozygous genotype C/T rs1045642-of MDR1 gene in all groups studied (patients and con-

trolled) was similar and did not reach statistically significant differences versus control group ( $P > 0.05$ ).

Thus, we can conclude that the homozygous genotype T/T of rs1045642 polymorphism -MDR1 gene is an important determinant of increased risk for MPD development in Uzbekistan ( $P < 0.05$ ). These data further reinforce the position of rs1045642 polymorphism of -MDR1 gene as a marker, causing disorder of the regulatory function of P-glycoprotein and processes of biotransformation of xenobiotics, and perhaps associated with the formation of cancer processes.

#### Conclusion:

1. rs1045642 polymorphism of MDR1 gene is associated with a risk of MPD developing. Functionally unfavorable genotype T/T is a predisposing marker to damage the expression level of P-glycoprotein and elimination of various toxins and carcinogens from the body. On the contrary, the carriage of wild genotype C/C was significantly associated with a protective effect against MPD development ( $P < 0.05$ ).

2. The prognostic value of genotyping of rs1045642 polymorphism of -MDR1 gene demonstrates a high level of efficiency by classifier as an independent gene-determinant in developing MPD, at significantly higher values ( $P < 0.05$ ).

#### References:

1. Sychev D. A., Ramenskaya G. V., Ignatiev I. V., Kukes V. G., Clinical pharmacogenetics: Teaching medium/under Ed. of V. G Kukes, N.P Bochkova. – M.: GEOTAR Media, 2007. – P. 9.
2. Deininger M. W., Goldman J. M., Melo J. V. The molecular biology of chronic myeloid leukemia. *Blood*. 2000; 96: P 3343–3356.
3. Rumjanek V.M, Vidal R.S, Maia R. C. Multidrug resistance in chronic myeloid leukaemia *Biosci Rep*. 2013; 33 P.
4. Mabel Lardo, Marcelo Castro, Beatriz Moiraghi, Francisca Rojas. MDR1/ABCB1 gene polymorphisms in patients with chronic myeloid leukemia 2015 sep; 50 (3): P. 154–159.
5. Callen D. F., Baker E., Simmers R. N., Seshadri R., Roninson I. B. 1987. Localization of the human multiple drug resistance gene, MDR1, to 7 q 21.1. *Hum. Genet.* 77, 142–144 p.
6. Chin J. E., Soffir R., Noonan K. E., Kyunghee C., Roninson I. B. Structure and expression of the human MDR (P-glycoprotein) gene family. // *Molecular and Cellular Biology*. 1989. 9, P. 3808–3820.
7. Chen C., Clark D., Ueda K., Pastan I., Gottesman M. M., Roninson I. B. 1990. Genomic organization of the human multidrug resistance (MDR1) gene and origin of P-glycoproteins. *J. Biol. Chem.* 265, P. 506–514.
8. Rao D. N., Anuradha C., Vishnupriya S., Sailaja K., Surekha D., Raghunadharao D., Rajappa S. Association of an MDR1 gene (C3435T) polymorphism with acute leukemia in India. *Asian Pac J Cancer Prev*. 2010; 11 (4): P. 1063–1066.
9. Qian X., Cao S., Yang G., Dong J., Jin G., Shen Y., Hu Z. Variant genotypes of MDR1 C3435T increase the risk of leukemia: evidence from 10 case-control studies. *Leuk Lymphoma*. 2012 Jun; 53 (6): P. 1183–7.
10. Andersen V., Ostergaard M., Christensen J., Overvad K., Tjonneland A., Vogel U. Polymorphisms in the xenobiotic transporter Multidrug Resistance MDR1) and interaction with meat intake in relation to risk of colorectal cancer a Danish prospective case-cohort study. *BMC Cancer*. 2009 Nov 21; 9: P. 407.
11. Mrozikiewicz P. M., Seremak-Mrozikiewicz A., Semczuk A., Landt O., Breborowicz G. H., Drews K. The significance of C3435T point mutation of the MDR1 gene in endometrial cancer. *Int J Gynecol Cancer*. 2007 May-Jun; 17. (3): P. 728–31.
12. Nizar M., Mhaidat, Osama Y Alshogran, Omar F Khabour, Karem H Alzoubi, Ismail I Matalka, William J Haddadin, Ibraheem O Mahasneh, and Ahmad N Aldaher. Multi-drug resistance 1 genetic polymorphism and prediction of chemotherapy response in Hodgkin's Lymphoma. *J Exp Clin Cancer Res*. 2011; 30 (1): P. 68.
13. Hoffmeyer S., Burk O., von Richter O., Arnold H. P., Brockmüller J., Johne A., Cascorbi I., Gerloff T., Roots I., Eichelbaum M., Brinkmann U. 2000. Functional polymorphisms of the human multidrug-resistance gene: Multiple sequence variations and correlation of one allele with P-glycoprotein expression and activity in vivo. *Proc. Natl. Acad. Sci. USA*. 97, P. 3473–3478.

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## Tumor-to-breast ratio in forecast of breast cancer

**Abstract:** The role of tumor-to-breast ratio is determined in breast cancer forecast. Case histories of 49 patients with breast cancer were analyzed. The undergone analysis showed that tumor-to-breast ratio has a statistically significant impact on the outcome of the treatment of breast cancer.

**Keywords:** forecast, tumor-to-breast ratio, breast MRI, TNM system.

In recent years, despite the increase in the incidence of breast cancer in Uzbekistan noted the same trend as in the developed countries: a reduction in mortality from tumors of this localization, which is explained on the one hand — the identification of a growing number of patients in the early stages of tumors, and on the other — the use of modern methods of treatment.

As we know, the course and outcome of tumor diseases affect a complex of factors, depending on the biological characteristics of the tumor itself, the body, as well as on the adequacy of the diagnosis, treatment, management of patients.

In recent years, impressive results of treatment of patients with cancer, including breast cancer are achieved. In clinical practice, the choice of treatment strategy comes from the prognostic features of the disease, which is the main indicator of the clinical classification and staging process. In a narrow sense, the forecast called the scientific prediction of future properties of an object or situation, based on its current and past symptoms. In summary, in order to predict in medicine, particularly in oncology, it is to anticipate the nature of the pathological process both stages of treatment, and subsequently — during its progression.

Individual plan of treatment of cancer patients are still made on the basis of personal experience and intuition clinicians take into account a number of factors that characterize the tumor and tumor-bearing characteristics of the organism. However, only the individual prognosis may suggest in each case the most rational plan of remedial measures.

The problem of the individual prognosis of cancer is a relatively new trend in the domestic oncology. The study of the individual problems of forecasting dedicated work of many domestic and foreign researchers [1; 2; 3].

However, it proposed, in most cases difficult, mathematical methods of group and individual prediction is not widely available in the clinic due to the complexity of the methods and difficulties of multivariate analysis.

The diagnosis is the main prognostic factor as to the prognostic factors are fundamental signs that determine the course and outcome of the disease. Factors predictive of response to treatment (predictive factors), are those that help to detect subgroup of patients with more or less significant response to this treatment. The final results of the flow nature of the forecast, outcomes and complications of any of the examined clinical entities directly dependent on the choice of a competent reliable diagnostic indicators that best reflect the clinical, functional, morphological, social and many other features of the disease process.

Of interest is the fact that the conduct of the treatment with the same histological types and stages of breast cancer process often gives different results. None of the locations has such a number of treatment options, like breast cancer, for example, Letyagin V.P. (2000) pointed out that for the treatment of breast cancer the same stage, there are about 60 thousand nuances in the approaches to the treatment of breast cancer.

In everyday practice, the question arises whether the same cancer patient's prognosis breast with the same size of the primary tumor and the different size of the affected organ. For example, a tumor measuring 5 cm in a small breast strikes it almost totally, and a similar tumor in the large breast takes only a part of it. However, according to the TNM system, in both cases the same diagnosis of T2 will be installed.

In connection with which the question of the advisability of taking into account the ratio of the tumor volume in breast volume.

#### Materials and methods

To study the effect tumor-to-breast ratio on the forecast we had studied the history of the disease, case histories of 49 patients

with breast cancer T2N0–1M0 treated in Tashkent City Oncology Center. All the patients, depending on the stage, clinical and pathological features of the tumor, received comprehensive treatment in accordance with international recommendations. We studied the correlation of tumor volume in breast volume and their effect on the overall and disease-free survival.

Tumor volume was measured by ultrasonography and MRI studies, and the volume of breast with anatomical measurements, mammograms, according to the formula proposed Kalbhen C. L. et al. [4], MRI and post-mastectomy, postoperative material by weighing and dipping into the liquid. Tumor volume was calculated with special programs were compared with the manual method for measuring breast volume. In all cases, we obtain accurate figures for further processing of the material.

To determine the volume of the breast we divided the following forms of breast cancer: a conical, hemispherical, pear.

Usually special device the size of the breast base, subsequent breast base line was measured, crossed in the nipples were determined. Determined base radius and apply the formula for determining breast volume. Depending on the patient fatness made relevant amendments. Manual method for determining breast volume compared with the data of MRI yielded 2.4% error in the calculations.

To determine the volume using the following formula: For cone formula for determining the volume of a cone, ie, one third of the product of the square base and the height. For hemispherical breast volume formula for determining the volume of a sphere and divided it into two for pear-shaped used formula for determining the volume of a sphere. The volume of the breast to 200 cm<sup>3</sup> (172 cm<sup>3</sup> on average) was observed in 4 patients (8.2%), and 300 cm<sup>3</sup> (232.7 cm<sup>3</sup>) 14 (28.6%) patients, and 400 cm<sup>3</sup> (349, 6 cm<sup>3</sup>) in 5 patients (10.2%) and 500 cm<sup>3</sup> (459.2 cm<sup>3</sup>) in 6 patients (12.2%) and 600 cm<sup>3</sup> (569.3 cm<sup>3</sup>), y3 (6.1%), up to 1000 cm<sup>3</sup> (856.9 cm<sup>3</sup>) and more detected in 17 (34.7%) patients. The average volume of breast MRI studies was 410.4 cm<sup>3</sup>, the manual method 420.4 cm<sup>3</sup>, with the method of immersion — 410.7 cm<sup>3</sup>. Tumor volume at T2 ranged from 32 cm<sup>3</sup> to 125 cm<sup>3</sup>, the average volume of 85cm<sup>3</sup>. Tumor volume 50 cm<sup>3</sup> was found in 10 patients and 100 cm<sup>3</sup> was observed in 22 patients and more than 100 cm<sup>3</sup> in 17 patients.

For convenience, on the basis of the above findings, we divided patients depending on tumor-to-breast ratio and divided into three groups and the data designated as an addition to T2. The first group (T2/1) included patients whose tumor volume ratio to the volume of breast was from 1/1 to 1/3, in the second group (T2/2) 1/3 and 1/4, in the third group (T2/3) bolee 1/4.

#### Results:

Influence of tumor-to-breast ratio at time of recurrence (progression) process were as follows: the ratio 1/3–25 months, at a ratio of 1/4–31.5 months and at the ratio 1/4–55.3 months. Depending on the results of the data of the treatment were followed in all patients. In two cases due to moving patients, the connection was lost. In 13 patients with fixed time progression (recurrence, metastasis) and studied the nature of their development. Five-year disease-free survival in the observation group was 72.3%. In the group of patients with breast cancer of up to 200 cm<sup>3</sup> survival rate was 33.3% (rough average), in the group to 300 cm<sup>3</sup>, 57.1% to 400 cm<sup>3</sup>, 75 to 500 cm<sup>3</sup>–66.7% to 600 cm<sup>3</sup> 66.7%, and in patients where the breast volume was more 600 cm<sup>3</sup>–only 94.1%. We followed the outcome of the disease after completing the full course of treatment. 5-year disease-free survival rate was 72.3% (34 patients). The survival of patients in the first group was 33.3% in the second group 57.1%,

best results with the tumor-to-breast ratio more than 1/4–81,1% ( $p = 0,249$ ). ( $\chi^2 = 2,53$  the third degree of freedom  $p < 0,05$ ).

Thus, comparing the results of treatment of breast cancer based on the tumor size only, excluding the ratio of the tumor volume and the body is not completely correct. In this regard, the only rational approach to the forecasting of issues in any pathological conditions including breast cancer can be a comprehensive analysis of information about the patient, the disease pattern, using the available arsenal of reliable clinical features and diagnostic indicators.

Tumor-to-breast ratio has a statistically significant impact on the outcome of the treatment of breast cancer. It is necessary to conduct a more in-depth study to determine the criterion laws discovered by us, for a supplement to the classification of breast cancer.

The study shows the complexity of a clear and reliable prediction of disease outcome. We have tried to link the size of the tumor and breast volume on outcome. Many questions still await answers. In the future, they will no doubt be developed by us, further developed and refined. Finally, in one study it is impossible to specify all possible variants of the disease. But all these problems, obviously, can and should be the subject of separate research.

### References:

1. Christakis N.A. Death Foretold: Prophecy and Prognosis in Medical Care. Chicago: University of Chicago Press; 1999.
2. Fletcher S.W., Fletcher R.H., Greganti M.A. Clinical research trends in general medical journals, 1946–1976. In: Roberts EB, Levy RI, Finkelstein SN, Moskowitz J, Sondik EJ, eds. Biomedical Innovation. Cambridge, M.A.: MIT Press; 1981.
3. Mackillop W.J., Quirt C.F. Measuring the accuracy of prognostic judgments in oncology. *J Clin Epidemiol* 1997; 50: 21–29.
4. Kalbhen C.L., McGill J.J., Fendley P.M., et al. Mammographic determination of breast volume: comparing different methods. *Am J Roentgenol* 1999; 173: 1643–9.

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## Surgical treatment of secondary brain injury combined with cranial trauma

**Abstract:** Research based on analysis of 315 patients, between 2011 and 2016, passed a comprehensive examination and treatment in the Andijan branch of the Republican Scientific Center for Emergency Medical Aid. In the study groups at all 315 (100%) patients with traumatic brain injury, including the spine and spinal cord injuries occurred in 88 (27.9%), extremity injuries — 123 (39%) injuries of the pelvis — 37 (11.7%), chest trauma occurred in 67 (21.2%) cases.

**Keywords:** concomitant traumatic brain injury, secondary damage, surgical aspects.

### Introduction

Combined injury as the most serious form of damage is characterized by high and has no tendency to decrease mortality of between 23,5–85%, and long-term disability, and a high level of disability (from 25 to 80%), exceeding 10 times that of when isolated lesions [1; 2].

According to many authors, the poor results of treatment of patients related to the lack of a unified doctrine of surgical relief of severe combined trauma and the treatment of the majority of those affected by the general surgical hospitals and surgeons with insufficient representation about the features of surgical tactics in combined injuries [3; 4]. Combined traumatic brain injury (SCHMT) — a kind of type of injury, in which the pathological changes in the body create serious difficulties in the diagnosis and treatment especially in the acute period [5].

To date, the treatment of victims in the acute period of severe SCHMT remains complex and urgent problem (Reilli P., 1997, Konovalov AN, et al., 2001). It was found that the highest value for mortality and disability of victims, along with the primary are secondary brain injury factors (voiti SG, ea1991; Bullok K. ea.1995; Chegrut RM ea, 1993; Gaytur EI, 2000). These include extracranial factors such as hypoxia, arterial, hypo — and — hypertension, hyperthermia, violation of gas exchange and internal homeostasis, as well as intracranial factors (intracranial hypertension, disturbance of cerebral circulation and metabolism), accompanying the acute

phase of severe head injury, aggravating his clinical course and directly influencing the prognosis and outcome (Kohy Y., ea1984; Lam AM, ea 1991; Miller JD 1993; Nakamura Nea 1993).

### Objective

To determine the indications for surgical and conservative treatment of the secondary damage of combined traumatic brain injuries

**Materials and Methods:** Our study is based on an analysis of 315 patients, between 2011 and 2016, passed a comprehensive examination and treatment in the Andijan branch RSCEMH (Andijan Regional Emergency Medical Hospital).

In the study groups at all 315 (100%) patients with traumatic brain injury, including the spine and spinal cord injuries occurred in 88 (27.9%), extremity injuries — 123 (39%) injuries of the pelvis — 37 (11.7%), chest trauma occurred in 67 (21.2%) cases. Of the 315 victims of brain squeezing intracranial hematomas were in 158 (46%). In this analysis included only 101 patients who underwent complete dynamic MDCT study, since the first days after the injury. Statistical analysis was conducted using the basic clinical and MSCT and MRI data (volume of intracranial hematoma, brain swelling severity, prevalence of cerebral edema, the degree of displacement of the transparent partition). Patients were divided into three groups depending on the cause compression of the brain: the first group — 46 affected by compression of the brain intracerebral hematomas; the second group — 34 affected by compression of the brain enveloped hematomas, which were accompanied by

structurally unstable parenchymal lesions; the third group — 21 affected by compression of the brain enveloped hematomas, which were accompanied by severe parenchymal lesions.

When intracerebral hematomas most often the cause of the injuries were blows to the head or head and accident (one-third of the victims). The average age they were highest. The severity of their condition does not differ materially from the severity of the patients of the second group ( $t = 1,6; p > 0,05$ ). The average amount of bruising, and a shift of midline structures were lowest in this group of patients.

The second group was characterized by the youngest age and the severity of the patients at admission. unconsciousness period was shorter. When we look at the causes of traumatic brain injury in this group could not be found, the prevalence of what — or mechanism of injury. The average volume of the shell hematoma was twice as much as the volume of intracerebral hematomas. The shift of midline structures more pronounced.

The third group was characterized by a more severe state of patients, the most common cause of traumatic brain injury in this group was hitting the car at a traffic accident (25%). In addition, the duration of unconsciousness was greatest in this type of cord compression. On the severity of injury in this group of patients showed a maximum and the total volume of intracranial hematomas, and accordingly the maximum displacement of midline structures.

Analysis of the level of consciousness of the dynamics of oppression, found that one-third of patients, unconsciousness occurred after the light period. Most often a light period was observed among patients with the second and the third group (42%). At the same time he was the most characteristic shell hematomas. Along with lucid intervals were separately analyzed the main neurological symptoms in all patients who have had a lucid interval, regardless of the etiology of brain compression.

Clinical and computed tomography revealed a comparison of the close relationship between the duration of coma and outcomes for all patients with brain compression ( $r = 0,6; p < 0,01$ ). The outcomes in these patients was significantly correlated with the severity of the condition on admission ( $r = 0,5; p < 0,01$ ), the volume of intracranial hematoma ( $r = 0,3; p < 0,05$ ), the severity of brain swelling ( $r = 0,4, p < 0,01$ ), the degree of compression of the tank base ( $r = 0,3; p < 0,05$ ), the degree of displacement of midline structures ( $r = 0,2; p < 0,05$ ).

In determining these same patterns of patients with lucid intervals strong correlation with the volume of the hematoma outcomes have been identified, the severity of cerebral edema, the degree of displacement of midline structures and the degree of compression of the tank base ( $p < 0,05$ ). In patients who have loss of consciousness immediately after the injury occurred, these correlations were mild and not significant ( $p > 0,05$ ). This suggests that patients with a light gap, in which the primary injury was less severe, the further course of the disease depends on the development of secondary brain damaging factors — increase hematoma, cerebral edema and the rise accordingly brain gain offset.

Laws of cord compression in patients of different ages differ. Based on the correlation analysis revealed that outcomes in patients up to 40 years ( $n = 146$ ) was significantly dependent on the amount of pinching the substrate ( $r = 0,3; p < 0,01$ ), the prevalence of cerebral edema ( $r = 0,5; p < 0,01$ ), the degree of compression of the ventricular system ( $r = 0,3; p < 0,01$ ) and a base tank ( $r = 0,3, p < 0,01$ ). While the age of 40 years ( $n = 56$ ), injury outcomes were

not correlated with these parameters. This suggests that in patients under 40 years, there are more stringent volume ratios in the cranial cavity, the violation of which due to the additional volume and compression of the brain, have a more pronounced effect on injury outcomes (251).

The severity of the injury, which was assessed by the Glasgow Coma Scale on admission, provided a significant impact on the outcome. Outcomes in patients admitted to sopor or coma ( $n = 124$ ) were associated only with the severity of concomitant brain edema ( $r = 0,3; p < 0,01$ ). Outcomes in patients admitted to the stunning ( $n = 72$ ) were correlated with the volume of intracranial hematoma ( $r = 0,3; p < 0,01$ ) and severity of cerebral edema ( $r = 0,3; p < 0,01$ ). Therefore, patients in stunning most important prognostic significance hematoma volume and the associated cerebral edema.

Between the duration of coma and outcomes for all patients revealed a high degree of correlation. In patients with coma lasting up to 3 days inclusive ( $n = 120$ ) outcomes injury correlated with the volume of intracranial hematomas ( $r = 0,2; p < 0,05$ ), the prevalence of cerebral edema ( $r = 0,3; p < 0,01$ ). In patients with coma lasting more than 3 days ( $n = 76$ ) outcomes were correlated only with the prevalence of concomitant brain edema ( $r = 0,3; p < 0,01$ ).

The prevalence of cerebral edema was significantly correlated with the outcome of the whole group. In the propagation of edema or within one lobe ( $n = 122$ ) outcomes were closely linked with the volume of intracranial education ( $r = 0,2; p < 0,05$ ). In the case of the spread of edema on one hemisphere or its generalization ( $n = 74$ ) there was no correlation between computed tomography and performance outcomes. Therefore, when distributing edema of the brain or within the brain volume fraction of intracranial hematomas affects outcomes, but in the case of generalization cerebral edema, hematoma volume, the degree of compression of the ventricular system and tank base does not affect the outcome of the injury.

**Results:** Analysis of the unconscious depths of the dynamics among operate on and non-operated patients showed that the non-operated patients in the level of consciousness have been relatively stable for the first 11 days after trauma, while patients who were operated REMARC often showed clinical deterioration associated mainly with inhibition of the level of consciousness, and sometimes, and the growth of urological focal deficiency. When the amount of less than 30 ml, all patients were treated conservatively, and only surgical treatment was carried out with volume over 40 ml.

In case of focus contusion volume from 30 ml to 40 uses as surgical and conservative treatment. 9 patients with volume over 30 ml, which were not surgical treat, died three patients: one patient died as a result of not delete intracerebral hematoma, and the rest of the extracranial reasons.

#### **Conclusions:**

1. The conditional boundary between the amount of injury-crushing chamber in surgical and surgical groups can be carried out at the level of 30 ml.

2. If there is a penetrating head injury or depressed surgical treatment is definitely indicated, even if the person meets the above criteria.

3. The choice of method of treatment of patients with focal injuries crushing 3–4 types based on clinical indicators and MSCT. The success of treatment and the right choice of tactics in this time is not possible without taking into account the secondary intracranial and extracranial factors and their severity, and without taking into account the proportion of focal and diffuse brain damage.

## References:

1. Ropper A., Gress D., Diringer M., Green D. M., Mayer S. A., Bleck T. P. Neurological and Neurosurgical Intensive Care. Fourth Edition. LWW. – 2004. – P. 12–25.
2. Silver F. L., Norris J. W., Lewis A. J., Hachinski V.C Early mortality following stroke: a prospective review//Stroke.
3. Hlunovsky A. N., Starchenko A. A., Damaged brain. Methodological bases. SPb., – 1999.
4. Petrikov S. S., Krylov V. V. brain edema in surgery (clinic, diagnostics, treatment)//Cardiovascular disease. Application. Bull. NTSSSH them. AN Bakuleva RAMS. – 2008. – T. 9, number 6.
5. Romodanov AP Progressive consequences of head injuries//Questions of Neurosurgery. N. N. Burdenko. 1986. number 1.
6. Andrews B. T., Chiles B. W. 3rd, Olsen W. L., Pitts L. H. The effect of intracerebral hematoma location on the risk of brain-stem compression and on clinical outcome//J. Neurosurg. – 1988.
7. Adelson P. D., Bratton S. L., Carney N. A. et al. Guidelines for the acute medical management of severe traumatic brain injury in infants, children and adolescents.

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## Development of ocular hypertension in the eyes with proliferative diabetic retinopathy after vitreoretinal interference

**Abstract:** The factors of risk of occurrence of ocular hypertension in the eyes with proliferative diabetic retinopathy after vitreo-retinal surgical interference were studied.

The factors of risk of the increase of intra-ocular pressure in the eyes with PDR, including during post-operation period, were: the absence of panretinal laser coagulation of retina at earlier stages of PDR and tamponade of vitreous cavity with silicon oil. The application of silicon oil was significantly associated with the absence of pre-operation laser coagulation of retina with diabetic nephropathy, decompensation of carbohydrate metabolism and complicated course of operation and post-operation period.

**Keywords:** proliferative diabetic retinopathy, ocular hypertension, silicon oil.

One of the PDR complications is the increase of intra-ocular pressure, which is related to the iris neovascularisation (neovascular glaucoma) and development of intravitreal hemorrhages (ghost-cell glaucoma). After vitreo-retinal surgical interference, there is also a risk of ocular hypertension; tamponade of vitreous cavity is an additional factor of pathogenesis [1, 954–60].

The aim of the research was the study of factors of risk of occurrence of ocular hypertension in the eyes with proliferative diabetic retinopathy after vitreo-retinal surgical interference.

**Materials and methods of research.** The research included 160 patients (200 eyes) with diabetes complicated with grade IV diabetic retinopathy (proliferative diabetic retinopathy — PDR) admitted for surgical treatment at the clinic of eye microsurgery LLC «KuzTibServis» (Tashkent) and Eye center in Samarkand. All patients were divided into two clinical groups depending on the preceding laser coagulation: the PLC+ group included 116 eyes, on which laser photocoagulation was performed at grade III and early IV of PDR; the group PLC– included 84 eyes without preceding laser coagulation. The indications for operative treatment were: intravitreal hemorrhages that did not resolve within 3–6 months

without traction retinal detachment (within 4–6 weeks in case of grade I diabetes or bilateral damage); traction retinal detachment; progressing neovascularization despite pan-retinal laser photocoagulation, massive pre-macular hemorrhage, macula detachment, pre-macular fibrosis, combined retinal detachment, media opacity (including cataract, opacity of posterior capsular, vitreous opacity making laser photocoagulation difficult, neovascularization of iris, anterior hyaloid proliferation, macular edema resistant to laser photocoagulation). All patients included in the research underwent vitreo-retinal surgical interference. At the decompensation of IOP, fixed combined anti-hypertensive agent Brimoptic (brimonidine + thymolol) was used to reduce intra-ocular pressure.

Complete ophthalmological examination was performed during primary consultation of the patients on 1, 3 and 10 days post operation. Long-term results were evaluated after 3, 6, 9 and 12 months. The examination included the determination of the sharpness of vision, IOP, conditions of anterior chamber, lens, posterior chamber and retina.

**Results of the research and discussion.** In the present research, in the PLC– group, 18 patients (21,43%) had increased IOP

(over 20 mm of mercury) against 12 patients (10,34%) in the group PLC+ (the differences between the groups according to the frequency-based division of the patients with ocular hypertension chi-square = 4,64,  $p < 0,05$ ). Herewith, absolute mean values of IOP between the groups differed significantly:  $p < 0,001$  (Table 1).

Table 1. – The dynamics of IOP in the eyes with PDR after vitreo-retinal interference depending on the preceding laser coagulation of retina

	PLC+ (n=58)	PLC- (n=42)
Before operation	15,59±0,30	19,52±0,79***
1 month	16,28±0,31^^^	20,83±0,77^^^***
6 month	15,31±0,22	17,17±0,44^^^***
12 month	15,24±0,19	16,74±0,45^^^***

Remarks: significance of differences with initial data:

^^^ –  $p < 0,001$ ; significance of differences between groups:

\*\*  $p < 0,01$ , \*\*\*  $p < 0,001$ .

After vitreo-retinal surgery, the level of IOP in both groups increased significantly ( $p < 0,001$  compared to the initial data in both patient groups) by the 1<sup>st</sup> month. Subsequently, IOP in both groups significantly reduced reaching the initial values in the group PLC+ and going below the initial value in the PLC- group. However, during the entire period of observation, IOP in the PLC- group remained significantly higher than in the PLC+ group ( $p < 0,001$  at 1 and 6 month and  $p < 0,01$  at 12 month of observation).

The dynamics of IOP in the PLC-, but not in the PLC+, affected the dynamics of frequency division of eyes depending on the presence of ocular hypertension ( $p < 0,001$ ): the share of normotensive eyes increased by the end of observation.

Frequency division of eyes in the groups PLC+ and PLC- according to the presence of ocular hypertension. It was established that both, initially and by the 1<sup>st</sup> month after vitreo-retinal interference, the share of eyes with increased IOP was significantly higher in the group PLC- than in the group PLC+. By the 6<sup>th</sup> and 12<sup>th</sup> month, frequency comparison of the groups PLC+ and PLC- after operation became insignificant.

Taking into account between the groups according to IOP, we set forth the hypothesis about the contribution of tamponade of vitreous body with silicon oil in the development of ocular hypertension in the eyes with PDR after vitrectomy. In order to check this hypothesis, we conducted the analysis of dependence of researched signs on the application of silicon oil in the course of operation (Table 2). It was established that in the group of patients who required

tamponade with silicon oil diabetic nephropathy occurred more often ( $p < 0,01$ ), including at the stage of renal disease ( $p < 0,05$ ), and decompensation of carbohydrate metabolism was observed ( $p < 0,01$ ). However, the groups didn't differ according to the level of glycemia and uremia. According to the frequency of AH, including hypertensive crises, as well as level of arterial pressure, groups SO+ and SO- were compared.

Among the indications for vitreo-retinal interference, combined detachment of retina was not noted in the group SO-, whereas in the group SO+, it was observed in 8 cases ( $p < 0,01$ ). The frequency of occurrence of other indications for vitreo-retinal interference did not differ in the groups.

As it was expected, the application of silicon oil was associated with complicated course of PDR: in this group of eyes, intra-operational hemorrhages occurred more often ( $p < 0,001$ ), and in post-operation period repeated interferences were required more often ( $p < 0,01$  for lavage and re-vitrectomy). Also, the use of silicon oil is related to longer time required for operation ( $p < 0,05$ ).

The analysis of functional condition of eyes depending on the use of silicon oil showed that in the group SO+ both, initially and during the entire period of observation, the sharpness of vision was significantly lower than in the group SO- ( $p < 0,001$  for all time points), and the level of IOP was higher ( $p < 0,001$  for all time points).

Since the mechanism of development of ocular hypertension in the eyes with PDR after vitreo-retinal interference can be related to both, the effect of silicon oil and neovascularisation of iris, we divided the patients inside the groups depending on the use of silicon oil in the process of operation (Table 4). Maximal level of IOP throughout the observation, IOP after 1 month after the removal of silicon oil and sharpness of vision against the background of maximal increase of IOP and after the removal of the oil was assessed.

As it is shown in the table, in both research groups, the eyes that had undergone tamponade of vitreous cavity with silicon oil had a significantly higher level of IOP than the eyes, which silicon oil had not been used for ( $p < 0,001$  in the group PLC- and  $p < 0,05$  in the group PLC+). However, assessing the eyes of the groups PLC+ and PLC- inside the sub-groups SO+ and SO-, it is seen that inside the sub-group SO+, in the eyes, which PLC was conducted on preliminarily, the level of IOP was significantly lower than in the eyes of the group PLC- ( $p < 0,001$ ). It indirectly certifies about the contribution of neovascularisation in the pathogenesis of ocular hypertension in the eyes after vitreo-retinal interference with regard to proliferative diabetic retinopathy [2, 169–76; 3, 189–95].

Table 2. – Effect of silicon oil on the level of IOP and sharpness of vision in the eyes with PDR after vitreo-retinal interference depending on the preceding PLC

	PLC-/SO- (n=20)	PLC-/SO+ (n=64)	PLC+/SO- (n=86)	PLC+/SO+ (n=30)
Max IOP, mm mercury	16,87±0,75	26,53±1,36^^^	15,74±0,42	18,64±0,85^***
Frequency of ocular hypertension	2 (10%)	28 (43,75%)^	4 (4,65%)	8 (26,67%)
Sharpness of vision during the period of max IOP	0,046±0,002	0,025±0,003^^^	0,078±0,002**	0,062±0,001^***
IOP after 1 month after the removal of SO		18,22±0,97&&&		17,96±0,67
Sharpness of vision after 1 month after the removal of SO		0,036±0,003&&		0,068±0,002***

Remarks: significance of difference inside the group SO+ and SO- between the groups PLC- and PLC+; \*, significance of difference inside the group PLC+ and PLC- between the groups SO- and SO+; ^, significance of difference with indications before the removal of SO; &. One sign –  $p < 0,05$ , two signs –  $p < 0,01$ , three signs –  $p < 0,001$ .

Sharpness of vision was significantly lower in the eyes, which tamponade of vitreous body with SO was used on ( $p < 0,001$  for

the group PLC- and  $p < 0,05$  for the group PLC+), which can be related to both, the effect of ocular hypertension and effect of SO.

Division of the patients depending on the use of SO showed, in both groups, significantly big visual function in the eyes, which LC was preliminarily used on ( $p < 0,01$ , for the group SO- and  $p < 0,001$  for the group SO+), which is apparently related to the initially high visual function before operation and better structural-functional pre-operation state of the eyes.

The removal of silicon oil contributed to the reduction of IOP level (in the group PLC-  $p < 0,001$ , in the group PLC+ — insignificant) and increase of the sharpness of vision (in the group PLC-  $p < 0,01$ , in the group PLC+ — insignificant) compared to the results fixed at the level of maximal IOP.

Thus, the present research demonstrated that in the group PLC- after vitreo-retinal surgery, there was a big frequency and expressiveness of ocular hypertension, which was coupled with the reduction of visual function. This phenomenon is not completely explained by tamponade of vitreous body, because, even after randomization of groups depending on the use of SO, the differences in IOP level were preserved. The use of silicon oil was significantly associated with diabetic nephropathy, decompensation of carbohydrate metabolism and complicated course of operation and post-operation period.

#### References:

1. Shen Y.D., Yang C.M. Extended silicone oil tamponade in primary vitrectomy for complex retinal detachment in proliferative diabetic retinopathy: a long-term follow-up study. // *Eur J Ophthalmol.* 2007 Nov-Dec; 17 (6): 954–60.
2. Honavar S. G., Goyal M., Majji A. B., Sen P. K., Naduvilath T., Dandona L. Glaucoma after pars plana vitrectomy and silicone oil injection for complicated retinal detachments. // *Ophthalmology.* 1999 Jan; 106 (1): 169–76; discussion 177.
3. Henderer J. D., Budenz D. L., Flynn H. W. Jr, Schiffman J. C., Feuer W. J., Murray T. G. Elevated intraocular pressure and hypotony following silicone oil retinal tamponade for complex retinal detachment: incidence and risk factors. // *Arch Ophthalmol.* 1999 Feb; 117 (2): 189–95.

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## Morbidity of children with non-hodgkin lymphoma from them in Uzbekistan

**Abstract:** Knowledge of basic epidemiological factors and the prevalence of reasons in will allow general practitioners, pediatricians, pediatric surgeons, otolaryngologists and other professionals of various parts of the pediatric network to regularly-purposeful work of the Management Board to increase the level of timely diagnosis and oncologic alertness, especially childhood.

**Keywords:** Children, non-Hodgkin's lymphoma, the incidence.

Additional malignancies worldwide in children with non-Hodgkin's lymphomas up 5–7% in adolescents over 15 years — 10%. The prevalence of NHL in children and adolescents up to 18 years in Europe and North America is 0.6–1.5 cases per 100,000, in Uzbekistan this figure, according to current statistics, locat-ditsya in the same range. The peak incidence between the ages of 5–10 years, children under 3 years old rarely get sick.

Despite the fact that pediatric oncology is one of their young directions in oncology, to date, it has been substantial progress. Known co-temporal methods of treatment allow to cure more than 50% of children suffering from malignant tumors, and in non-Hodgkin lymphoma in the presence of timely diagnosis and conducting the specialized help cure occurs in 80% of patients.

Improving methods of prevention, early detection of non-Hodgkin lymphomas promotes adequate treatment, thereby leading to the achievement of satisfactory results and lower mortality rates in children. For a full understanding the current situation it is necessary to have reliable data statistics NHL, as well as their changes over time, which can be carried out epidemiological analysis and monitoring of all disease entities encountered in the pediatric population.

Over the past 30–40 years in the dynamics of the incidence of non-Hodgkin's lymphomas in children on the rise of a number of diseases. This may be due to the improvement of the diagnosis and the influence on the developing child's body to various exter-

nal and internal factors (physical, chemical and biological, and others.) [1; 2; 3].

The internal factors, first of all, should include genetic factors. To date, there is no clearly defined endogenous and exogenous risk factors that affect the mother and child, who were studied depending on the location, in this connection, this research is relevant and necessary [2; 3; 4].

The study of the prevalence of social aspects, possible causes and factors in the development of childhood diseases, including cancer is quite important-nym in planning work onkopediatricheskoy service.

Objective: analysis of key statistical indicators Non-Hodgkin Lymphoma in the dynamics of the child population in the Republic of Uzbekistan.

Uzbekistan — a country with great human potential. At the end of 2015 was more than the population of Uzbekistan — 30 million people, of which 63.1% — in rural areas, 36.9% — urban population. The age structure of the population belongs to a progressive type: the number of children — 28.8%; adolescents up to 15 years — 6.7%, significantly higher than the number of persons over 65 years old.

Against the background of high fertility and population growth, the imbalance in the age structure of the complex social and environmental situation in particular, Aral-ray of the crisis in the country in the mid 80-ies of the last century began to unfold "demographic crisis".



It is characterized by:

- Increasing levels of child and maternal mortality;
- Deterioration of the health of the population, especially women and children;
- Child-bearing age;
- A reduction in life expectancy.

Consequences boomers are considered with a 2-position:

Medical — high fertility; deterioration in maternal and child health;

Socio-economic — the increase in population density in the oasis areas; reducing the amount of arable land per capita; decline in GDP per capita on-villages; the main part of the population — children and young people 48–50%; increase the burden on the working population.

Thanks to the Republic of Uzbekistan the government's policy in the health system takes a number of measures to improve and enhance the quality of the copper-care services to the population, including children, that started especially active in connection with the commemoration in 2014 on the initiative of President of the Republic — the “Year of a healthy child” 2016 — “The Year of healthy mother — healthy child”.

In reviewing Uzbekistan in terms of the territorial unit it includes 12 regions, the Autonomous Republic of Karakalpakstan and Tashkent city. Each region in turn is composed of several parts, so the total number of districts — 162; 118 cities and towns.

#### Materials and methods:

A retrospective analysis of the dynamics and structure of non-Hodgkin's lymphoma in children in the Republic of Uzbekistan on the basis of statistical reports the National Cancer Research Center (RCRC) Ministry of Health of Uzbekistan in the form 7-SSV for the period from 2005 to 2015., With the calculation and analysis of the main statistical indicators (incidence, morbidity) by region of the country.

**Results:** According to reports in the Republic of 10,485,000 of the child population in the dispensary with non-Hodgkin lymphomas comprise 1186 (. 2015), this suggests that Uzbekistan is gradually approaching the countries with high incidence of cancer in children.

Analysis of published data [1; 4; 5] show that the frequency and incidence of non-Hodgkin lymphomas structure can vary and have territorial variability, which is associated with the presence of the socio-economic, geographical, genetic, natural, household and other factors, which currently require study.

In our country, as in all other countries, there are some problems in the study of the epidemiology of origin non-Hodgkin lymphomas in children. Through analysis of the assessment of the main statistical indicators of non-Hodgkin's lymphomas in children can not only be based on official statistics. It is therefore necessary to carry out epidemiological studies in each individual region, the identification of risk factors, the study of their specificity, followed by the possibility of preventing their occurrence.

The incidence rate of non-Hodgkin's lymphoma in children in our country is an average of 3.9 per 100 000 population. According to the literature, this show-Tel in other countries is 13–18 per 100,000 population. According to global statistics, one hundred in the world there is a slow but steady increase in the incidence of lymphomas.

The incidence of non-Hodgkin's lymphoma in childhood in Uzbekistan this figure respectively averages 2.0–2.5. On account of the proportion of children 2 to 8% of all cancer [2; 3; 4; 5; 6]. It should be noted that there has recently been an increase in sick children limfoproliferativ diseases and central nervous system, which is likely due to the presence of immuno-genetic mechanisms of regulation, as well as man-made factors causing the activation process of carcinogenesis.

Indeed, the average annual rate of morbidity in children with non-Hodgkin lymphoma is different depending on the region of the Republic of Uzbekistan. The most frequent MN in children identified in regions with ecologically unfavorable situation, as well as the presence of a large number of industrial facilities, in particular the chemical, oil, gold, metals and mining and uranium mining. This can be seen in terms of morbidity: Tashkent (453.1), Namangan (396.2), Khorezm region — (341.2), Tashkent (319.0), Samarkand (264.1), Jizzakh (219.5), the Republic of Karakalpakstan (111.3), Navoi — (201.6). In this country's index amounted to 376.2 per 100 000 population (Table).

Table 1. — The incidence of non-Hodgkin's lymphoma by year from 2005 to 2015 in the Republic of Uzbekistan

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Andijan	15	17	10	17	11	8	8	8	7	9	7
Bukhara	9	14	13	10	16	10	15	18	4	1	9
Jizzakh	5	6	3	9	5	11	4	3	4	12	2
Kashkadarya	11	12	13	20	22	5	0	6	17	4	8
Navoi	4	2	1	3	1	5	0	3	4	1	5
Namangan	15	11	15	8	13	9	1	3	12	5	4
Samarkand	17	17	16	11	9	8	6	2	5	6	9
Surkhandarya	12	7	14	16	13	13	8	12	5	10	11
Syr	3	3	4	2	5	1	2	2	0	1	1
Tashkent	8	3	12	7	6	7	4	5	6	2	0
Tash.obl	12	9	6	16	15	8	0	13	5	10	7
Fergana	22	24	12	13	27	16	3	8	7	12	9
Khorezm	17	18	15	18	24	12	2	5	5	5	8
KKR	6	1	1	11	5	2	0	1	4	0	2
Res. Uzb.	72	144	135	161	172	115	53	89	85	78	82

Also, the dynamics of different size in the analyzed period were indicators of morbidity in children. We tended to increase, so in Navoi (10.5 times), Syrdarya region (5 times), Samarkand (3.6 times) areas. The relatively stable indicators of morbidity remained in Andijan and Jizzakh regions.

Existing territorial differences in morbidity related, most likely, with possible underestimation of patients in some regions of the country, also plays an important role such factors as — environmental conditions are unstable for large centers and cities with developed industrial infrastructure.

**Conclusion.** On this basis, we can conclude that the change in statistics is exponent in the dynamics and epidemiological analysis requires more study in depth-of. The necessary is primarily a study of the dynamics of disease, its structure, factors that contribute to their development, as well as the impact of immunogenetic, immu-

nomorphological features of the child's body. The important values is the establishment of continuity in the work of primary health care (general practitioners and pediatricians) and oncology service in order to provide more accurate data to original sources and to improve diagnostic results and treatment of children with cancer.

#### References:

1. Злокачественные новообразования в России в 2013 г. (заболеваемость и смертность)/Под ред. В. И. Чиссова, В. В. Старинского. – М., 2013. – 180 с.
2. Злокачественные новообразования на радиационном следе в Алтайском крае./Под ред. Лазарев А. Ф., Петрова В. Д.//Материалы 5 съезда онкологов и радиологов СНГ. – Ташкент, 2008. – С. 23.
3. Киреев Г. В., Баленков О. Ю. Изучение канцерогенной загрязненности атмосферного воздуха жилых микрорайонов г. Ташкента.//Материалы 5 съезда онкологов и радиологов СНГ. Ташкент. – 2008. – С. 30.
4. Аксель Е. М., Горбачева И. А. Заболеваемость детей злокачественными новообразованиями и смертность от них в России и странах СНГ//Вестник РОНЦ им. Н. Н. Блохина РАМН. – 2012, – т. 19, – № 2 (прил. 1), – С. 135–152.
5. Трапезников Н. Н., Аксель Е. М. Заболеваемость злокачественными новообразованиями и смертность от них населения стран СНГ в 1996 г. – М., 1997. – 189 с.
6. Рыспекова Ч. Д., Жумабаев А. Р., Макимбетов Э. К. Заболеваемость злокачественными новообразованиями у детей в Ошской области//Вестник Кыргызско-Российского Славянского университета. – Бишкек, – 2007, – Т. 7.– № 2. – С. 159–161.

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## Assessment of the effectiveness and safety of epidural-sacral anesthesia during cesarean section

**Abstract:** Investigation was carried out with the aim to determine reasonability of using epidural-sacral anesthesia during cesarean section and also to assess the effectiveness of such method. 19 women with supposed difficulties of traditional methods of anesthesia have been included in the investigation. The implementation method of epidural-sacral anesthesia and also subsequent monitoring of patients' health status have been described in detail. The results of investigation allow us to consider that this type of regional blockade on the assumption of its correct technical realization provides reliable antinociceptive defense and hemodynamic stability, limits neuro-endocrine reaction for the surgical aggression.

**Keywords:** epidural-sacral anesthesia, cesarean section, regional anesthesia.

**Introduction.** Continually growing temps of distribution of obesity in the world wide, and also connecting with obesity the increased morbidity and mortality have been made it one of the most actual problems of the modern health care, while the obesity of pregnant women has been attracted the most attention. In spite of the constant improvement of the system of antenatal observation and delivery system the amount of pregnant women with obesity in economically developed countries has been reached 15,5–26,9% and continually increased, in connection with it the actuality of this problem takes the particular importance [1].

According to the data of the world health care statistics the frequency cesarean sections in the USA increased from 20,7% in 1996 to 31,1% in 2006 and for the present time it is the most distributed surgical operation in women [2; 3; 4]. The generally accepted "gold standard" during anesthetic supplying of cesarean section considers central neuroaxial blockades (CNB).

Spinal and epidural anesthesia are generally accepted as the most rational methods of regional anesthesia during cesarean section [5; 6]. However in the certain contingent of patients (obesity, congenital and acquired deformations of spinal column, edema) their technical implementation is accompanied by considerable difficulties [7; 8; 9]. At the same time type of regional blockade called epidural-sacral anesthesia (ESA) technical implementation of which is not presented difficulties has already existed for a long time [10; 11]. For the present time this method is rather widely used in proctology, traumatology [12], and urology [10]. However in the operative obstetrics it has not found due acknowledgement probably because of the cesarean section requires highly extensive sensor-motor blockade on the level of lumbar and low thoracic segments of spinal cord.

ESA considers as a variant of epidural blockade since local anesthetics injected through sacral foramen is extended to the cranial direction and in the enough injected amount could reach low

thoracic segments of spinal cord [10]. The effectiveness of ESA substantially increases during catheterization of the epidural cavity with carrying out catheter until L<sub>3</sub>-L<sub>4</sub> levels. This tactic is guaranteed necessary before surgical operation level of sensor-motor blockade and to the considerable degree reduce the amount of local anesthetic in the comparison with single-stage injection through the needle [10; 13]. At the same time this method is not found a wide application in the obstetrical practice in connection with the limited amounts of investigations confirming its effectiveness and safety.

**The aim of investigation.** The assessment the effectiveness and safety of epidural-sacral anesthesia during anesthetic supplying of cesarean section.

**Materials and methods of investigation.** On the basis of Republican specialized scientific-practical medical center of obstetrics and gynecology together with the first clinic of Samarkand State Medical Institute for the period of 2015–2016 it has been carried out prospective investigation in which according to the inclusion criterion with the use of simple randomization 19 women with supposed technical difficulties of using traditional variants lumbar epidural (EA) and spinal anesthesia (SA) and also with accompanying obesity, congenital and acquired deformations of spinal cord have been selected. According to the conclusions of the adjacent specialists (neurosurgeons, traumatologists and therapeutics) 15 (78,9%) of investigated patients have got obesity of the 1–2 degree (body mass index was 30–39,9 kg/m<sup>2</sup>) and 4 (21,1%) patients have got deformation of the lumbar part of spinal cord. Pregnant women with the other extra genital pathology or conditions which potentially lead to the disorders of the function of the basic systems of life support have not been included in the investigation. Authors on the basis of clinical findings (thick subcutaneous fat, deformations of the lumbar part of spinal cord) and conclusions of the adjacent specialists were made conclusions about proposed difficulties on the performing of traditional variants of anesthesia. In connection with it ESA was chosen as an alternative method of CNB.

Introduction of this method of investigation was carried out by the authors themselves on the basis of center and clinic (certificate № 75 about the introduction of the results of scientific-research elaboration “Sacral-epidural anesthesia during delivery anesthetization of women with accompanying obesity” from November 5, 2015, duration of introduction 2015–2016 years).

Before surgical operation all women were examined by anesthesiologist and adjacent specialists and were informed about supposed anesthetic manual. We have received the information consent of patient with following official registration in the case history. The investigation has been coordinated with the leaders of center and clinic. Observation and complex of clinical-functional-biochemical examinations during cesarean section have been performed to all 19 women at the age from 26 to 32 years old at the gestation periods of 37–39 weeks. Operations were carried out in the planned order and duration of them was 35–50 minutes.

Method of anesthesia came to the following actions: after premedication by diphenhydramine (0.2 mg/kg), dexamethazone (0.07 mg/kg) and intravenous injection of paracetamol (100 ml of 1% solution) in the left side position we palpated sacral fissure and carried out local infiltrative anesthesia. Puncture was performed by the use of short till 7.0 centimeter Kraford's needle with straight tip and lumen of 1.2–1.5 mm, but not Tuokhi's needle since the last one has bent tip which can lead to the changes of the catheter direction with subsequent torsion or knot forming.

Puncture needle at first entered perpendicularly to the skin until contact to the ligament (it is felt as increasing resistance). At this

point we turned the needle around in 45° to the skin surface and moved through ligament. With the beginning of the loss of resistant sensation we dropped turned the needle parallel to the skin and moved to 1–2 cm again which guaranteed hitting into the sacral epidural cavity without risk of injure of dural sac. In the next step we entered graduated epidural catheter G16-G18 “BALTON” with preliminary measuring distance from sacral fissure to L<sub>3</sub>-L<sub>4</sub> level. Catheter is moved to the cranial direction and led to L<sub>3</sub>-L<sub>4</sub> level. Patient is turned to the back and imparted body left-uter lateral position. After “test-dose” and the absence of the signs of spinal blockade we fractionally injected 0,5% of bupivacain hydrochloride solution in the combination with fentanil (1,4 mcg/kg) at a rate of 2 ml for the spinal segment (18–20 ml). In connection with low cardiotoxic action and with the aim of the achievement of sufficient motor-sensor blockade 0.5% of bupivacain solution was chosen.

Operation has been started in 15–20 minutes with the development of all clinical signs of segmental sensor-motor blockade on the needed for operative intervention level. In the postoperative period the placed in the epidural cavity catheter has been used for postoperative analgesia.

About the effectiveness of anesthesia we judged due to the generally accepted clinical signs. The level of sensor blockade has been assessed due to the loss of tactile sensitivity (test — «pin prick»). The upper border of blockade has been assessed after its stabilization. P. Bromage scale has been used for the assessment of the depth of motor blockade (DMB). With the aim of the assessment of ESA safety we have studied central hemodynamic by the method of echocardiography with the use of SA — 600 apparatus of “Medison” firm. Impact index (II), cardiac index (CI) general peripheral vascular resistance (GPVR), mean dynamic pressure (MDP), heart rate (HR) and saturation (SpO<sub>2</sub>) have been studied and followed with the use of Schiller monitor. In order to assess reaction of neuro-vegetative system on ESA we have performed the study of tension index (TI) with using of mathematic analyses of cardiac rhythm [14]. Also for the study of adequacy of anesthesia we have determined the level of total cortizol (TC) in the blood plasma (radioimmunologic method) and due to excretion of noradrenalin (NA) with urine [15] for this. All numerical values received during investigation have been processed by the method of variation statistics with the use of Student's criterion (by Microsoft Excel program) and presented in the form of  $M \pm m$ , where  $M$  — arithmetical mean value and  $m$  — standard error. Differences consider statistically reliable in  $p < 0,05$ . Received results have been presented in table.

**Results and their discussion.** As our investigations showed that in 18 patients ESA was highly effective. The distribution level of full sensor-motor blockade is corresponded to the Th<sub>4</sub>-L<sub>5</sub> dermatomes. During the whole operation including of it's the most traumatic stages patients were not reacted and presented complaints. Signs of depression were not observed. SpO<sub>2</sub> was 96–98%. Hemodynamic stability has been saved.

However in 1 our observer on the stage of extraction of infant from uterus and subsequent revision of the wound patient was presented complaints for moderate pains and unpleasant feelings which required additional anesthesia by parenteral injection of the minimal doses of ketamin (0.5 mg/kg). Subsequent stages of cesarean section have been passed normally. It should be noted that in the case of insufficient effectiveness of ESA epidural catheter we could lead only to L<sub>4</sub>-L<sub>5</sub> level. At the same time, level of the full segmental sensor-motor blockade has been corresponded only to Th<sub>10</sub>-S<sub>3</sub> dermatomes. Analyzing the technical side of ESA performing we should mention that epidural carrying out of the

usual catheters could cause certain difficulties in the connection with its insufficient elasticity and stiffness. At the same time the

movement of epidural catheters G16–G18 to the cranial direction is not caused any difficulties.

Table 1. – Some indexes of hemodynamic, neurovegetative and hypothalamic–hypophysal–adrenocortical systems on the stages of anesthesia and surgical operation

The studied parameters	Stages of investigation				
	I	II	III	IV	V
Heart rate, in 1 minute	89,7±2,1	84,9±1,1*	84,2±1,6*	85,6±1,3	82,2±2,1*
Mean dynamic pressure, mm Hg	92,4±1,9	84,6±1,8*	85,2±1,6*	88,4±2,6	84,1±1,3*
Cardiac index, l/m <sup>2</sup> /min	2,075±0,09	2,78±0,13	2,77±0,09	2,69±0,1	2,81±0,07
General peripheral vascular resistance, din×s/sm <sup>5</sup>	1414,3±46,1	1288,3±42,3*	1293,4±48,4	1372,4±46,3	1204,2±42,3*
Impact index, in standard units	356,4±10,2	278,4±8,4*	337,6±11,4 Δ	381,3±10,8	334,5±8,0 Δ
Total cortizol, nmol/l	398,4±36,3	504,2±50,3	–	719,4±46,6* Δ	592,4±42,2* Δ
Noradrenalin in urine, nmol/l	8,9±0,8	–	–	–	11,4±1,4

Footnote: \* — reliability of differences ( $P<0,05$ ) concerning initial values; Δ — reliability of differences ( $P<0,05$ ) concerning previous stage of investigation. Stages: I — on the operation table; II — before beginning of operation; III — after skin incision; IV — traumatic stage of operation; V — end of operation.

In the all stages of anesthesia and operation hemodynamic stability has been remained (see table). Adequacy of anesthesia was confirmed by the absence of significant II and concentration of TC in the blood plasma in the traumatic stages of operation. So, concentrations of II and TC in the stage of extraction of infant from uterus and surgical revision were accordingly 381,3±10,8 standard unit and 719,4±46,6 mmol/l and were not overrun “stress-norm”. Concentration of NA in the urine during operation period has been increased till 11,4±1,4 mmol/l. At the same time NA excretion speed with urine was not reliably differed from this index before operation.

The above mentioned is testified about the moderate significant activation of sympathy-adrenal and hypothalamus-hypophysis-adrenocortical systems on the operational wound confirming the effectiveness of the approved method of regional blockade. We were not observed complications connected with the use of ESA. Postoperative epidural analgesia supplied fluent duration of

the nearest postoperative period and promoted and curtailment of terms of rehabilitation.

Thus, our experience of using ESA in the combination with preventive analgesia has been testified about its high effectiveness and safety. The presented data allows us to recommend ESA for the anesthesia of cesarean section concerning patients with proposed difficulties of puncture — catheterization of subarachnoid and epidural cavities.

#### Conclusions:

1. ESA in the combination with preventive analgesia can be used for the anesthesia of cesarean section concerning patients with proposed difficulties in carrying out of traditional types of blockades of central nerve system.

2. The investigated type of regional blockade on the assumption of correct performing supplies reliable antinociceptive defense and hemodynamic stability also restricts neuro-endocrine reaction for the surgical aggression.

#### References:

- Hamilton B. E., Martin J. A., Ventura S. J. Births: preliminary data for 2006//National vital statistics reports. – 2007. – Vol. 56, no. 7. – P. 88.
- MacDorman M. F., Menacker F., Declercq E. Cesarean birth in the United States: epidemiology, trends, and outcomes//Clin. Perinatol. – 2008. – Vol. 35, no. 2. – P. 293–307.
- Rates of caesarean section: analysis of global, regional and national estimates/Betran A. P. [et al.]//Paediatr. Perinat. Epidemiol. – 2007. – Vol. 21. – P. 98–113.
- Chernuha G. Ye. Obesity as a risk factor for disorders of the reproductive system in women//Consilium medicum, – 2007; – № 6.
- Kulakov V. I., Serov V. N., Abubakirova A. M., Chernuha E. A. Anestezija i reanimacija v akusherstve i ginekologii. – Moskva.: Triada-X; – 2000. 110–113 s. (in Russian).
- Semenihin A. A., Kim E. D. Rukovodstvo po regionarnoj anestezii i analgezii v akusherstve i ginekologii. Tashkent: Nauka; – 2002. 84–86 s. (in Russian).
- Matinjan N. V., Belousova E. I., Saltanov A. I. Ul'trazvukovaja navigacija pri kateterizacii torakal'nogo paravertebral'nogo prostranstva. Anesteziologija i reanimatologija. – 2014; 4: 57–8. (in Russian).
- O'Donnell D., Prasad A., Perlas A.: Ultrasound-assisted spinal anesthesia in obese patients. Can J. Anaesth. 2009; 56: 982–3.
- Pandin P. Combined Ultrasound and Nerve Stimulation-Guided Thoracic Epidural Catheter Placement for Analgesia Following Anterior Spine Fusion in Scoliosis. Pain Practice. – 2009; 9 (3): 230–4.
- Lopatkin N. A., Rubinov D. M. Jepidural'no-sakral'naja anestezija v urologii. – Tashkent: Medicina; – 1969. 109 s. (in Russian).
- Pashhuk A. Ju. Regionarnoe obezbolivanie. – Moskva.: Medicina; 1987. 131 s.
- Iljukevich G. V., Romanjuk T. I. Modificirovannaja metodika sakral'noj anestezii pri operacijah v oblasti promezhnosti: Materialy XII s#ezda federacii anesteziologov i reanimatologov. – Moskva, 19–22 sentjabrja 2010 g. – Moskva; 2010. (in Russian).
- Sabirov D. M., Krasnenkova M. B., Sharipova V. H., Matzhanov U. O. Ostraja bol' i sekreti obezbolivaniya. Tashkent: Nauka; 2011. 106–113 s. (in Russian).

14. Baevskij R. M., Kirilov S. Z., Kleckij S. Z. *Matematicheskij analiz izmenenij serdechnogo ritma pri stresse*. – Moskva: Nauka; 1984. 22 s. (in Russian).
15. Matlina Je.Sh., Kiseleva Z. M., Sofieva I. Je. *Metody issledovanija nekotoryh gormonov i mediatorov*. – Moskva: Medicina; 1965. 25–32 s. (in Russian).

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## Comparative age features of clinic and pathogenetic aspects of school disadaptation

**Abstract:** The clinic manifestations and the main factors of pathogenesis of school disadaptation in the comparative-age aspect (7–11 years old,  $n = 950$ ) and (12–17 years old,  $n = 550$ ). More significant factors of risk together with the psycho — social ones (conditions of micro social sphere of family and school) are genetic and cerebral organic. The feature of found out by children and teenagers disadaptation is its massive somatisation, which characterised by polymorph vegetative and visceral disorders in different organs and systems (digestive, skin, respiratory, moving, heart-vessel, secretory, endocrine) and painful manifestation.

**Keywords:** school disadaptation, factors of risk, somatisation.

School period of life is considered by most authors as a very special, very important period of human life, have a great influence on the formation of the body [1, 3, 4, 5]. Intensive processes of maturation of certain biological systems of the body in conjunction with an increase in the level of socio-psychological requirements for students, increase the possibility of psihotraumatik personality. These biological and psychological characteristics of a certain effect on the prevalence and clinical manifestations disadaptation (crisis) disorders in this age group. All this creates conditions for a possible formation and manifestation of abnormally personal characteristics, which does not rule out further genesis clinic border states and increases the likelihood of neuropsychiatric and somatic diseases [2, 6]. “School maladjustment” — a violation of the individual student adaptation to the school environment, which acts as a private phenomenon of disorder in the child's overall ability to adapt in connection with any pathological factors N. V. Vostroknutov [4].

Purpose a comparative study of age-related clinical manifestations and pathogenesis of the main factors of school exclusion [4].

### Material and methods

The main methods of investigation were clinical-epidemiological and psychological. Additionally used psychopathological, paraclinic and catamnesis methods. Observation of children with impaired adaptation we carried out in conditions of children's clinics and psycho-neurological clinic (7–11 years,  $n=950$ ) and (12–17 years, and  $n=550$ ).

### Results and discussion

Fully taped maladjustment in children 12–17 years of  $29,6 \pm 3,58\%$ ;  $P > 0,05$  ( $22,4$  and  $36,0\%$  of boys and girls) than in younger schoolboys  $22 \pm 3,38\%$  ( $16,5$  and  $28,1\%$  respectively in girls and boys). This ratio is celebrated and II degree maladjustment ( $14,5$  and  $25,6\%$ ,  $10,4$  and  $19,4\%$ ,  $P > 0,05$ , respectively, in girls and

boys) in the age periods 12–17 and 7–11 years. In  $72,7\%$  of girls and  $52,5\%$  of boys aged 7–11 years and  $63,1\%$  of girls and  $38,4\%$  of boys aged 12–17 with maladjustment infringements of only one of the 3 parameters.

Thus, much more often than in children ( $15,7 \pm 1,18\%$ ), among school-age adolescents ( $29,4 \pm 1,9\%$ ;  $P < 0,001$ ) found violations of adaptation. The degree of response and the quality of mental and emotional changes Profile depend on the age of the subjects. So, boys and girls aged 7–11 years of mental and emotional changes in the background significantly marked decrease in impu-nitive “M” orientation reaction ( $20,4 \pm 5,11$ ;  $P < 0,01$ ). In general, the observed increase in reduction of tolerance to frustration, which is manifested by increased ekstrapunitive indicator “E” reactions ( $48,65 \pm 6,34$ ) and the reaction needs to continue, “1-R» ( $44,45 \pm 6,31$ ;  $P < 0,05$ ). In adolescents, students with maladjustment reaction ratio between the types of reactions and their direction abruptly broken.

It is stated significant increase ekstrapunitive “E” self-protective reactions of the type ( $58,25 \pm 3,5$ ;  $P < 0,05$ ) when compared with the children of 7–11 years and compared to children 12–17 years of healthy population. It is also a marked trend of increasing demand indicator reaction continued, “1-R” ( $21,75 \pm 2,98$ ;  $P < 0,001$ ). Reactions on the “O-D” type ( $21,95 \pm 2,99$ ;  $P < 0,01$ ) — domination of the obstacle is reduced in comparison with the healthy population. The findings suggest that a stressful situation with students maladjustment likely to respond to the aggression of others, excessive self-defense, and their emotional reactions differ inadequate. Low “On-D” in both age groups ( $19,2 \pm 5,0$  and  $21,95 \pm 2,99$ ;  $P < 0,001$ ) 7–11 and 12–17 years shows a decline in severity and self-esteem. Obstacles caused by frustration, children assessed as having significant value or children looking for the source of conflict outside of yourself. Significantly

less than normal, the answers impunitively-oriented and slightly more intrapunitive ( $23,8 \pm 3,08$ ;  $P < 0.05$ ).

Neurotic disorders were found in 20.1% of all surveyed and represented mainly asthenia, hysterical and obsession-but-phobic disorders. Asthenic disorders of psychogenic origin characterized by symptoms of "irritable weakness" in combination with mood fluctuations, vascular disorders: nervousness, anxiety, irritability, etc. These few students participated in public affairs classes. As a rule, they performance was low, which led to conflicts with the teachers. Hysteria, neurotic disorders presented acute affective demonstrative behavior problems, a variety of complaints, mainly of asthenic and hypochondriac nature; impulsivity, aggression, lack of physical feeling, unpleasant pain, etc. These teens were characterized by partial maladjustment in a team that was caused by systematic conflicts with teachers and classmates, sharp fluctuations in performance indicators. Obsessive-fobic disorders encountered in the ground rated as obsessive fear of hypochondriac nature, compulsive actions, fear of illness and death, Onychophagia three-hotillomanii etc. In this group, the relative maladjustment arose because of poor performance. The expressed disturbances of behavior and conflicts with his classmates have been noted. Analysis of the frequency of neurological disorders shows that children aged 7–11 years with impaired adaptation of the most common symptoms of motor disinhibition syndrome or hyperactivity or restlessness intensively manifested ( $28,0 \pm 3,61$  and  $44,6 \pm 4,0\%$ ), disinhibition ( $31,5 \pm 3,7$  and  $29,3 \pm 3,66\%$ ), lack of focus and impulsive action ( $39,7 \pm 3,94$  and  $27,5 \pm 3,59\%$ ), violation of concentration ( $17,6 \pm 3,06$  and  $15,5 \pm 2,91\%$ ), restlessness ( $27,5 \pm 3,59$  and  $39,3 \pm 3,93\%$  respectively for girls and boys). Adolescents 12–17 years manifestations syndrome, primarily motor excitability ( $21,0 \pm 3,20$  and  $27,0 \pm 3,48\%$ ) and motor disinhibition ( $12,4 \pm 2,58$  and  $18,5 \pm 3,05\%$ ), restlessness ( $13,5 \pm 2,68$  and  $22,0 \pm 3,25\%$  respectively for girls and boys) are gradually smoothed out.

It was found that premature birth with the birth of a premature baby were observed in 11 (12.08%) women, children with congenital malnutrition — in 15 (16.5%), post-term baby — in 7 (7.69%), which is significantly different from the proportion of children in the general population (2,99; 2,32%,  $P < 0,001$ ). The average weight of girls body with adjustment disorder at birth ( $3235 \pm 8.9$  g) did not differ from the mass of the girls in the control group ( $3320 \pm 294$  g,  $P < 0.05$ ), and the average body mass of boys with TTTD ( $3057 \pm 84.9$  g) was significantly lower than control group newborn males ( $3372 \pm 33,4$  g,  $P < 0,01$ ).

It should be noted that in children with impaired adaptation dominated children at birth have both reduced ( $< 2.5$  kg) of body weight — 14 (15.4%,  $P < 0.01$ ) and increased ( $> 4.0$  kg) body weight — 15 (16.3%), which significantly reduces the percentage of children having an average body weight (3100–3500 g), respectively, in females (36.7%  $P < 0.01$ ) and 37.4 boys ( $P < 0.01$ ) as compared with the control group (55,5–54,9%). In the group of children with maladjustment high proportion of occurrence of pre — and perinatal ( $P < 0.05$ – $0.001$ ) disease than in the control group, which were based on the microcirculatory disorders hypoxic and hypoxic-traumatic nature.

The results of experimental studies of psychological maladjustment in children with perinatal CNS, indicate mental disorders health, manifested in violation of pace, the inertia of mental processes, exhaustion and violation of affective-personal sphere (re-

duction of cognitive activity, indecision in action, disruption of activities at difficulties). A significant part of the intellectual functions they seemed intact, however, noted the weakening of mnemonic processes, which led to a reduction of the storage material and the strength of its hold.

A special place among the neurotic symptoms of the surveyed children and adolescents with SE occupy the thoughts and concerns about their appearance and structure of the body. These symptoms are significantly higher in adolescents 12–17 years than in children 7–11 years old ( $36,0 \pm 3,77$  and  $44,0 \pm 3,89\%$  against  $14,0 \pm 2,79$  and  $12,7 \pm 2,68\%$ ;  $P < 0.001$ ), respectively, in girls and boys. The results of the study of personality characteristics of children and adolescents with SM show that overall detection of types of character accentuations significantly different from population ( $B < 0.001$ ). Large group of gipertimnye and gipertim-but-mixed ( $24,5 \pm 4,72$  and  $13,7 \pm 3,34\%$ ;  $P < 0.05$ , respectively, for boys and girls), hysteroid ( $4,1 \pm 2,20$  and  $4,7 \pm 2,35\%$ ), astenonevrotic ( $4,5 \pm 2,30$  and  $5,5 \pm 2,53\%$ ,  $P < 0.05$ ) the types of character accentuations. Indicators of the other types did not differ from those of the population. An analysis of the family situation in the group of children with SE showed in most cases the presence of frequent conflicts between the parents (87.7%,  $P < 0.001$ ). Almost half of the surveyed were raised in a single-parent families (37%,  $P < 0.001$ ), — absence of one or both parents, often the father, the presence in the family of his stepfather, stepmother, and others, as well as in the atmosphere of constant scandals and conflicts of family relationships. Normal conditions of education are much rarer (7.7%,  $P < 0.001$ ) than in children and adolescents without behavioral disorders (control group). Among the forms of improper upbringing often detected gip-opek (35.7%), neglect (36.0%). The situation of "idol" family more common (18.9%) than "Cinderella." Quite often revealed mixed variants of improper upbringing. It is characteristic that in the majority of households surveyed (86.8%) of the material and living conditions were favorable. Hence, the emergence of deviant behavior among adolescents depended not so much on material well-being, but on the negative climate.

### Conclusio

Thus, clinical and population-based studies conducted among healthy schoolchildren, revealed a greater incidence of children and adolescents with adjustment disorders (72%), among which is dominated by Grade III — a relative maladjustment. The most significant risk factors, along with psycho-social (micro social status of the family and school environment) are genetic and cerebro-organic. A feature of the identified children and adolescents maladjustment was its massive somatic, which was characterized by polymorphic vegetative-visceral disorders in various organs and systems (digestive, skin, respiratory, locomotor, cardiovascular, excretory, endocrine) and algic manifestations. Neurotic disorders occur among children and adolescents in a relatively large percent of cases, and usually leads to severe violations of students to adapt to the team.

Neurological examination of school-age children with pre- and perinatal pathology identifies risk with SE, determined on the basis of minimum functional deviations forecast further psychomotor development of the child, to ensure the timely correction of these deviations. Situation and behavioral disorders due to occur more frequently on a background of accentuations nature, lead to a full school maladjustment.

### References:

1. Andreyuk V.Y. School maladjustment in the form of systematic absenteeism: risk factors and psychosocial rehabilitation//Defectology. – 2009. – № 5. – S. 387.

2. Arzikulov A.S.H. Clinical and psychological evaluation of school exclusion//Pediatrics them. Speransky. – 2004. – № 4. – S. 110–111.
3. Zavadenko N. N. School maladjustment pediatric//attending physician. – 2005. – № 1. – S. 22–26.
4. Vostroknutov N. V. School maladjustment and key diagnostic and rehabilitation problems//School maladjustment: the emotional and stress disorders. – M., 1995. – P. S. 8–11.
5. Filippov E. A. School maladjustment and risk factors of borderline mental disorders among students in middle and high school mass schools//Social and clinical psychiatry. – 2010. – № 3. – S. 50–53.
6. Tredwell-Deering D. E., Hanisch S. U. Psychological response to disaster in children and families//Clin. Pediat. Emer. Med. – 2002. – Vol. 3. – P. 4–14.
7. Acute stress disorder symptoms in children and their parents after pediatric traffic injury/F. K. Winston, N. K. Adams, C.V. O'Neill et al.//Pediatrics. – 2002. – Vol. 109, – № 6. – P. 1293–1299.

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## Pharmacological effect of Trisodium salt of Glycyrrhizic acid

**Abstract:** Trisodium salt of glycyrrhizic acid (Glycyrrinate) with strong anti-ulcerous activity combined with anti-inflammatory effect was synthesized on the basis of glycyrrhizic acid. According to the parameters of acute toxicity in experiments on white mice and rats with per oral administration Glycyrrinate was included to the group of little toxic substances. And according to the assessment of anti-ulcerous activity on the models of rats' gastric mucous membrane destruction caused by indometasin, ortophen, and reserpin glycyrrinate has an expressed antiulcer effect. The mechanism of glycyrrinate's antiulcer effect is linked with its antioxidant property and suppression of the secretory function of gastric glands.

**Keywords:** extract *Radix glycyrrhizae*, glycyrrhizic acid, antiulcer activity.

The search of new sources of very active medical agent based on local raw materials is a topical problem of the modern science.

It is known that, *Radix glycyrrhizae* is widely used in various fields of national economy. Its basic component is glycyrrhizic acid. The presence of anti-inflammatory activity, low toxicity, and absence of severe side-effect make the new synthetic derivatives of glycyrrhizic acid compounds perspective for medicine [6].

Glycyrrhizic acid (GA) and its derivatives have strong antiulcer, anti-inflammatory, antiviral, antitumor and other pharmacological activity. The modern antiulcer agents in the modern time do not completely meet the requirements of clinical practitioners, as these agents often cause side-effects, and sometimes even severe complications. Some of these agents have insufficient therapeutic effect (5). While continuing the search of new biological active derivatives of glycyrrhizic acid we studied its trisodium salt.

**The objective.** To study antiulcer activity of glycyrrinate on an experimental model of ulcer caused by 24-hour immobilization of animals and to reveal the mechanism of antiulcer activity.

### Materials and methods.

Experimental model of ulcer caused by 24-hour immobilization of animals was performed on rats with body mass equal to 160–200 g [1]. Animals were divided to three groups, with 6 rats in every group. Glycyrrinate 100mg/kg was introduced per orally in experimental groups every day for a week prior to stress. And in the control group the same volume of distilled water was given to the rats. The effect of the agent was compared

with cimetidine, which was introduced in the dose 400mg/kg. at the seventh day all animals were fixed on a desk belly up. In 24 hours all animals were decapitated, gastric mucous membrane was examined macroscopically and antiulcer effect of the agents was evaluated. We studied the impact of glycyrrinate on secretory function of stomach and acidity of gastric juice on rats. The agent was introduced per orally for a week; in 20 minutes after the last administration of the agent the ligature of pylorus was performed under narcosis. After that in 2–3 hours the animals were killed with further measurement of the volume of gastric juice and titration with 0.1 H of NaOH solution till appearance of pink color. In blood serum of rats we determined the activity of super oxide dismutase (SOD) [4] and catalase [7].

The obtained results were processed with the help of R. V. Strelkov's variation statistic method [9].

**The results of the research.** The performed experiments showed that, in the control group of rats the average number of ulcers was  $5.66 \pm 0.54$ , and the average summary square area of ulcers was equal to  $6.33 \pm 0.54 \text{ mm}^2$ . Under the influence of glycyrrinate the average number of ulcers and average summary square area of ulcers was diminished to  $2.33 \pm 0.18$  and  $2.0 \pm 0.18$  (58% and 68%). Under the influence of cimetidine the average number of ulcers and average summary square area diminished to  $4.66 \pm 0.36$  and  $3.33 \pm 0.54$  (18% and 48%), respectively, in comparison with the control group.

It is known that, an important role in the development of gastric and duodenal ulcer is played by hyper secretion of hydrochloric acid,

decrease of protective functions of gastric and duodenal mucous membrane, and its blood supply.

For the detection of the mechanism of antiulcer effect we studied the influence of glycytrinate on secretory function of stomach and acidity of gastric juice on rats. Results of the experiment showed that, in the control group of rats the volume of gastric juice was 2.05 ml, pH = 1.33, total acidity 0.5 ml, titrated unit was 100 TU. Under the influence of the agent the volume of gastric juice decreased to 39%, pH = 3.25, total acidity 0.37, titrated unit 74 TU.

Development of ulcerous process proceeded together with background decrease of SOD antioxidant system enzyme activity [1.07 (1.0±1.14)] and catalase [1.41 (0.94±1.88)]. Glycytrinate 3.3 folds increased the activity of catalase in comparison with the control [4.76 (1.96±7.6)], and activity of super oxide dismutase [1.24 (1.14±1.34)].

Thus, under the influence of the agent pH shifted to alkali side 1.4 folds; total acidity decreased to 26%. The agent decreased the speed of mucocytes exfoliation, and by these means increased formation of mucin and bicarbonates, which neutralize hydrogen ion, increasing mucous viscosity in stomach. Development of ulcerous process in animals was accompanied by significant decrease of enzyme activity of antioxidant protection. So we can state that, expressed antiulcer effect of glycytrinate is conditioned by its antioxidant properties.

We performed clinical testing of glycytrinate on patients with gastric and duodenal ulcers in the gastroenterology unit of Tashkent Medical Academy.

It was revealed that glycytrinate has antiulcer and anti-inflammatory effect. It is sufficiently effective and has no side-effects. Its efficiency and tolerance is similar to the agent for comparison De-nol.

Earlier we determined that, trinitrium salt of glycyrrhizic acid — “Glycytrinate” was little toxic, even in doses over 4000–5000 mg/kg, in case of per oral administration on rats it had no toxic effect, as it did not cause lethal outcome [3]. According to antiulcer activity on the models of rats’ gastric mucous membrane destruction caused by indometacin, ortophen, and reserpin, it was determined that, glycytrinate had expressed antiulcer effect [2].

On formalin model the agent was characterized by anti-inflammatory effect [8]. In experiments on various animals the agent doses with antiulcer effect did not have a significant influence on CNS, vegetative innervations, breathing, and arterial pressure. The study of chronic toxicity revealed that the agent had no local irritating, accumulative, or embryonic toxic effect [3].

Thus, it was determined that “Glycytrinate” agent was little toxic and had expressed antiulcer activity. The mechanism of antiulcer effect of glycytrinate is linked with its antioxidant property and suppression of the secretory function of gastric glands.

#### References:

1. Aminov S. D. Antiulcer activity of pinocembrine. Actual problems of gastroenterology and dietology. [Materials of Republican scientific-practical conference.] Protivoyazvennaya aktivnost pinocembina. Aktualniye problemi gastroenterologii i diyetologii. Materiali respublikanskoy nauchno-practicheskoy konferencii. Urgench, November 14–15, 2005. P. 182–183 (in Russian).
2. Aminov S. D., Babayeva L. T. Poisk novikh protivoyazvennikh preparatov sredi trizameshennikh soley glycirizinovoy kisloti. [The search of new antiulcer agents among trireplaced salts of glycyrrhizic acid. Infection, immunity and pharmacology.] 2012; – № 3: P. 12–13 (in Russian).
3. Aminov S. D. Redjepov J. The study of chronic toxicity of gastro protector agent glycytrinate. [Bulletin of South Kazakhstan pharmaceutical Academy. Republican scientific journal.] Izucheniye khronicheskoy toksichnosti gastroprotektornogo preparata glycytrinat. – № 3, 2014, P. 93–96. (in Russian).
4. Brusov O. V., Gerasomiv A. I., Panchenko L. V. The impact of natural inhibitors of radical reactions on the auto oxidation of adrenalin. Vliyaniye prirodnykh ingibitorov radikalnykh reaktsiy na avtookisleniye adrenalina. [Bulletin of experimental biology and medicine]. 1976. – № 1. – P. 33–35 (in Russian).
5. Grigoriyev P. Y., Yakovenko E. P., Yakovenko A. V. Modern branches in pharmacotherapy of digestive system diseases. Sovremenniy napravleniya v farmacoterapii bolezney organov pishhevareniya. [Clinical medicine]. 1999. – № 10. – P. 7–10.
6. Zemlyanskaya N. R., Adilova Z. A., Orlova Y. Y., Mirkhanova F. A., Novikova I. U., Makhkamov K. M. Isolation of glycyrrhizic acid from Radix glycyrrhizae. Videleniye glicirizinovoy kisloti iz solodkovogo kornya. [Pharmaceutical journal]. 2004. – № 2. P. 30–31.
7. Korolyuk M. A. et al. Method of definition of catalase activity. Metod opredeleniya aktivnosti katalasi. [Laboratory affair]. 1988. – № 1. P. 16–19.
8. Rejepov J., Zemlyanskaya N. R., Makhkamov K. M. Anti-inflammatory activity of glycytrinate. Protivovospalitel'naya aktivnost glicitri-nata. [Pharmaceutical journal]. 2007. – № 3. P. 18–20.
9. Strelkov R. V. Statistical tables for acceleration of quantitative assessment of pharmacological effect. Statisticheskiye tablitsi dlya uskorennoy kolichestvennoy otsenki farmacologicheskogo effekta. [Pharmacology and toxicology]. – 1986. – № 4. P. 100–104.

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## The anxious state in the adolescents with Graves' disease under conditions of Iodine deficit

**Abstract:** In 19 adolescent children with Graves' disease were studied especially the psycho-emotional state with using test of Spielberg (STPI — State Trait Personal Inventory), modified by A. D. Andreeva. In this group of children identified



expressed vegetative symptoms, stress symptoms et al., and also in this group dominated phenomenon anxiety and negative emotional experiences, but cognitive activity was lower when compared with those of the control group. Further it's necessary to study of emotional expressions and anxiety syndrome in adolescents with Graves' disease.

**Keywords:** adolescents, Graves disease, thyrotoxicosis, anxious syndrome.

According to the traditional system the anxious disorders are related to the group of neurotic disorders (neurosis). In the ICD the anxious disorders present clusters F40-F41. The basic feature of generalized anxious disorder (F41.1 by ICD-10) is the anxiety which seems to be generalized and persistent, is not limited by any ambient conditions and even does not arise at all with obvious preferability under these circumstances. The symptoms are expressed mostly often as:

1. Fear (anxiety about the future failures, sensation of excitement, difficulty in concentration etc.);
2. Motor tension (fussiness, headaches of effort, shiver, impossibility to relax);
3. Vegetative hyperactivity (sweating, tachycardia or tachypnea, epigastral discomfort, dizziness, dryness in a mouth and etc.).

Epidemiologic study "RAPSDY" showed that among the patients suffering from chronic pain syndromes, 14% had only disturbing disorders, in 17% — only depressive disorder, and in 36% — combination of anxiety and depression [5, 13]. The anxiety disorders are diagnosed only at 50% of the patients with clear symptoms [15, 16]. Clinical typical anxiety occurs in 5–7% in the general population, and in 25% or more patients observed by the general practitioner. Morbidity rate due to anxiety disorders may accounts more than 30% [7, 9].

Etiology, pathogenesis, clinical picture, efficacy and cost of various methods of treatment of Graves' disease are subjects of multiple studies [2, 10], at the same time not enough attention is given to the patient — dependent characteristics, especially to their psychological state and quality of life. [3]. Thus the significant importance in occurrence and progressing of GD is given to the extrathyroid effects as factors contributing to realization of genetic predisposition to development of GD which are expressed by personal characteristics, emotional state of the patient, presence of psycho-injuring situation (acute, chronic stress) (6), and at the same time thyrotoxicosis itself seems to be factor provoking stress, severe psychic trauma that worsens the psychic state of the patient. Thyroid hormones are mediators in the hippocampal neurogenesis and effect on the mood, stimulate reticular formation and cortical processes in the central nervous system [1; 12; 14], while thyrotoxicosis induces worsening of the general and central hemodynamics being responsible for such changes in the brain which, in their turn, resulted in pathological cerebral changes, creating so called "the closed circle" [10].

Thus, the Graves' disease has negative effect on the psychic state of the patients, contributes to development of secondary psycho-vegetative disorders of ityreotoxic encephalopathy, progressing of thyrotoxicosis [1]. Involvement of the central nervous system into the pathological process in thyrotoxicosis seems to be so clear, that the physicians from the end of nineteenth century to beginning of the twentieth century called this state "neurothyrosis" "thyronurosis" [3; 8].

**Research objective:** to study characteristics of the psychoemotional state in adolescents with Graves' disease with use of Spilberg's test, modified by A. D. Andreeva.

#### Materials and methods

On the basis of clinic of RSRPMC of Endocrinology of the Ministry of Health of the Republic of Uzbekistan there were studied 19 children of the adolescent age with Graves' disease. At the same

time there were observed 12 healthy adolescents without endocrine pathology, pupils of the secondary school in Tashkent, forming control group.

Diagnosis of the thyroid gland pathology (TG) was made on the basis of clinical data (examination and palpation), laboratory investigations, radioimmune assay (TSH, fT3, fT4, AT-TPO), needle aspiration biopsy (if required), ultrasonography of the thyroid gland.

The study of the anxiety syndrome in the adolescents with Graves' disease was performed with use of questionnaire of Spilberg (STI — State Trait Personal Inventory), modified by A. D. Andreeva (1988). This questionnaire includes scales of the cognitive activity, anxiety and negative emotional worry, characterizing personal characteristics of the subject. Each of these scales consists of 10 points, distributed in the special order. At answer the studied subjects use four-point rating scale: "Almost never" (1 point), "Sometimes" (2 points), "Often" (3 points), "Almost always" (4 points) [4, 11].

Thus, for each individuum the information were obtained about general level of the main emotional processes — anxiety, cognitive activity and negative emotional feeling — and character of their expressions.

#### Results and discussion

The average age of the studied adolescents with Graves' disease was  $13,0 \pm 0,6$  years, the average age of control group had no reliable differences from studied group and accounted for  $13,7 \pm 0,2$  years. However gender distribution differed reliably between groups — in group of the control the girls was 7 (58,3%), and boys 5 (41,7%), whereas in group of the teenagers with GD in the girls the diagnosis of thyrotoxicosis was made more often than 5,3 times in comparison with boys (16 cases (84,2%) against 3 (15,8%), respectively), OR 3,8; DI (0,7–20,5).

The average duration of illness in group of the adolescents with thyrotoxicosis was, on the average,  $2,5 \pm 0,4$  years (range from 2 months till 8 years). By results of radioimmune analysis the mean values of the thyroid status indicated about presence of thyrotoxicosis in the studied children: TSH  $0,16 \pm 0,02$  mIU/l (norm 0,17–4,05), fT3  $5,8 \pm 0,1$  pmol/l (norm 2,5–5,8), fT4  $24,1 \pm 0,3$  pmol/l (norm 11,5–23), AT-TPO  $14,02 \pm 1,9$  IU/ml (norm less than 12).

Endocrine orbitopathy was diagnosed in 13 (68,4%) adolescents with thyrotoxicosis. At the moment of this article has being written 14 (73,7%) children continue to receive thyrostatic therapy with drugs of thyamazole, in 2 (10,5%) there is noted remission of thyrotoxicosis, 3 (15,8%) children was carried out total/peritotal thyroidectomy and the replacement therapy was prescribed with preparations of sodium Levothyroxine, registered in the Republic of Uzbekistan, in appropriate dosage.

The majority of clinical effects of thyrotoxicosis have been connected with effect of exceed amount of thyroid hormones on the sympathetic nervous system. As a result of this the tachycardia occurred, tremor of the fingers of the outstretched arms (Mary's symptom), whole-body tremor, of the tongue, hyperhidrosis, irritability, feeling of anxiety and fear, hyperactivity, restlessness. Besides, thyroid hormones stimulate reticular formation and cortical processes in the central nervous system.

All surveyed adolescents with GD had vegetative symptoms: tachycardia or palpitation, hyperhidrosis, feeling heat, fine tremor of fingers, and also complained on feeling of an asphyxia (89,5%),

rough breathing (84,2%), discomfort in the chest (68,4%). From the symptoms of tension there was noted muscular tension and/or pain in the muscles (63,2%), restlessness and inability of relaxation (100%), feeling of nervousness (100%), «have a broad back» or to be on psychic tension (100%), sensation of a lump in the throat (94,7%) or difficult swallowing (73,7%). Besides, the other not specific symptoms are revealed:

- strengthened reaction to unexpectedness or on a fright (63,2%);
- difficulties in a concentration of attention or «emptiness in a head» because of an alarm or trouble (47,4%);

- constant irritability (94,7%);
- difficult falling asleep due to restlessness (worry) (63,2%).

By results of the performed research of anxiety by Spilberg's questionnaire (STPI — State Trait Personal Inventory), modified by A.D. Andreeva (1988), in the adolescents we revealed, that among children with thyrotoxicosis the signs of anxiety and negative emotional feeling prevailed, and cognitive activity appeared to be lower in comparison with parameters of the control group (Fig.1) the phenomena of uneasiness and negative emotional experiences prevailed, thus познавательная the activity has appeared below, at comparison with those parameters of control group (Fig. 1).

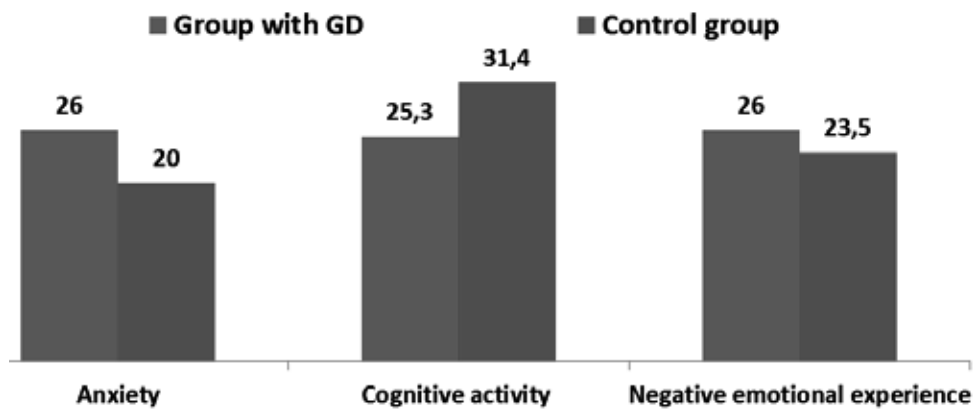


Figure 1. Parameters of the Spilberg's test in children with GD and group of control.

Thus in group of the adolescents with toxic goiter in 100% of children the high level of an alarm was revealed (range of points 24–40), in the same group children prevailed (68,4% (13)) with a

high degree of negative emotional experience, and in third of children (31,6% (6)) the middle degree of negative emotional experiences (Fig. 2) was diagnosed.

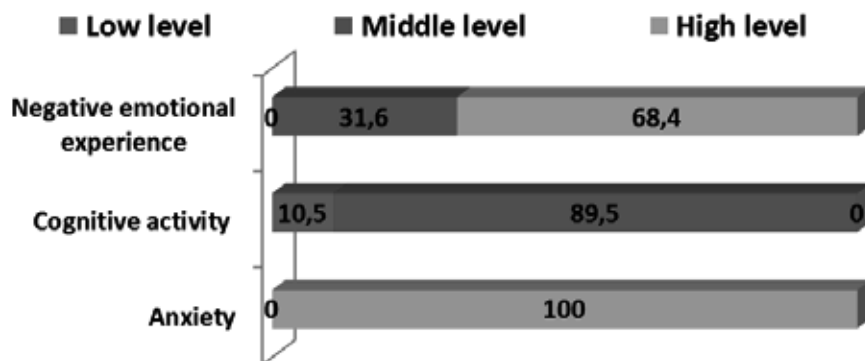


Figure 2. Results of a questionnaire STPI among the adolescents with Graves' disease.

Whereas the analysis of similar parameters in control group has shown, that in 50% (6) of healthy teenagers the low level of an alarm was revealed, in other half — middle level of an alarm was revealed; children with a high degree of negative emotional experiences in this group were absent, the adolescents with middle degree

(75% (9)) of negative emotional experiences (Fig. 3) prevailed. At the same time in control group at 91,7% (11) of children there has appeared high cognitive activity, whereas among the patients with thyrotoxicosis the low (10,5% (2)) and middle (89,5% (17)) level of cognitive activity was revealed.

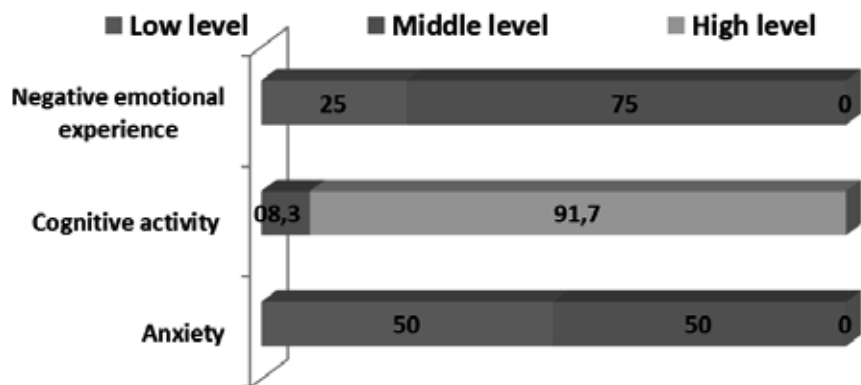


Figure 3. Results of a questionnaire STPI among the teenagers of control group.

After consultation of neurologist in 14 (73,79%) adolescents with thyrotoxicosis there has been diagnosed endocrine encephalopathy, of them in 8 (57,4%) — neurasthenia.

**Conclusion**

1. In all adolescents with Graves' disease there are noted vegetative expressions of thyrotoxicosis, connected with influence of exceed quantity of thyroid hormones on the sympathetic nervous system.

2. Among children with thyrotoxicosis the phenomena of anxiety and negative emotional experiences prevailed, thus cognitive activity has appeared below in comparison with those parameters of control group.

3. The further research of emotional expressions and anxiety syndrome in the adolescents with Graves' disease would be required.

**References:**

1. Antonova K. V. Thyrotoxicosis. Changes of mentality. Treatment opportunities//RMJ. – 2006. – Vol.14. – № 13. – P. 14–15.
2. Balabolkin M. I., Klebanova E. M., Kreminskaya V. M. Differential diagnostics and treatment of endocrine diseases: Manual Book. – M.: medicine, 2002. – 752 p.
3. Frigorieva E. A., Pavlova E. ПАВЛОВА Е. А. Depression and thyrotoxicosis//Socialnaya and clinicheskaya psychiatry. – 2010. – № 2. – P. 100–107.
4. Dermanova I. B. A questionnaire for research of anxiety in the senior teenagers and young men (Spilberg Ch. D. Adaptation by Andreeva A. D.)/Diagnostics of emotional –moral development. – SPb., – 2002. P. 75–80.
5. Muratova Sh. T., Ismailov S. I. Influence of Graves' disease on psychic-cognitive state of children and adults (review of the literature)//Mejnarodniy endokrinologichniy journal, Ukraine. – № 6 (70), 2015. – with 86–90.
6. Fadeev V. V. Diseases of the thyroid gland in the regions of mild iodine deficit.
7. Cytko E. V., Korotaev A. V., Naumenko E. P., Kudlacevich S. B. Specific features of vegetative regulation and structural-functional heart parameters in diffusive toxic goiter three months later the thyroidectomy. Problemi zdoroviya I ekologii.-2013.-2 (36). – P. 70–75.
8. Shereshevskiy N. A. Klinical endocrinology. – M., – 1957, 307 p.
9. Cao Y., Liu Z. Factor structure and factorial invariance of the State-Trait Anxiety Inventory for Chinese children and adolescents//Psych J. 2015 Jun; 4 (2): 74–87.
10. Dement M. M., Ozmen B., Deveci A. et al. Depression and anxiety in hyperthyroidism//Arch. Med. Res. 2002. Vol. 33, N 6. P. 552–556.
11. Julian L. J. Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A)//Arthritis Care Res (Hoboken). – 2011. Nov; 63 Suppl 11: S467–72.
12. Kelly S., Hall L. Measuring anxiety in adolescents exposed to community violence: a review, comparison, and analysis of three measures//Issues Ment Health Nurs. 2010 Jan; 31 (1): 28–38.
13. Mignon A., Linkowski P., Van Heeringen C., Dramaix M. Registry of patients with painful symptoms and observation of depression and anxiety.//19th Congress of European college of Neuropsychopharmacology, Paris, France, 16–20. Sep. 2006.
14. Muratova Sh. T., Ismailov S. I. Mental characteristics of teenagers with Graves' disease in Uzbekistan//European science review (Vienna). – № 7–8 (July-August) – 2015. – P. 77–80.
15. Orgil S. M., Spence S. H., Huedo-Medina T. B., Espada J. P. Spanish validation of the Spence Children's Anxiety Scale//Child Psychiatry Hum Dev. 2012 Apr; 43 (2):271–81.
16. Van Wijk C. H. The use of Spielberger's State-Trait Personality Inventory (trait anxiety subscale) with naval subaquatic specialists//Int J. Occup Med Environ Health. 2014. Dec; 27 (6): 959–66.

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**The combined effect of complex mixes of poisons on the organism of white rats in 30-day round-the-clock inhalation and measures of biological prevention**

**Abstract:** The direction of “biological prevention” in the field of hygiene of the environment, which is understood as the complex of measures directed to the increase in resistance of individual person and population to exposure of harmful factors of the industrial and ambient environment, are increasingly being developed over the last years. For biopreventive maintenance only the means are used harmless at long application in preventive effective dosage. In this context in the industrial towns for residents of ecologically unfavourable territories there are used pectin, glutamate, adaptogenes of vegetative origin and additives containing calcium, iodine, iron, cuprum, various vitamins and some aminoacids as bioprotectors.

**Keywords:** environment pollution, poisons, rats, bioprotectors.

Last years the persistent interest has been observed to development of methods of bioprevention of intoxications with various

poisons by method of correction of metabolic processes directed to the lowering of their toxic effect [4].

Detoxicant effect of biologically active substances (BAS) has been attributed to intensification of the processes of biotransformation, endo- and exotoxins in the body consistent with the enhancement of their toxicodynamics, toxicokinetics with increase in effect of body detoxication which results in maximum reduction of the contents of toxic components in the bioenvironment and restoration of homeostasis [9].

It is known, that phenol, formaldehyde and lead are substances of the leading and mostly widespread industrial poisons. Besides they often render summary effect with other pollutants. High toxicity of these components, growth of their manufacture and application require development of methods of bioprevention and their wide introduction in clinical practice [6]. The methods of biopreventive maintenance, as a rule, directed to increase of body resistance to negative influence of pollutants of the industrial environment and potentially adverse factors of human environment in small concentrations and doses.

In a number of experimental works it was shown, that the rationally selected substances with taking into account of peculiarities of toxicological characteristics of poisons, on one side, and pharmacotherapeutic characteristics of BAS, on the other side, favorably influence on kinetics of the poisons in the body weakening their toxic effect and rising the body immunostimulation [1; 2; 3; 5; 7; 8].

**The purpose of researches** was the experimental study of the character of resorptive toxic effect of the mix of phenol, formaldehyde and lead acetate on the bodies of animals and development of the methods of pathogenic prevention of intoxications by correction of the metabolic processes.

**Materials and methods of researches.** The experiment has been carried out on 5 groups of animals (10 rats in each group) with use of inhalation chambers (tab. 1). 1-st group of studied animals during 30 day was exposed to round-the-clock inhalation effect of the mix of phenol, formaldehyde and lead acetate; group II, on a background of inhalation, beginning from the second week received additionally drug hepamal per oz in dose 1 ml per 100 g of body mass of an animal (hepamal — correcting preparation manufactured by joint-stock company "Sorb-Tex», produced on the basis of the species of flowers of *Helichrysum L.*, ginger plant (*Tanacetum vulgare*) and fruits of a dogrose); animals of group III — on a background of inhalation received intragastrally biofenikol in dose 100 mg/kg of body mass (biofenikol — phyto-preparation of the liquorice) group IV additionally received to the daily ration fix of vitamins thiamine (150 mg), calcium carbonate (225 mg) and ascorbic acid (50 mg); group 5 — is control group.

The definition of the contents of phenol, formaldehyde and lead acetate in the air was performed with use of unified method of definition of the atmospheric pollution (Moscow, 1976).

Table 1. – Administration of the real concentrations of the chemical components and correcting preparations during experiment

Animals		Mix components concentration, mg/m <sup>3</sup>						Correcting preparations		
		phenol		formaldehyde		Lead acetate		hepamal 1 ml/100g body mass	biofenikol 100 mg/kg	Vitamin mix
group	quantity	M	±m	M	±m	M	±m			
I	10	1,12	0,15	3,45	0,6	0,1	0,012	–	–	–
II	10	1,13	0,12	3,41	0,75	0,098	0,010	+	–	–
III	10	1,11	0,16	3,48	0,70	0,1	0,013	–	+	–
IV	10	1,12	0,15	3,46	0,62	0,1	0,010	–	–	+
V	10	fresh air								

Toxic effect of a mix of phenol, formaldehyde and lead acetate in the experimental researches was determined as a result of study of the following parameters: the summary-threshold parameter (STP was determined by method of S. V. Speransky in modification of S. M. Pavlenko (Moscow, 1975); sulfhydryl groups (SH-groups) in the blood with use of spectrophotometric method of Kh. N. Rubina and A. A. Romanchuk (Moscow, 1965); activity of cholinesterase (CE) in the whole blood — by method of Chestrin, B. A. Krivoglaz (Leningrad, 1965); activity of alanin — and aspartat aminotransferase (ALAT and AsAT) — by method of E. Reitman and S. Frenkel (Minsk, 1977); activity of enzyme catalase (CAT) — by method of A. N. Bach and S. Z. Subkova (Saratov, 1968); activity of alkaline phosphatase (AP) — by method of Bessey, L. A. Loury, Brock (Minsk, 1976); a level of pyruvic acid (PA) in blood — by modified method of Umbrait (Moscow, 1969); malon dialdehyde (MDA) — by technique of L. I. Abdreeva et al (Moscow, 1988); the contents of leucocytes, erythrocytes and hemoglobin in the peripheral blood — by V. E. Predtechenskiy (Moscow, 1966).

**Results of research and discussion.** 30-day treatment of the rats with fix of phenol, formaldehyde and lead acetate (1,12±0,15; 3,45±0,6 and 0,1±0,012 mg/m<sup>3</sup> — respectively), has resulted in development of subchronic intoxication with a primary lesion of the CNS and liver.

It was revealed, that the effect of high concentration of the given mix, at monthly round-the-clock inhalation exposure caused change of appearance and behavioral status of animals.

In the animals of the I-st group there were observed trouble, excitation, hurried breathing, irritation of mucous membranes of eyes and skin, plentiful salivation. There was noted tarnishing hair and its coming out, in this case the animals became flaccid and inactive. The observable animals suffered from poor appetite, that confirmed by decrease of their body mass. To the end of the treatment in animals of group I the decrease of body weight was registered by more than 26%, in comparison with control group (132 against 278,5g).

On the 10-th day of an exposition in the toxic environment the parameters of the functional condition of the CNS changed sharply in the animals. So, STP in the animals of group 1 was more by 39,8% in comparison with the data of the control. With increase of an exposition, the process of inhibition grew on 20–30 days, accounting 45, 64 and 49,04%, respectively.

It was established, that in the animals who have undergone the round-the-clock exposure to the mix of studied toxic substances, there was developed marked syndrome of endointoxication, confirmed by the increase of a level of medium-sized toxic molecule of the blood serum by 1,85 times (0,13±0,008 against 0,07±0,005 IU in the control, P < 0,001).

Table 2 shows that the exposure to the mix of chemical substances resulted in significant disorders of the metabolic process in the rats of group I, which were expressed in filling of the underoxidized products of the carbohydrate, fatty and protein metabolism.

Enzyme aminotransferase is one of the most important components in the body for maintenance of the interrelation between metabolisms of lipids and carbohydrates, as well as for participation in the amino acid biosynthesis. ALAT and AsAT are the most active in the body of animals.

Table 2. – Dynamic changes of physiologic, biochemical and hematological parameters in rat undergone the round-the-clock inhalation exposure to the mix on the 30-s day of study

№	Parameter	Group of animals				
		I	II	III	IV	V
1.	Body mass, g	132±4,62***	164±4,23	166±5,0	158±3,8**	178,5±5,0
2.	STP, IU	4,50±0,43***	7,50±0,85	7,83±0,43	6,83±0,85*	8,83±0,21
3.	SH-groups, mg%	42,5±3,20***	61,8±5,40	51,8±2,80***	59,3±4,30*	74,8±3,60
4.	Whole blood CE, µg/ml. min	248±11,3***	357±8,95	310±12,7**	335±18,2	374±8,94
5.	ALAT, µmol/l. h.	2,08±0,11***	1,72±0,09**	1,75±0,10**	1,87±0,08**	1,26±0,06
6.	AsAT, µmol/l. h.	2,43±0,12***	1,84±0,15	1,87±0,21	1,93±0,1	1,62±0,08
7.	AP, µmol/l	1,48±0,06***	1,02±0,051	1,14±0,06*	1,23±0,06**	0,85±0,102
8.	PVA, mg%	3,53±0,18**	2,52±0,34	2,48±0,3	3,12±0,15*	2,38±0,24
9.	MDA, µmol/l	3,45±0,16***	2,19±0,05*	2,17±0,04*	2,45±0,08**	1,95±0,06
10.	CAT, IU.	6,02±0,13**	6,94±0,3	6,98±0,35	6,43±0,20	7,34±0,36
11.	Medium-sized toxic molecule, IU,	0,13±0,008***	0,09±0,004*	0,08±0,005	0,085±0,004*	0,07±0,005
12.	Leucocytes, 10 <sup>12</sup> /l	14,25±0,96**	10,3±0,45	9,84±0,24	10,28±0,3	9,54±0,44
13.	Erythrocytes, 10 <sup>9</sup> /l	4,97±0,67***	7,0±0,39	7,2±0,41	6,51±0,38	8,10±0,38
14.	Hemoglobin, %	11,2±0,45**	12,7±0,17	12,4±0,3	12,40±0,5	13,7±0,1

Note: \* –  $P < 0.05$ , \*\* –  $P < 0.01$ , \*\*\* –  $P < 0.001$

Increase in activity of ALAT, AsAT, AP, PA, decrease in activity of CE, SH-groups and rise of the level of molecules of the medium-sized mass indicate about developing marked syndrome of endogenous intoxication and deep disorders of lipid, protein and carbohydrates metabolism.

In parallel with the specified biochemical changes the change of hematological shifts (increase in quantity of leucocytes, decrease in number of erythrocytes and hemoglobin) were found.

As a result of research it was revealed, that, on a background of receiving preparations there was observed change of clinical status, attenuation of the toxic effect of the mix and changes of a number of biochemical and physiological parameters in direction to the data of control group.

The animals of II, III and IV groups receiving correcting preparations, compared with animals of the I-st group, had no so expressed signs of intoxication: the animals were more mobile, did not suffer from the expressed absence of appetite, the loss of body weight did not exceed 8–11% compared to indicators of control group.

At administration to intoxicated animals of the preparations hepamal (group II), biofenikol (group III) and mix of vitamins (group IV) there was observed normalization of the majority of the investigated parameters.

So, the parameter STP in the rats of group I, in comparison with the data of control group, on the 10-th day of experiment decreased by 32.6%, on the 20-d day — by 45.63% and on the 30-th day — by 49.3%; in the rats of group II the decrease achieved 30.7%, 30.5% and 20.7%, respectively; in the rats of group III — falling was by 29.6%, 28.65% and 11.32%; in the rats of group IV — by 29.2%, 22.6% and 22.62%. During carrying out experimental research in the rats of I, II, III and IV group there were no revealed changes of MDA parameters, however, the clear tendency was to its reduction, that indicated about positive metabolic changes in the body. In the rats of groups III and IV the activity of enzymes ALAT, AsAT and AP attenuated. However the observable changes did not reach a level of control group. The results received showed reduction of the intensity of pathological process in the body.

The most expressed changes on a background of hepamal and biofenikol effects were noted in the parameter of free radical oxidation of lipids and antioxidant blood systems that confirmed antioxidant activity of these preparations.

The comparative analysis of the data received in the experimental animals of groups II, III and IV showed, that the most expressed correcting effect was noted in the rats, receiving hepamal; biofenikol was on the 2 place, and the mix of thiamine, calcium carbonate and ascorbic acid — on the third place.

It is known, that many plants, including also into the structure of hepamal, such as dogrose, ginger plant (*Tanacetum vulgare*) and *Helichrysum* L., and also root of licorice (biofenikol) contain great quantity of BAS, having high antioxidant potential and rendering stimulating action on the enzymes of the body detoxicational system. Taking into account more expressed correcting effect of hepamal and biofenikol they may be recommended as means of preventive maintenance at exposure to chemical substances (phenol, formaldehyde, and lead acetate).

#### Conclusions:

1. Aerogenic 30-day exposure of phenol ( $1.12 \pm 0.15 \text{ mg/m}^3$ ), formaldehyde ( $3.45 \pm 0.6 \text{ mg/m}^2$ ) and lead acetate ( $0.1 \pm 0.012 \text{ mg/m}^3$ ) renders negative influence on the rats body. In the animals, beginning from the 10-th day of poisoning, there is noted statistically reliable reduction of physiological, immunological and biochemical characteristics.

2. On a background of intoxication of animals due to a mix of the investigated substances, the administration of hepamal, biofenikol and vitamin mix into the rats' body during 3 weeks renders marked preventive effect. In this case there is noted attenuation of the oxidative metabolism of lipids and blood proteins, parameters of endointoxication that emphasized correcting effect of studied preparations.

3. Hepamal has the most expressed correcting effect; biofenikol occupies the second place, and the mix of thiamine, calcium carbonate and ascorbic acid — on the 3d place.

## References:

1. Akhmadaliev N. O., Ponomareva L. A., Safarov M. B. Increase of body protective properties on the basis of use of natural food additives and flavouring substances. XII International Congress on rehabilitation in medicine and immunorehabilitation. – Pattay, Thailand, 2007. – P. 340.
2. Kadirova D. E., Mirzakarimova M. A. Inhalation effect of tobacco dust on the body of laboratory animals and its correction. *Pharmaceuticheskiy jurnal*. – Tashkent, 2012. – № 3. – P. 75–78.
3. Kasimov A. Kh. et al. Antioxidant efficiency of phytopreparation hepamal at toxic effect of combinations of metals- pollutants of the Ambient area. *Toxikologicheskij vestnik*. – Moscow, 2008, N4: P. 17–21.
4. Katcnelson B. A., Degtareva T. D., Orivalova L. I. Principles of biological prophylaxis of the occupational and ecological pathology due to effect of inorganic substances. Yekaterinburg: EMHЦП and OЗППП, 1999. – 106 p.
5. Korovkin B. F., Debov S. S. Clinical enzymology: problems and ways of development. 5-th All-Union Biochemical Congress: The theses of reports. – M.: Nauka, 1985. – Vol. 1. – P. 78–79.
6. Kulbalieva J. J. The state of integral coefficient SROL-AOS in blood at lead intoxication under effect of biophenikol. *Біофізичні стандарти та інформаційні технології в медицині: Матер. конф.* – Odessa, 2007. – P. 72–76.
7. Mirzakarimova M. A. Changes of biochemical parameters in rats at chronic intoxication with ammonium and their correction. *Actual problems of hygienic science in Uzbekistan: Proceedings*, – Tashkent, 2010, P. – With. 71–76.
8. Khamrakulova M. A. Correcting effect of the dogrose fruits on the state of carbohydrate-energetic metabolism in chronic intoxication, induced by combined effect of various pesticides. *Actual questions of clinical and experimental medicine*. – Minsk, 2000. P. 305–306.
9. Khamrakulova M. A. Effect of biological active substances on the toxicity of pesticide ciperfos. *Problems of hygiene and toxicology in Uzbekistan: Material of research-practical conference*. – Tashkent, 2009. P. 81–84.

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## Structural features of the radial artery at the different ways in their harvesting for use in coronary artery bypass

**Abstract:** According to the study of muscular type artery, radial artery has all inherent in this type of vessel shell. In their different ways of allocating the radial artery revealed that the structural safety of the shells of the radial artery, especially the inner lining depends on the method of their selection. "Skeletonization" leads to disruption of the integrity of the inner shell, especially its endothelial layer, which is the most vulnerable. Deendotelizatsiya inner shell can promote thrombus formation in the graft.

**Keywords:** radial artery, bypass, skeletonization.

The leading factor in the development of various complications in graft is a morphological discrepancy of graft's (vein) wall and artery in anastomosis area Ham, Cormac [3]; Rosws [6]. This led to intensive development and active implementation in practice of coronary surgery techniques total autoarterial bypass. Choices for these operations was the internal thoracic artery.

High prospects noted and in use for coronary artery bypass surgery radiotherapy. This is due to its sufficient length and diameter Vechersky Yu. Yu. et al [1]; Shneider et al. 2004; Laco et al 2001; Tatoulis et al [8]; Wilson et al [10]. In turn, the active use of the radial artery has caused the need to study its morphological features Machur S. E. et al [2]; Wildhirt et al [10].

Of particular interest is the comparative morphological analysis of the radial artery walls with different methods of harvesting.

The most appropriate way to harvesting, preserving the intactness of the major structural components of the arterial wall and, primarily, the intima, provides full value functional of transplant. It largely determines the success of the operation autoarterial bypass. Research, how harvesting ways influence on the morphology of radial artery walls, especially the intima, was not conducted. Not studied the three-dimensional organization of the arterial wall by using a scanning electron microscope.

Noted above, to define the tasks in this section work:

*Post a structural characteristic of radial artery wall at its harvesting without skeletonization. To determine the effect of skeletization on the radial artery wall structure.*

#### Materials and methods

*For light microscopy*, tissue samples were fixed in 10% formalin solution for the phosphate buffer. Paraffin sections were stained with hematoxylin and eosin. Light optical microscope micrographs obtained on Axioscop 40 — ZEISS »conjugate with a digital camera,

*For electron microscopy scanning*, tissue was fixed by 2.5% glutaraldehyde solution, with osmium tetroxide on phosphate buffer, dehydrated in alcohol, acetone, and dried by the method critical point in the device HCP-2, gold was sputtered in the apparatus IB -2 and viewed in an electron microscope Hitachi — S 405. Photographed from Monitor screen with a digital camera Canon.

#### Own research

The walls of the muscular type arteries (the radial artery) three different shell defined. The inner shell — intima which from internal side is covered by endothelial cells.

This is the most specific cells throughout the vascular system, forming it a continuous layer from cavities of the heart to the capil-

laries and veins of all sizes up the vena cava. In some types of capillary endothelium is a single layer of wall forming.

Outside the endothelial layer is bordered by a pronounced plate elastin called the internal elastic membrane, which is part of the inner shell of the artery. In light optical preparations it is defined as a corrugated ring-shaped structure (Fig. 1.2)

The endothelium can be located directly on the internal elastic membrane and to separate it from a layer of fibroblasts, intracellular material, separate smooth muscle cells and isolated connective tissue fibers (Fig. 2).

The basis of the middle shell wall of the radial artery is smooth muscle cells make up, which are arranged helically (Figure 2). Between the smooth muscle myocytes has intercellular substance produced by the myocytes. The boundary between the outer shell is the external elastic membrane. It is in the wall of the radial artery is not expressed as clearly as the internal elastic membrane (Fig. 2).

Scanning electron microscopy shows expressed longitudinal folds of intima. The formed rolls are covered by endothelium, which forms a smooth surface (Fig. 3).

The inner shell is formed by smooth muscle cells, and intertwining with connective tissue fibers.

The outer shell has a large thickness, it turn in circumjacent connective tissue (Fig. 3).

Substantial structural changes in the walls of the radial artery is identified at various ways of their allocation.

When “skeletonization” of the vessel, there are significant changes in the intima as a violation of the integrity of the epithelial layer (Fig. 10). Desquamating of endothelial cells of internal elastic membrane, exposing it. The place has been a violation of the integrity and the membrane itself. “Bare” internal elastic membrane can take place at a considerable her over (Fig. 4).



Figure 1. Skins radial artery walls with severe internal elastic membrane. G. -EYU x10

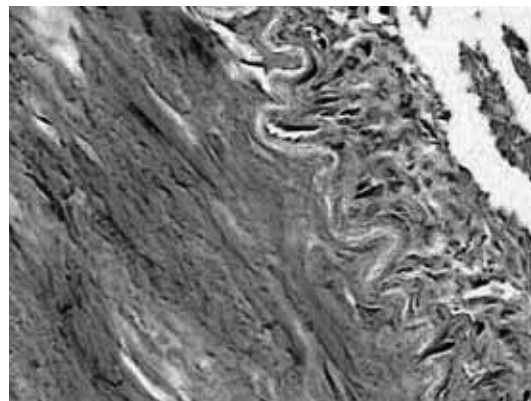


Figure 2. The inner shell and the average radial artery with severe internal elastic membrane. D-E x 1040

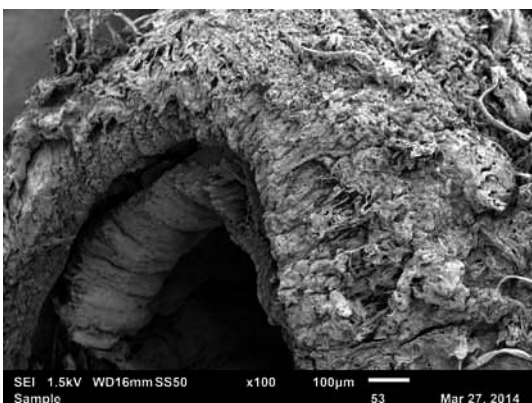


Figure 3. Skins radial artery with severe internal elastic membrane. G. -EYU x 10



Figure 4. Skins radial artery developed severe outer shell with vasa vasorum and lymphatic capillaries. D -E 10 x 10





Figure 5. Skin radial artery developed severe outdoor shell with vasa vasorum and lymphatic capillaries. D — E 10 x 10

When you select the radial artery while preserving the outer shell and its contacts with the surrounding connective tissue, the integrity of the intima and its contact with the inner elastic membrane saved (Fig. 5).

When “skeletonization” has been performed, observed sharp hyperemia of vasa vasorum in the remaining parts of the outer shell (Fig. 6). And in the lumen of blood vessels, usually dominated by pathological forms of red blood cells.

Scanning electron microscopy also shows that “Skeletonization” leads to significant violations of the integrity of the inner shell

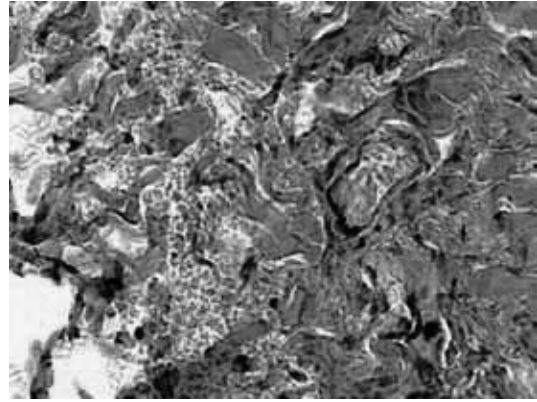


Figure 6. Severe intimal folds developed middle and outer shell. SEM x 100.

(Fig. 7), as well as to a breach of contact of the outer shell with the average. On the inner damaged surface marked accumulation of lipid granules and erythrocytes (Fig. 8). In some places there is a marked desquamation of the endothelial lining.

Deendothelized of part expose the internal elastic membrane. In the nude areas seen that the inner elastic membrane is composed their dense network of thin interwoven fibers (Fig. 9).

On the surface often located deendothelized lipid granules of different size, and homogeneous masses of erythrocytes (Fig. 9). Along with thin fibrils intertwined meet their larger bundles (Fig. 10).

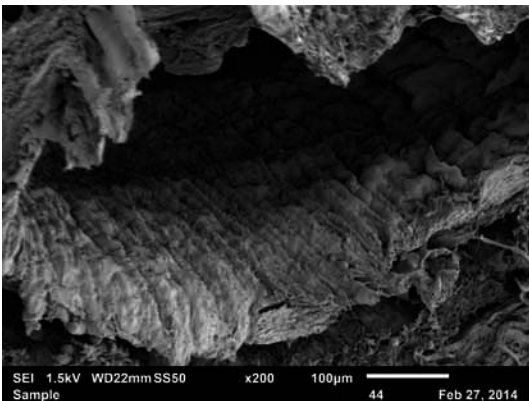


Figure 7. Severe intimal folds developed middle and outer shell. SEM x 100.

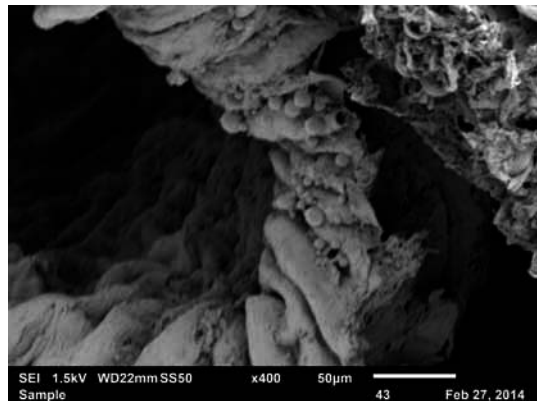


Figure 8. Severe intimal folds developed middle and outer shell. SEM x 100.

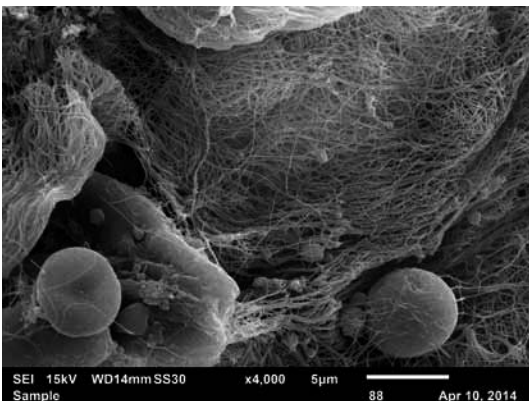


Figure 9. Severe intimal folds developed middle and outer shell. SEM x 100.

In cardiovascular surgery for coronary artery bypass grafting on to the most wide used autovenous shunts. However, venous shunts do not always ensure the stability of the late results of coronary artery bypass surgery. An alternative to venous conduits

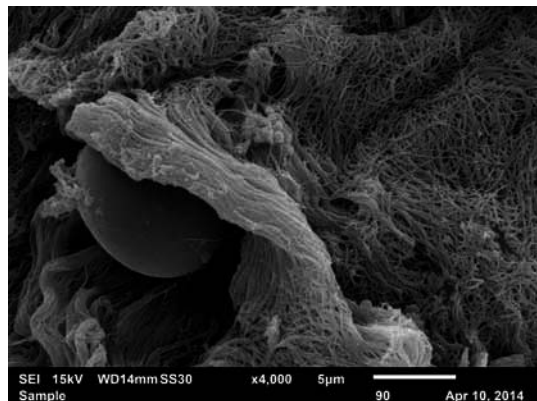


Figure 10. Defects in the intima. “Skeletonization” radial artery at its harvesting. T-E 10 x 10.

autoarterial are jesters. The most commonly used autoarterial conduit for coronary artery bypass surgery are internal thoracic and radial arteries. The latter has become the object of choice for such operations by the structure of the vascular wall, the lumen di-



ameter, comparable with the coronary arteries, a sufficient length and resistance to pressure, the relative ease of isolation, a good postoperative results [1].

Studies have shown that as the muscular artery, radial artery has all inherent in this type of vessel shell. Since the coronary arteries, also referred to as the arteries of muscular type Ham, Koprak [3], Ross [7] morphologically justified the use of the radial artery for coronary artery bypass grafting. Besides these basic morphometric parameters coincide vessels Mamchur S. E., et al [2].

Comparative studies of the radial artery at various ways of their allocation showed that the structural safety of the shells of the radial artery, especially the inner lining depends on the method of their selection.

“Skeletonization” leads to disruption of the integrity of the inner shell, it is especially the endothelial layer, which is the most vulnerable. Deendothelization of inner shell can promote thrombus formation in the graft.

#### References:

1. Vechersky Y. Y., Dndreev S. L., Zatolokin V. V., comparative study of the functioning of various autoarterial and venous grafts according shuntography after isolated GABG. Siberian Medical Journal (Tomsk). – 2010. – № 4, no. 1. – S. 43–49.
2. Mamchur S. E., Vechersky Y. Y., Mikhail Fadeev. The morphology of the internal thoracic and radial arteries in patients undergoing coronary artery bypass grafting//Bul. Sib. medicin. – 2004. – № 2. – S. 85–89.
3. Ham A., Cormac D. Gtistologiya. Cardiovascular system. – 1983. 4 P. 6–48.
4. Schneider J. A., Tolkachev V. V., Jorin S. P. Revascularization by using the radial artery//Herald surgery. – 2004. P. 14–18.
5. Iaco A. L., Teodori G., Di Giammarco G. Radial artery for myocardial revascularization: long-term clinical and angiographic results//Ann. Thorac. Surg. – 2001. – Vol. 72. – P. 464–468.
6. Rosai J. Ackerman's surgical Pathology 9th ed. V. II, Cardio vascular system. 2003. – P. 2173–2226.
7. Ross M. H., Romrell L. J., Kaye G. I., Histology a text and atlas. Cardiovascular system 4th ed., – 2003, – M. I. P. 302 – 329; 438.
8. Tatoulis J., Buxton B., Fuller J. Patencies of 2127 arterial to coronary conduits over 15 years//Ann. Thorac. Surg. – 2004. – Vol. 77. – P. 87–92.
9. Wildhirt S. M., Voss B., Von Canal F. et al. Graft function, histopathology and morphometry of radial arteries used as conduits for myocardial revascularization in patients beyond age 70//Eur. J. Cardio-thoracic Surg. – 2006. – Vol. 30. – P. 333–340.
10. Wilson J. M., Ferguson J. J., Hall R. J. Coronary artery bypass surgery and percutaneous coronary revascularization: impact on morbidity and mortality in patients with coronary artery disease//Cardiovascular Medicine. – NY: Springer, 2007. – P. 1073–1112.

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## Efficiency in phytotherapy endogenous intoxication syndrome in pregnant women with infectious risk

**Abstract:** To evaluate the dynamics of changes of lipid peroxidation (LPO) and antioxidant activity in the peripheral blood, the level of endogenous intoxication in pregnant women with infectious risk in depending on the reception phytocombination. To study the parameters of endogenous intoxication are a predictor of condition assessment and the course of pregnancy in infection risk. The inclusion of herbal tea in a comprehensive prevention and treatment promotes faster the removal of endogenous intoxication of 96.4% and a decrease in complications by 82.1% in pregnant women with infectious risk.

**Keywords:** phytocombination, pregnant women, infectious risk.

Prevention and treatment of infectious complications of the urogenital tract in pregnant women remains an urgent problem researchers in the basic sciences and clinical doctors of various specialties [2; 6]. Despite significant advances in diagnosis and treatment of urogenital infections, their frequency has a strong tendency to increase, presenting a danger, both for the mother and fetus [1; 5]. In recent decades, a steady trend worldwide increasing incidence of infections transmitted mainly through sexual contact, the dominance of surgical abortion method of production, the growth of extragenital infection focal diseases of inflammatory etiology that reduce the body's immunoresistance and irrational use of antimicrobial agents contributed to a significant increase in the prevalence of infectious diseases and dysbiotic genitalia in the female population [1; 3].

One notable vectors medicine of the 21<sup>st</sup> century is no medicalization treatment process, avoiding polypharmacy in general and on the

prevalence of synthetic substances in the therapeutic arsenal of doctors all specialties. Deciphering the human genome has given significant reason for denying a large part (80%) “is traditionally appointed by” drugs, as irrefutable evidence of their inefficiency were obtained [5]. Given the increasing antibiotic resistance, increasingly attempts to move away from the use of antibiotics, even in cases of non-severe forms of lower urinary tract infection [4; 5]. Rational use of the algorithm of medical possibilities formulated Hippocrates: “For a man of healing, there are three things: first — floor, second — the grass, the third — the knife” [5; 7]. Studies demonstrating non-ideal treatment by synthetic means in comparison with the quite effective and quite safe herbal remedies, once again confirms that it is not necessary to “reinvent the wheel” if nature has created all the necessary [4; 5].

In recent years, an important role in the pathogenesis of many infectious complications during pregnancy given to system-

ic inflammatory response syndrome, metabolic disorders in the body of the mother [3; 8]. On the other hand central to the pathogenesis of many disease processes, including obstetric pathology, is a disorder of redox processes involving violation of the biological barrier of cell membranes and activation of free radical oxidation reactions. Changes in the activity of this process leads to disruption of cell function and, consequently, to develop a pathology [2; 10], which lead in particular to the endogenous toxicity [5; 9]. Based on the above relevant in terms of assessment of the state and the course of pregnancy, as well as the selection of evidence-based diagnosis and treatment is the study of endogenous intoxication in pregnant women infection risk, as well as the development of therapeutic and preventive measures based on herbal remedies.

**Objective.** To evaluate the dynamics of changes of lipid peroxidation (LPO) and antioxidant activity in the peripheral blood, the level of endogenous intoxication in pregnant women with infectious risk in depending on the reception phytocombination.

**Material and methods.** The study included 68 pregnant women the group infection risk between the ages of 18 to 35 years, 23 (33.8%) were the first pregnancy and nulliparous, in 45 (61.2%) had two or more pregnancies. All patients were informed about the purpose of the study and signed a written voluntary informed consent before participation. The groups were matched by age, according to the somatic and obstetric and gynecological history. The criteria for inclusion in the main group were pregnant woman's consent for the study, the presence of urogenital infections, clinical medical history of vaginitis, gestational pyelonephritis, the threat of termination of pregnancy during the entire period of gestation, the presence of polyhydramnios during this pregnancy, pregnant, miscarriage and premature labor infectious genesis in the history of gestation 32–40 weeks. Pregnant divided into 3 groups: I of the group — the main (the  $n = 28$ ) and II group — the comparison (the  $n = 20$ ), III of the group — control (the  $n = 20$ ) with physiological pregnancy. Pregnant core group phytocombination reception (he was appointed for the prevention of infectious complications and improve antioxidant defenses and decreasing endogenous intoxication the  $n = 28$ ), in a comparison group of pregnant phytocombination did not use (the  $n = 20$ ). A survey of all pregnant women included an assessment of the traditional clinical and laboratory parameters, microbiological research by bacteriological, ultrasonic scanning system mother-placenta-fetus and kidneys. All surveyed pregnant core group determined viral and bacterial infection. In order to evaluate the endogenous intoxication caused by the breach of peroxide lipid peroxidation (LPO) using the following biochemical parameters: the content of secondary product of lipid peroxidation — malondialdehyde (MDA), by which you can judge the intensity of peroxide processes, the activity of the antioxidant enzyme catalase (CA), the contents of the average mass of molecules ( $IMS_{280}$ ,  $IMS_{254}$ ), ratio of MDA/CA — POL shift measure prooxidant or antioxidant side and  $MSM_{280}/MCM_{254}$  — resistance protein ratio (AFB), which indicates a decrease of protein conversion to a degraded form. In plasma, venous blood was measured markers of endogenous intoxication —  $IMS_{280}$  and  $IMS_{254}$  method Gabrielyan and V.I. Lipatova, MDA method S. G. Konyukhova, SC method M. A. Koroljuk et al. Calculate the ratio of MDA/CA and KUB. Following the approval of the ethics committee and informed consent of pregnant core group for the purpose of treatment and prevention of inflammatory complications included phytocombination consist-

ing of above-ground parts of the plant *Codonopsis Lanceolatae* [6; 10] and *Pimpinella anisum* of L. [6; 9] in the component ratio by weight of 9:1 as the selected medicinal plants possess strong antibacterial, antioxidant, immunomodulatory properties, stimulates protein synthesis, cell growth processes, and other properties. 5 grams collection brewed a thermos and take 200 ml 5–6 times a day for 30 minutes before meals for up to 5 days. Statistical processing of the data was performed using Student's coefficient at  $P > 0.95$ .

**Results of the study.** Analysis of the results showed that in pregnant women the main group MDA content increased 1.6-fold ( $5,84 \pm 0,36$ ) compared with the control group, which indicates that the intensification of free radical oxidation of the destabilization of the membrane structures of cells in the background reducing enzyme SC  $0,31 \pm 0,02$  ( $p < 0.001$ ) at 2.9 times the ratio of MDA/CA in pregnant women compared to the control group increased 4.8 times  $18,84 \pm 1,14$  ( $p < 0.001$ ), which also pointed to significant activation of free radical oxidation in pregnant group infectious risk, there is an accumulation in the blood plasma of MSM: MSM content  $_{254}$  increases 2 times  $0,44 \pm 0,04$  ( $p < 0.001$ ), and  $MSM_{280} - 0,42 \pm 0,03$  1,6 times compared to the control ( $p < 0.001$ ), which indicates the degree of degradation of protein molecules. This KUB reduced 1.3 times  $0,92 \pm 0,06$  ( $p < 0.001$ ). As a result of the activation of lipid peroxidation and accumulation of free radicals is a violation of the structural and functional integrity of the cell membrane, the release of lysosomal enzymes that ultimately leads to pathological processes in the cell and the organism as a whole. Thus, in pregnant women at risk of infection occurs the development of endogenous intoxication syndrome, i. e. against the background of activation of free radical oxidation of accumulation in the plasma hydrophilic endotoxemia markers — MSM and most distinctive parameters of endogenous intoxication can be used in the assessment of pregnant women with the infection risk. On the other hand, the above necessitates the inclusion in a complex of therapeutic and preventive measures phytocombination appointment, leading to inhibition of lipid peroxidation reactions, increase antioxidant status and decrease in plasma endotoxemia hydrophilic components.

Revealed differences in terms of endogenous intoxication in pregnant women with infection risk compared with normal pregnancy during treatment and preventive measures: MDA in the application of herbal tea decreased by 1.5 times; catalase increased 2.8 times;  $MSM_{254}$  decreased by 1.76 times;  $MSM_{280}$  after taking herbal tea decreased by 1.9 times, KUB increased 1.31 times; the ratio of MDA/catalase after decreased 4.34 times. Thus, the prevention and treatment of infectious complications in pregnant women at risk of infection in the use of herbal tea, leads to normalization of endotoxemia markers, which has antioxidant and detoxication properties and more rapid normalization of these indicators.

Thus, the inclusion of herbal tea in the range of therapeutic and preventive measures facilitates a more rapid (3–5 days) the removal of endogenous intoxication in pregnant women with infectious risk slowing down the process of lipid peroxidation and improve antioxidant protection indicators

**Conclusions.** 1. To study the parameters of endogenous intoxication are a predictor of condition assessment and the course of pregnancy in infection risk. 2. The inclusion of herbal tea in a comprehensive prevention and treatment promotes faster (3–5 days) the removal of endogenous intoxication of 96.4% and a decrease in complications by 82.1% in pregnant women with infectious risk.

## References:

1. Ветров В. В., Пестряева Л. А. Значение синдрома эндогенной интоксикации в патогенезе гестоза // Эфферентная терапия. – 2005. – Т. 11. – №. 3. – С. 3–9.

2. Кан Н.Е., Сироткина Е.А., Тютюнник В.Л., Высоких М.Ю., Курчакова Т.А., Володина М.А., Тарасова Н.В., Пятаева С.В. Особенности антиоксидантной защиты беременных в системе «мать-плацента-плод» при внутриутробной инфекции // Акуш. и гинекол. 2016, – № 1, С. 40–46.
3. Ломова Н.А., Ораджоникидзе Н.В., Ванько Л.В. Синдром системного воспалительного ответа и беременность (обзор литературы) // Акушерство и гинекология. – 2012. – №. 1. – С. 23–27.
4. Радзинский В.Е. и др. Treating imbalances of vaginal microbiota: are we standing in place or going forward? // Reproductive Endocrinology. – 2014. – №. 18. – С. 92–100.
5. Радзинский В.Е., Симоновская Х.Ю. Фитотерапия в акушерстве и гинекологии. Новый век – новая идеология. Концепция фитониринга как этап развития фитотерапии. Информационный бюллетень. – Изд. 2-е, испр. и доп. – М.: Редакция журнала Status Praesens, 2015. – 16 с.
6. Al-Bayati F.A. Synergistic antibacterial activity between *Thymus vulgaris* and *Pimpinella anisum* essential oils and methanol extracts // Journal of ethnopharmacology. – 2008. – Т. 116. – №. 3. – С. 403–406.
7. Bin Q.I.U. et al. GC-MS Analysis and Antimicrobial Activity of Essential Oils from the Fresh and Dried Roots of *Codonopsis cordifolioidea* // Natural Product Research & Development. – 2010. – Т. 22. – №. 3.
8. Chang-Seon Yoo, Sung-Jin Kim Methanol Extract of *Codonopsis pilosula* Inhibits Inducible Nitric Oxide Synthase and Protein Oxidation in Lipopolysaccharide-Stimulated Raw Cells // Tropical Journal of Pharmaceutical Research October – 2013; 12 (5): 705–710.
9. Kim N.Y. et al. Analysis of chemical composition and antioxidant activity of *Codonopsis lanceolata* skin // Journal of the Korean Society of Food Science and Nutrition. – 2010. – Т. 39. – №. 11. – С. 1627–1633.
10. Kosalec I. et al. Antifungal activity of fluid extract and essential oil from anise fruits (*Pimpinella anisum* L., Apiaceae) // Acta pharmaceutica-zagreb. – 2005. – Т. 55 – №. 4. – С. 377.

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## Callus distraction for congenital fourth brachymetatarsia

**Abstract:** 22 metatarsal lengthening procedures by callus distraction using mini-fixator were performed in 15 patients with congenital fourth brachymetatarsia. The mean age at the time of the surgery was 16.3 years (range, 11–28 years). The mean duration of follow-up was 1.3 years (range, 6 months–2.0 years). The bones were lengthened at a rate of 1.0 mm/day by a mean of 17.8mm (range, 11–22 mm), which was 37.7% of their original length (range, 33.3–53.6%). The mean healing index was 52.8 days/cm (range, 39–68.7 days/cm). In all cases we achieved the restoration of metatarsal parabola, most patients satisfied with the result of surgery. The evaluation according to AOFAS score was excellent in 20 cases and good in 2 cases. The most common complication was stiffness of the metatarsophalangeal joint (5) and hypertrophic scarring (2), premature consolidation (1) and dislocation of finger (1). Distraction osteogenesis for fourth brachymetatarsia can give satisfactory cosmetic and functional results. Most complications can be treated effectively and successfully even though additional surgery may be warranted.

**Keywords:** brachymetatarsia, Callus distraction, external fixator, complication.

### Introduction

Congenital brachymetatarsia is an abnormal shortness of the metatarsal bones due to a premature closure of the epiphyseal plate. It may be congenital, post-traumatic, or iatrogenic, or the disease can be associated with such systematic diseases [2–7]. This condition affects one, usually the fourth, or more metatarsals, unilaterally or bilaterally [1–11]. Compliments of patient are the dorsally displacement of digit, metatarsalgia, shoe irritation, tyloma formation and deformation of adjacent fingers (hallux valgus, varus of fifth finger) [2; 4; 5; 6]. The main option of surgical correction is restoration of metatarsal and finger parabola.

Two surgical methods: one-stage lengthening or distraction osteogenesis is widely used. Each method has its own advantages and disadvantages. The advantages of one-stage lengthening include a shorter period of bony union, better patient compliance, and less scar formation. However, this method has the disadvantages of donor site morbidity, neurovascular impairment, and smaller length gain. The advantages of distraction osteogenesis include: no need for

bone grafting, easier tendon stretching, fewer neurovascular complications, early weight bearing, and a larger length gain, whereas disadvantages include stiffness or subluxation of the metatarsophalangeal (MTP) joint, cavus or angulation deformity, pin tract infection, and a longer period of bony union [1; 3; 7; 9].

The purpose of this study was to review the results of treatment 15 patients with congenital fourth brachymetatarsia, for whom a total of 22 gradual lengthening procedures were performed by callus distraction using external fixator which was designed by the author.

### Patients and methods

Between 2013 and 2016 at Scientific Research Institute of traumatology and orthopedics, Tashkent, Uzbekistan, 14 girls and one boy underwent 22 fourth metatarsal lengthening procedures by callus distraction. The mean age at the time of the surgery was 16.3 years (range, 11–28 years). The mean duration of follow-up was 1.3 years (range, 6 months–2.0 years). All the patients complained of finger shortening and the cock-up deformity, pain on walking, 4 patients had hallux valgus. 5 patient had bilateral, 5 –left sided and

5-right sided brachymetatarsia. 1 patient underwent bilateral fourth metatarsal lengthening, the others — one-side by turns.

#### Operative technique

Under tourniquet hemostasis, a linear longitudinal incision was made on the dorsum of the fourth metatarsal. The extensor tendons were retracted and the metatarsal was exposed. After drill holes were made, four pins with 3mm diameter shafts were inserted in line, perpendicular to long axis of the metatarsal. Two proximal pins were inserted to the proximal metaphysis of the metatarsal, and two distal pins to the distal metaphysis of the metatarsal. The periosteum was longitudinally incised and carefully stripped. A transverse osteotomy between the second and third pins was made using an osteotom. The external fixator was attached. Metatarsophalangeal joint fixated with Kirschner wire transarticularly. The periosteum and skin were sutured. Elongation of the extensor tendon was performed in cases, where metatarsal shortening exceed 20 mm. After 5 days, callus distraction was started at a rate of 1 mm/day. The patients performed distraction by themselves as outpatients. Full weight bearing was allowed after restoration of metatarsal and toe tip parabola. K-wire removed after 2 weeks restoration. Radiographs were checked every other week to inspect the degree of osteogenesis and joint condition. When bone consolidation was confirmed by radiographs, the fixator was removed.

#### Results

We evaluated fourth metatarsal lengths, lengthening gains and treatment period (day), lengthening index, and ranges of motion of first MTP joints. We defined stiffness as being restriction of MTP joint motion to  $<30^\circ$ . The outcome was assessed clinically according to the American Orthopedic Foot and Ankle Society (AOFAS) hallux scale and graded as excellent ( $>85$ ), good (71–85), fair (56–70), or poor ( $<56$ ).

Bone consolidation was completed in all cases. Non-union and neurovascular complications were not observed in any of the patients. The metatarsal bones were lengthened by mean of 17.8mm (range, 11–22 mm), which was 37.7% of their original length (range, 33.3–53.6%). The mean healing index was 52.8 days/cm (range, 39–68.7 days/cm). In all cases we achieved the restoration of metatarsal parabola, most patients satisfied with the result of surgery. The evaluation according to AOFAS score was excellent in 20 cases and good in 2 cases. At early postoperative t follow-up (3 month),

5 patients had stiffness of the metatarsophalangeal joint. Joint stiffness was gradually resolved after the physiotherapeutic procedures. 2 patients complained to hypertrophic scarring. Dislocation of the metatarsophalangeal joint was observed in one case in which inadequate transarticular fixation with K-wire were performed. We recommend fixating the phalanx to metatarsal with K-wire at least to 10mm. Because, in congenital brachymetatarsia the head of metatarsal is osteoporotic, and it cannot fixate adequately. But patient refused of surgical treatment of dislocation. Premature consolidation occurred in one patient, because of wrong rate distraction. We performed reosteotomy and continued distraction. No pin-tract infection, angular deformation, non-union revealed.

#### Discussion

The main advantages of gradual lengthening by callus distraction are that there is no need for bone grafting, there are fewer neurovascular complications, and there is the capability of early weight bearing. The principal problems in metatarsal lengthening by callus distraction are joint stiffness and subluxation of the metatarsophalangeal joint [3–11]. These are considered to be due to the resistance of tendons and adjacent connections such as the transverse metatarsal ligament, flexor sheath, and other soft tissue structures. Masada et al. [7] and Takakura et al. [9] reported that the amount of lengthening should not exceed 40% of the original length in order to prevent joint stiffness and subluxation. Elongation of the tendon or temporal metatarsophalangeal joint fixation with Kirschner wire has also been recommended [6, 11]. In 10 of our 22 metatarsal lengthening procedures, the amount of lengthening exceeded 40% of the original length. In one case occurred the metatarsophalangeal joint dislocated due to inadequate transarticular fixation with K-wire. Our distraction rate was also 1.0 mm/day, and joint stiffness were observed in 5 cases. We recommend elongation of extensors if the shortening of metatarsal exceeds 20 mm. Although these problems were gradually resolved in our series. All our major complications (dislocation and premature consolidation) were associated with technical operative and post-operative managements.

Distraction osteogenesis for fourth brachymetatarsia can give satisfactory cosmetic and functional results. Most complications can be treated effectively and successfully even though additional surgery may be warranted.



Fig. 1. Pre-operative photographs and AP radiograph of a 14-year-old girl with brachymetatarsia of the 4<sup>th</sup> metatarsal of the right foot



Fig. 2. Photographs and radiographs of the right foot with external fixator and K-wire. K-wire fixates the metatarsal for more than 10 mm.

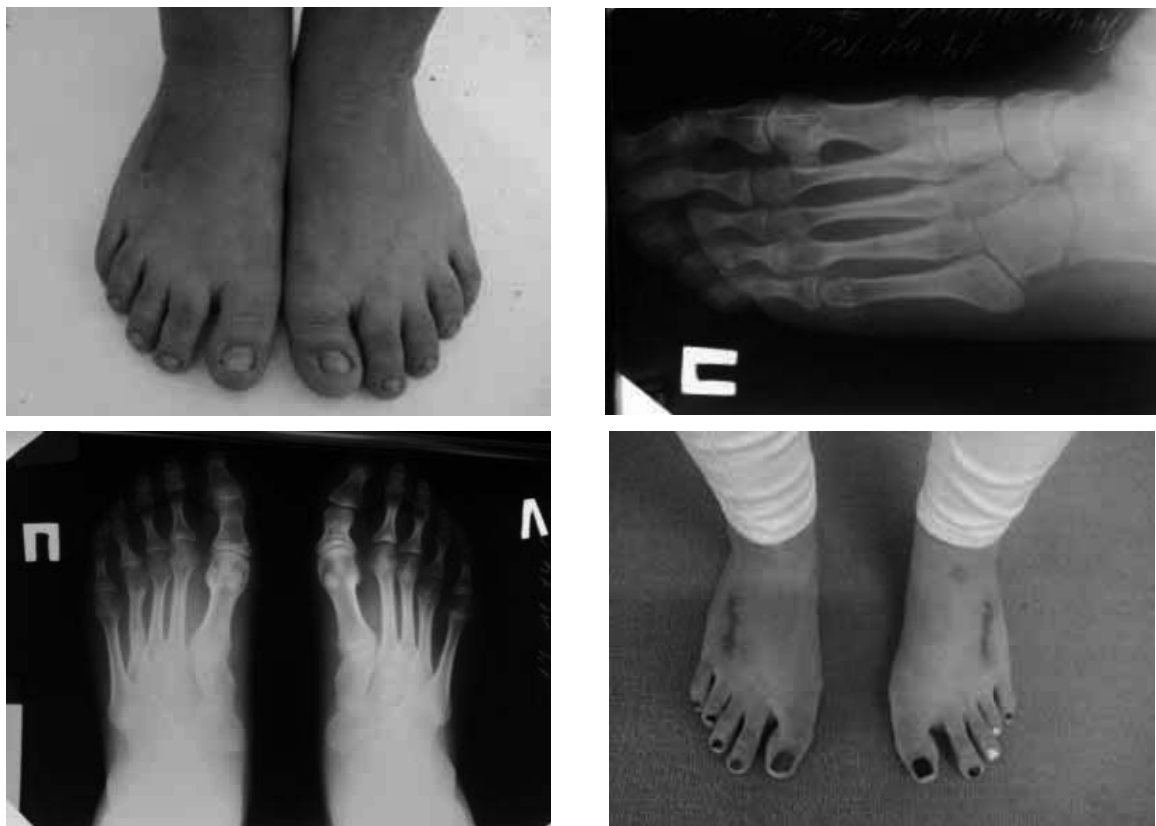


Fig. 3. Post-operative (18 month) photographs and radiographs

Post-operative (6 month) photograph of a 14-year-old girl with bilateral brachymetatarsia of the 4<sup>th</sup> metatarsals complicated with

hypertrophic scarring.

## References:

1. Baek G. H., Chung M. S. The treatment of congenital brachymetatarsia by one-stage lengthening. *J Bone Joint Surg Br.* 1998; 80: 1040–1044.
2. Bartolomei F. J. Surgical correction of brachymetatarsia. *J. Am Podiatr Med Assoc.* 1990; 80: 76–82.
3. Choi I. H., Chung M. S., Baek G. H., et al. Metatarsal lengthening in congenital brachymetatarsia: one stage lengthening versus lengthening by callotaxis. *J. Pediatr Orthop.* 1999; 19: 660–664.
4. Fox I. M. Treatment of brachymetatarsia by the callus distraction. *J. Foot Surg* 1998; 37: 391–395.
5. Kim H. T., Lee S. H., Yoo C. I., Kang J. H., Suh J. T. The management of brachymetatarsia. *J. Bone Joint Surg Br.* 2003 Jul; 85 (5): 683–90.
6. Magnan B., Bragantini A., Regis D., Bartolozzi P. Metatarsal lengthening by callotaxis during the growth phase. *J. Bone Joint Surg Br* 1995; 77: 602–607.
7. Masada K., Fujita S., Fuji T., et al. Complications following metatarsal lengthening by callus distraction for brachymetatarsia. *J. Pediatr Orthop.* 1999; 19: 394–397.
8. Scher D. M., Blyakher A., Krantzow M. A modified surgical technique for lengthening of a metatarsal using an external fixator HSSJ (2010) 6: 235–239.
9. Takakura Y., Tanaka Y., Fujii T., Tamai S. Lengthening of short great toes by callus distraction. *J. Bone Joint Surg Br* 1997; 79 B: 955–958.
10. Urano Y., Kobayashi A. Bone lengthening for shortness of the fourth toe. *J. Bone Joint Surg Am.* 1978; 60:91 Y 93.
11. Wada A., Bensahel H., Takamura K., Fukii T., Yanagida H., Nakamura T. Metatarsal lengthening by callus distraction for brachymetatarsia. *J. Pediatr Orthop B* 2004; 13:206–210.

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## Conservative treatment and rehabilitation of the patients with occlusive disease of femoropopliteal segment

**Abstract:** 48 patients who underwent reconstructive surgery in the femoral-popliteal-tibial segment are divided into 2 groups were under the watchful and received a course of rehabilitation therapy and have not received this treatment. After 2 years it noted that in one group the number of positive results for the treatment of above 45%, and the mortality rate is 25% lower than in group 2.

**Keywords:** antithrombotic prophylaxis, femoral-popliteal-tibial segment, rehabilitation, medical therapy.

**The relevance of the research.** The main site of localization of occlusive arterial lesions, leading to the loss of a limb, is the femoropopliteal segment — shin [1, 5–9; 2, 137–138; 4, 113; 5, 41–44]. Surgical treatment of such patients gives better results than conservative therapy. Nevertheless, conservative therapy is an essential complement to the adequate treatment of patients with obliterating vascular disorders of the lower limbs in the preoperative and in the postoperative period.

The debate continues on the choice of a rational conservative therapy and optimal antithrombotic prophylaxis in the complex postoperative rehabilitation of patients after revascularization of the limb [3, 118–120; 6, 204; 7, 80–82].

**Purpose of the study.** Improved results of treatment of patients with occlusive-stenotic lesions in the infrainguinal segment targeted by antithrombotic prophylaxis and full rehabilitation of patients.

**Materials and methods of research.** We studied the role of the clinical examination of patients discharged from hospital after proximal femoral-popliteal bypass grafting, through a comparative analysis of two groups of patients in terms of mortality and the number of amputations, depending on the quality of post-operative rehabilitation and dispensary observation.

The first group included 26 patients who were successfully operated in the vascular suit. All patients in this group shortly after surgery were under outpatient observation of angiosurgeon. After 0.5, 1, 2 and 3 years, the patients were examined, including the ul-

trasound investigation, and haemorrheology indicators, lipid and carbohydrate spectrum. Twice a year, the patient went through a course of conservative therapy.

Basic principles of treatment of lower limb ischemia were as follows: 1. Correction of risk factors:

- a) cessation of smoking,
- b) strict control of plasma lipid levels,
- c) control of blood pressure,
- d) therapy, which reduces the level of lipids.

2. Exercise and training:

- a) a special program of training,
- b) walking on 45–60 min 3 times per week (12 weeks),
- c) adding 6.5 min training walk every 6 months (before the pain).

3. Drug therapy:

a) intravenous infusion of reosorbilakt, latran, tivortin 10 days, twice a year. Subsequently, in the outpatient setting, patients received aspirin (100 mg per day) for two months, then along with aspirin sequentially sulodexide 250 LU twice a day for two months;

Further, in a month,

b) inhibitors of fosfodiesterases- cilostazol 100 mg per day for a month.

c) physiotherapy — massage of the lower limbs, applications with paraffin wax (ozokerite) to pelvis and thigh.

The second group (control) consisted of 22 patients who, after discharge from the hospital for various reasons (mostly nonresident)

in angio surgeon, were observed. 10 people did not receive any medical treatment, others did not regularly take aspirin. No rehabilitation was carried out to patients. By type of reconstructive surgery, and the original state at the time of hospital discharge, patients in both groups were comparable.

After 2 years, two patients from the first group of patients in 1 and 1.5 year went through reconstructive preventive intervention on the previously operated limbs due to stenosis in the zone of the distal vascular anastomosis. 5 patients within 2 years after a femoropopliteal bypass were performed surgery on the coronary arteries (2 — LAD stenting, 3 — aortocoronary bypass). One patient in 3 months after surgery underwent amputation at the thigh. Result of treatment: good — at 31.0%, satisfactory — at 50.0%, unsatisfactory — at 19.0% of patients. Mortality in the group was 10.0%.

In the second group, three patients underwent through amputation (2 — at the level of the hip, 1 — at the level of the lower leg). In general, the result of treatment in the group rated as good — at 11.0%, satisfactory — at 25.0% and unsatisfactory — at 64.0%. Mortality in the group amounted to 40.0%. The main cause of deaths in both groups were acute myocardial infarction (65%) and stroke (20%). Thus, in patients who have not received systematic monitoring and therapy, a positive outcome of the treatment after 2 years was produced only in 36.0% of patients. Meanwhile, in the group of

patients who were under medical supervision with adequate anti-thrombotic prophylaxis managed 2 years after femoropopliteal bypass got 45% increase in the number of positive results of treatment and 25% reduction in mortality compared to the control group. The findings confirm the need for a full and active postoperative rehabilitation of follow-up of patients after surgical revascularization of the lower limbs straight.

**Conclusions.** The leading role in the dispensary observation belongs to vascular surgeon who determines the tactics of the patient. It should be emphasized the need for timely detection and correction of lesions of coronary and brachiocephalic vessels, given that this comorbidity is the main reason of mortality (90.0%).

Thus, in the late postoperative period for the prolongation of functioning grafts full antithrombotic prophylaxis and timely preventive repeated reconstructive surgeries are needed. And in order to increase the life expectancy of patients after successful revascularization of the lower limbs, an early detection and surgical correction in the first place, coronary and cerebrovascular disease is needed. Rational drug therapy combined with conventional rehabilitation patients is necessary constantly.

Active follow-up for 2 years after femoropopliteal bypass allowed to increase by 45% the number of positive results of treatment and 25% reduction in mortality.

#### References:

1. Bokeria L. A. et al. Actual problems of surgical treatment of patients with critical limb ischemia –solutions (state the problem). //Annals of surgery. – № 1. – 2011. – P. 5–9.
2. Bokeria L. A. et al. The role of the rehabilitation of patients with atherothrombotic lesions of the lower extremities in an outpatient setting //Proceedings of the eleventh scientific conference outpatient surgeons Moscow and Moscow region, 2010. – P. 137–138.
3. Diveev V. A. et al. Correction of endothelial function in the complex treatment of patients with atherothrombotic lesions of the lower extremities //Proceedings of the eleventh scientific conference in Moscow clinics and surgeons Moscow region. – 2010. – P. 118–120.
4. Kovalenko V. I. et al. Comparative evaluation of the transplant in the femoropopliteal bypass surgery in patients with critical lower limb ischemia //Proceedings of the Seventeenth Congress of the All-Russia cardiovascular surgeons. – Moscow. – 2011. – P. 113.
5. Kalitko I. M. Repeated reconstructive surgery occlusion in femoropopliteal segment //Annals hirurgii. – 2011. – № 3. – P. 41–44.
6. Klimovich L. G. et al. The differentiated approach to the correction of hemostasis in patients with critical lower limb ischemia. //Proceedings of the Seventeenth All-Russia congress of cardiovascular surgeons. – Moscow. – 2011. – P. 204.
7. Rasulov U. A. Surgical treatment of lower limb ischemia. – Tashkent: “TURON-IQBOL”, 2016. – 192 p.

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## Differential diagnostics of the abnormalities of ureter-vesical segment development in children

**Abstract:** In case of suspicion of ureter-vesical abnormality it is recommended to use ultra-sound diagnostics, transformation echopyeloscopia with diuretic load, impulse-wave Doppler-metering of uretral emission, excretory urography with catheterization of bladder for the time of the test, roentgenocinematography, hydro dilatation and prophylo-metering, which provide differentiation of the kinds of the pathology impairments in children.

**Keywords:** children, abnormality of ureter-vesical segment, differential diagnostic.

According to some authors' opinion majority of children with non-reflux form mega ureter widening disappears after some time and does not demand surgical treatment. Obstruction in these patients has functional character and it is conditioned by UVS immaturity [2; 3; 4].

Though many works note late diagnostics of vesical-ureter reflux. Consequently there is high percentage of chronic renal failure

and nephrogenic hypertension leading to invalidity and often death of patients in young age [1; 5].

Taking into account the aforesaid, **the objective** of this work was design of differential-diagnostic criteria of UVS obstruction in children.

**Materials and methods.** Retrospective and prospective studies were performed in 161 patients in the age from 3 months to 15 years

old diagnosed with ureter hydronephrosis, hospitalized to surgery unit of TashPMI clinic and RSSPMC of Pediatrics from 2009 to 2015. As a result, 94 (58.4%) patients had left-side lesion of ureter, 53 (32.9%) — right-side and 14 (8.7%) patients had bilateral lesion.

In the process of the study the tested patients were divided according to the character of UVS obstruction to the following groups: 1<sup>st</sup> group — 53 (33%) patients with organic obstruction (stenosis of internal vesical part of ureter (45%), stenosis of intra-mural part (35%), urethrocele (20%); 2<sup>nd</sup> group — 31 (19%) patients with functional obstruction (absence of stenosis and reflux with compensated mega ureter); 3<sup>rd</sup> group — 77 (48%) patients with dynamic obstruction, i. e. impairment of UVS anti reflux mechanism (PMR).

For the diagnostics of the variants of ureter-vesical segment impairments we applied routine and special research methods. Routine research methods included: common and biochemical blood analysis (electrolytes, urea, creatinin, total protein, bilirubin); urine analysis (qualitative and quantitative, degree of bacteruria and micro flora sensitivity to antibiotics); ultra-sound study (USS) of kidneys and urinary ducts; measurement of the rhythm of spontaneous urinations (uroflowmetering); mixed cyst urography and excretory urography.

For the confirmation of the obstruction character we performed special research methods including transformation echopyelography with diuretic load, USS of ureter emissions with the help of impulse-wave Doppler-metering; excretory urography with catheterization of bladder for the time of testing; roentgenocinematography, and hydro dilatation with prophylometering of UVS.

**Results and discussion.** Small descriptiveness of the routine diagnostic methods of UVS developmental abnormalities, or subestimation of its degree leads to unjustified prolongation of conservative therapy and progressing of renal complications.

Comparative characteristics of the examined groups showed, that ultra-sound picture of the kidneys in the children of the 1<sup>st</sup> group with limited area of obstruction in distal part of ureter, different from these results in the children of the 2<sup>nd</sup> and 3<sup>rd</sup> groups, and it was characterized by increased echogenity of the cortical layer, widening of calicies-pelvic system, complete widening of ureter, twisting, thickening of ureter's wall and layering of the structure. Widening of ureter was determined independently of the fulfillment of the urinary bladder. Though the presence of ureter contraction testified maintenance of its function. In the children of the 2<sup>nd</sup> group ultra-sound picture of kidney was characterized by moderate widening or deformation of calicies-pelvic system. More expressed widening of ureter was determined in distal parts without alterations of its wall and maintenance of peristalsis. While the patients of the 3<sup>rd</sup> group had growing widening of CPS and ureter in the process of urinary bladder fulfillment; it disappeared after its void proving dynamic type of the obstruction. While performing transformation echopyeloscopy in the children of the 1<sup>st</sup> group the maximal widening of CPS and ureter was registered at the 15<sup>th</sup> minute of the test and composed 35–60% of the original size (average 43%) and reverse to original sizes did not occur till 60–90<sup>th</sup> minute. The analysis of transformation echopyeloscopy showed that the more expressed is the original dilatation of ureter the less widening it has at the moment of the study. Children of the 2<sup>nd</sup> group had maximal widening of the distal part of ureter (25–40%) was noted at the 15<sup>th</sup> minute of the test from original size and recovery of original sizes occurred till 45–60<sup>th</sup> minute. In these patients widening of ureter's diameter within the study period did not exceed 1.5 cm testifying preserving tension of its wall. Children of the 3<sup>rd</sup> group had no notable widening of CPS and ureter and recovery of the original size occurred to the 15<sup>th</sup> minute.

In impulse-wave Doppler-metering of ureter emission in the children of the 1<sup>st</sup> group we revealed significant decrease of its frequency (not more than 1 ejaculation per 2–3 min), prolongation of the time ( $3.54 \pm 0.18$  sec) and decrease of the maximal velocity of ejaculation ( $0.22 \pm 0.02$  m/sec). At the same time there is notable wide variation of IR values — from 0.43 to 0.85. In children with limited obstruction these alterations are conditioned by expressed dysplastic processes in the wall of ureter. In the children of the 2<sup>nd</sup> group frequency and duration was close to normal values (2–3 ejaculations per 1 min,  $T-1.8 \pm 0.4$  sec,  $V_{max} — 0.34 \pm 0.03$  m/sec). variations of IR values reached maximally 0.78 conditioned by immaturity of muscular wall of the distal part of ureter. Different from the abovementioned groups children of the 3<sup>rd</sup> group had symptoms of dynamic obstruction: decrease of the frequency to 1–3 ejaculations per one min., or retro flow of urine to distal part of ureter, diminishing of ejaculation time ( $1.54 \pm 0.18$  sec) and maximal velocity ( $0.22 \pm 0.02$  m/sec).

In the analysis of the values of excretory urography with catheterization of urinary bladder for the time of the test in the children of the 1<sup>st</sup> group we revealed symptoms of organic obstruction (significant impairment of urodynamics, supra stenotic widening of ureter along its length and deviation, decrease of of evacuation function of ureter more than 90 min). Children of the 2<sup>nd</sup> group had moderate widening of CPS. Widening of ureter was more expressed in distal part with absence of deviation; the time of complete contrast evacuation was not more than 45 minutes. Difference of these values for the patients of the 3<sup>rd</sup> group was in in-time contrast evacuation from ureter.

The performed roentgenocinematography of the patients of the 1<sup>st</sup> group revealed weak or chaotic cystoids contraction with anti peristaltic motions of ureter, with preserving contrast in the lower one third of ureter. Roentgenocinematography of the children of the 2<sup>nd</sup> group showed presence of cystoids contraction of ureter with incomplete propulsation of urine to urinary bladder in each contraction linked with UVS immaturity, while the patients of the 3<sup>rd</sup> group had wide opening of UVS, supply and advance of the contrast with complete relief of the lower one third from the contrast.

For transurethral little invasive tests we applied hydro dilatation and prophylometering of UVS. While having hydro dilatation the patients of the 1<sup>st</sup> group, different from the patients of the 2<sup>nd</sup> and 3<sup>rd</sup> groups, had no opening of the orifice. The values of prophylometering showed peak pressure (above 20 cm w.c) in intramural and sub-mucous parts of ureter, which indicated organic obstruction; while in the 2<sup>nd</sup> group there was moderate rise (14–20 cm w. c.). The results of the 3<sup>rd</sup> group children were characterized by opening orifices, visualization of intramural and extra mural parts, and pressure equal to 8–12 cm. w. c.

The achieved results of the special research methods serve for differential diagnostics of ureter-vesical segment developmental abnormalities. The character of UVS obstruction should be determined on the basis of assessment of the symptoms of calicies-pelvic system and ureter widening, its conductivity and functional status.

**Conclusion:** Special research methods including ultra-sound diagnostics, transformation echopyelography with diuretic load, impulse-wave Doppler-metering of ureter emission, excretory urography with catheterization of urinary bladder for the time of the test, roentgenocinematography, hydro dilatation and prophylometering of UVS provide clear differentiation of the kinds of UVS impairments (organic, functional, and dynamic obstruction) in children in any age groups. That will provide achievement of better quality results in the diagnostics and choice of therapeutic method for that pathology in children.



## References:

1. Aliyev M. M., Sapayev O. K., Terabayev B. A., Rakhmatullayev A. A. Protocols of checking of the children with congenital supra vesical obstruction at the various stages of medical aid. *Pediatrics*. – T., 2006; 3–4: 85–87.
2. Dvoryakovski I. V., Zorkin S. N., Dvoryakovskaya G. M., Tsigina Y. N. The role of ultra-sound diagnostics of kidneys in widening of collecting system in new-born babies. *The problems of diagnostics in pediatrics*. – M., 2010; V 2; 1: 30–33.
3. Canning D. A. British Association of Paediatric Urologists Consensus Statement on the Management of the Primary Obstructive Megaureter. *J Urol*. 2015 Aug; 194 (2): 518.
4. Iushko E. I., Strotskii A. V. Primary obstructive megaureter of newborns and infants: diagnosis, treatment, follow-up. *Urologiia*. 2011 Jan-Feb; (1): 63–67.
5. Halachmi S., Pillar G. Congenital urological anomalies diagnosed in adulthood –management considerations. *J. Pediatr Urol*. 2008 Feb; 4 (1): 2–7.

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## Ultrasonography research of knee joint injury

**Abstract:** Ultrasonographic studies were conducted in 468 patients with complaints of pain in the knee joint between the ages of 35 to 58 years (mean age 48 years). Traumatic injuries are identified as fractures joint, tendon ruptures quadriceps, gap lateral ligaments and the patellar tendon, meniscus damage, as well as changes that may be accompanied at these injuries. Semiotics joint damage elements are described.

**Keywords:** ultrasonography, knee joint, traumatic injuries, meniscus damage, synovitis, bursitis, partial tears of ligaments.

**Introduction.** The study of literature suggests that there is a little science-based information about the differential diagnosis of knee joint pathology. In many scientific publications, the main aspects of the use of ultrasonography in the diagnosis of injuries and other changes in the structures of the knee joint are shown (Eskin N. A., 2001; Bruhanov A. V., 2006). However, the problem of complex radiation pathology diagnosis of soft tissue structures of the knee joint remain insufficiently studied. Until now, no data regarding comparative analysis of diagnostic efficacy of ultrasonography and radiography of soft tissue injuries in the structures of the joint. Indications for use of radiographic diagnosis is not defined, clinical diagnostic algorithm of x-ray examination of patients with soft tissue injuries and bone structures of the joint is not designed. Investigation of the knee joint through the application of digital radiographic and ultrasonographic techniques, development of differentiated criteria for various types of joint pathology and put them into practical health care, in our opinion, is one of the most important preventive health trends of the population.

**Purpose of research** — Studying the state of elements of the knee joint during his traumatic changes.

**Materials and methods of research.** The basis of the research on these urgent issues is the results of comprehensive clinical, ultrasound, X-ray examination of patients with different types of traumatic changes of the knee joint structures. Ultrasonographic studies were conducted in 468 patients (574 hips) with complaints of pain in the knee joint between the ages of 35 to 58 years (mean age 48 years). Ultrasonic diagnosis conducted with MyLab-40 Company Esaote apparatus (made in Italy) by applying the method polypositional multifrequency linear transducer 7–12 MHz. During sonography of knee joint, we followed the mandatory requirements. In the beginning — the sick man on his back, knee examined first of several joint flexed about 30 degrees and in the

unbent state it, then survey the patient on his stomach with a straightened limb.

**Results and discussions.** Based on the study results of studies, we identified ultrasonographic changes in knee injury and the following semiotics are developed: During bone fractures of joint, hyperechoic contours are interrupted with the presence of hypo- or anechoic stripe or area, and when mixed fragments hyperechoic contour is deformed.

Gap quadriceps visualized with heterogeneous structure, while there is a violation of stroke fibers, existence of anechoic areas — hematomas, thickening of the muscle layers. Partial rupture is distinguished presence of micro hematoma and muscle thickening. Tendon rupture of the quadriceps femoris: it is not smooth contours, structure is uniformed, with the presence of anechoic areas, hematomas, and violation of interruption of the fibers, thickening of the tendon. Partial rupture of the tendon of the quadriceps femoris — contours equal or not equal, sometimes interrupted circuit on the one hand, the structure is uniformed, with the presence of micro-anechoic — micro damages, bruises, and a violation of interruption of the fibers, thickening of the tendon.

At breaks of lateral ligaments and the patellar tendon differentiated this picture: contours are not smooth, the structure — uniform, with the presence of anechoic areas, bruising, deformity and interruption of the fibers, thickening of ligaments. Partial tears of ligaments and the lateral patellar tendon looked with equal or even, sometimes discontinuous contours on the one hand, the structure with non-uniform, with the presence of micro-anechoic — micro tears, bruises, broken and interrupted the course of the fibers, ligaments thicken.

Above the knee bursitis visualized with smooth and crisp exterior contours, while often thickened synovium, the inner contour is usually uneven. Above the knee bag is extended and thickened, in-

ternal structure is homogeneous or heterogeneous suspension with flakes. Infrapatellar bursitis was detected less than above the knee bursitis. Its contours are always smooth and clear. Thickening of the capsule was observed in rare cases. The internal structure of the bursa is usually echofrei to liquid. In our observation, infrapatellar bursitis resolved quickly compared to above the knee bursitis. In the presence of bursal fluid was observed in the side channels, often in the medial channel.

In our practice, rarely mentioned fat-body injury (non-uniform structure with the presence of anechoic areas), more differentiated compacted areas that may have been previously associated with the transfer of trauma.

Gap (front or rear horns internal or external) of the meniscus was visualized very diverse. Contours equal or not equal — depending on the nature of the fracture line, the structure — the presence of non-uniform line fragmentation in different types: transverse, Y-shaped, longitudinal or oblique line fragmentation. Sometimes transverse fragmentation inner part of the meniscus is not rendered or visualized with the presence of diastase (as anechoic area with indistinct contours) — rupture of the type “watering can handle.” Also noted a couple capsular tears. In our practice, most often observed in the anterior horn tears of the medial meniscus.

Damage to the X-shaped ligaments caused some difficulties because of the inability to trace all over. This is usually inhomogeneous structure or not visualized on the site of its visualization is defined anechoic area with indistinct contours.

The above changes of the joint elements in some cases accompanied by the following states:

Myositis quadriceps — while the structure is somewhat reduced echogenicity, perhaps its thickening. Tendinitis quadriceps tendon — smooth contours and clear, homogeneous structure may be slightly reduced echogenicity, sometimes thickened. Tenosynovitis quadriceps tendon accompanied with smooth and precise contours, usually with a homogeneous structure, the presence of anechoic rim — liquids in small quantities between the tendon and its sheath. Small cystic formation quadriceps tendon — contours smooth and crisp, with the presence of non-uniform structure anechoic area round or round-oval.

Ligament lateral ligaments and the patellar tendon — smooth contours and clear, homogeneous structure may be slightly reduced echogenicity, thickened; ligament X-shaped ligaments — smooth contours and fuzzy, homogeneous structure, the presence of anechoic rim.

Meniscal cyst is visualized in different ways: 1) on the back portion of the meniscus is determined anechoic rounded shape, 2) on the background portion of the meniscus is determined anechoic rounded-oval or irregular shape with the presence of lateral ligament strain, 3) cystic degeneration of the meniscus lateral ligament damage, and 4) near the meniscus cyst usually looked oval, often located on the lower-outer contour of the meniscus. Cystic changes were more frequently observed in the anterior horn of the lateral meniscus.

Becker's cyst visualized at the joint on the rear surface of it, often in the central segment of the domestic — is manifested in different ways: 1) round-oval, 2) longitudinally oval 3) crescent-shaped, and 4) the presence of irregular shape with an internal partition. The internal structure of the cyst more homogeneous and smooth contours and clear, at least — with the presence of cereal suspension and moderately hyperechoic thickened capsule (for chronic forms). Almost all variants can be traced link (“path”) into the joint.

Having hondromic bodies (the number and size of different acoustic shadow densities depends on their localization — in the glenoid cavity).

Hygroma visualized with clear and smooth contours, mostly round or round-oval shaped anechoic internal structure.

Organized hematoma is visualized with clear and smooth, or not smooth contours, sometimes with a hyperechoic rim and inhomogeneous internal structure with the presence of hyperechoic inclusions.

Thus, on the basis of sonographic surveillance images in patients with knee injury, we came to the conclusion that this method of diagnosis allows to identify reliable criteria changes, thus giving reason to recommend it to the widespread adoption of the practice to clarify the diagnosis in conjunction with X-ray method. Described feature of the items in his knee injury helps to diagnose more fully and accurately, and improves the quality of diagnosis, allowing noninvasive and repeatedly monitor treatment.

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## Toxicological evaluation of medical and biological safety of the red palm oil «Premium caratino»

**Abstract:** It was found that the oil «Premium Caratino» has no negative impact on the health of the animals after prolonged entry into the body, does not cause locally-irritating to the skin, does not have sensitizing properties, non-toxic products of plant origin.

**Keywords:** toxicology, food safety, palm oil.

Relevance. Palm kernel oil is extracted from the pulp of the fruits of oil palm by pressing and produce only refined deodorized. Very unstable when the oil storage. At room temperature, it has a solid consistency.

When used in nutritionally substandard, falsified or delayed vegetable oil develops picture toxic poisoning associated

with the presence therein of degradation products and transformation of the fatty acid, not uncommon and the presence therein of toxic elements, pesticides, mycotoxins and other xenobiotics (foreign to the body substances chemical and biological etiology). The presence of some of these xenobiotics can cause severe poisoning, and some of them are able to accumulate in the body for

a long time, cause damage to the body and cause various disease [1; 2; 3].

**Objective.** Evaluation of medical and biological safety of red palm oil «Premium Caratino» for humans.

**Materials and methods of research.** It was delivered to the 3 Series chronic experiment on 18 white mongrel rats (male) with an initial weight of 140–150 g for 45 days. The animals were divided into 2 groups: the control consisted of 8 animals and 10 advanced. The experimental repeatedly administered enterally red palm oil «Premium Caratino». Experimental studies of possible toxic properties “consisted of the following stages: the study of the possible local effects on intact skin and mucous membranes; study of the possible sensitizing properties of the product.

The criteria for the possible toxic effects on the organism of white rats were: general condition and behavior of animals, body weight change, the dynamics of a number of integrated indicators of blood. Since the change in the morphological composition of

peripheral blood is a sensitive criterion in violation of assimilation of nutrients, a number of indicators to characterize these changes were used. The number of red blood cells and white blood cells was determined on «Picoscal» apparatus for the conventional method. The hemoglobin content determined using gemometra Sali [4].

The first and mandatory step biomedical safety assessment of new or used products for the first time — a toxicological assessment. Therefore, we evaluated the effect of «Premium Caratino» red palm oil for the main integrated, including biochemical, indicators of an organism of experimental animals.

Results and its discussion. 3 series of experiments have been put on mongrel white rats. Animals were placed in cages in groups 2 (control and test), they were kept in isolated cells, which were attached to the burette for recording water consumption. The diet of the control group was made up as previously tested scheme (table 1).

Table 1. – Components and energy value of the feed

Food components	Macca, г	Состав, г			Energy value kJ
		Proteins	Fats	Carbohydrates	
Oat groats	70	8,3	4,8	43,9	4,2
Wheat flour	20	2,1	0,2	13,8	1,2
Starch	4	–	–	3,2	0,2
Sugar	2	–	–	2,0	0,1
cottonseed oil	3	–	3,0	–	0,5
Salt, iodinated	1	–	–	–	–
Total	100	10,4	8,0	62,9	6,2

The diet is balanced by the energy value and the content of proteins, fats, carbohydrates, minerals and vitamins. The diet of the experimental group is based on the control of intragastric administration with extra ration studied «Premium Caratino» red palm oil at the rate of 3.5 grams. palm oil.

In the observation of the animals throughout the experiment it found that the general condition and behavior, both the control and experimental groups was satisfactory. All the animals were active

and willing to eat their meat. Wool covers and visible mucous membranes intact. The experiment was recorded daily eats a lot of food, you drink water, isolated excrement.

A simple and sensitive enough indicator of the adverse effects of the investigational product on the body, is the dynamics of animal body weight. Therefore, every 5 days the body weight of animals was determined. At the same time the largest of its growth was observed in the experimental group (Fig. 1).

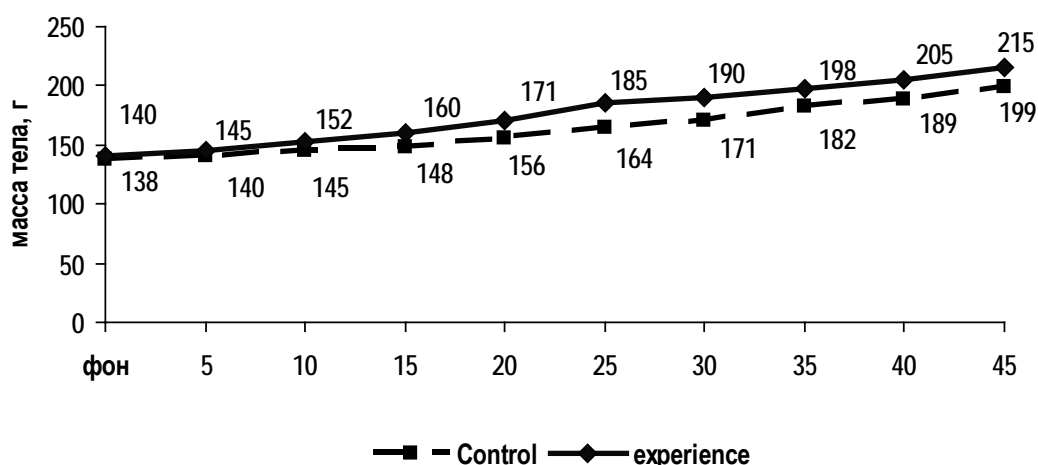


Fig. 1. Dynamics of body weight in rats

Along with the determination of body weight, estimated weights of the internal organs. From the data presented shows that the relative mass of internal organs in the experimental group of animals did not differ from that of the intact group.

Thus, administration of the studied red palm oil «Premium Caratino» in the diet positively influences the growth of rats. No differences in eating feed per 100 g body weight were observed in both the control and the experimental group.

Naturally with a decrease in feed consumption and reduced selection of excrement, the result of which the visual analysis of the good absorption of fat rats.

The consumption of water per 100 g of rat body weight was higher in the experimental group. Table 3 shows the dynamics of fluid mass consumption of animals in the process of setting up the experiment.

The experimental period there were no changes in behavioral and somatic status of the animals taken in observation.

«Premium Caratino» Local irritating red palm oil was studied on white rats weighing 160–200 grams, and guinea pigs, weighing 350–500 grams. Red palm oil «Premium Caratino» was applied to the pre-shaved abdominal skin of animals the size of 2×2 cm in the form of the native drug. Animals were fixed for 4 hours. In the observation period the animals were observed death of any toxic symptoms were noted. In the face of such a 4-hour exposure to samples of red palm oil «Premium Caratino» — is not marked in white rats and guinea pigs, the clinical manifestations of toxicity and functional and structural disorders of the skin. This suggests that red palm oil «Premium Caratino» has no skin-irritant.

The study of local action on the mucous membranes of the eyes was performed on rabbits. When administered in the conjunctival sac of the rabbit eye 0.05 g «Premium Caratino» red palm oil was a weak conjunctival hyperemia and lacrimation weak for 20 minutes, corneal sensitivity is not impaired. After 1 hour, fundus unchanged, all the phenomena of irritation have left their mark.

Consequently, the research findings have shown that the «Premium Caratino» the studied red palm oil does not irritate the mucous eye.

Allergenic effect of samples of red «Premium Caratino» palm oil — was investigated by a single intradermal sensitization in guinea pigs. The experimental animals were injected in the skin of the ear of 0.02 ml of the sample solution and control animals the same amount of saline. Within 11 days after a single course of sensitization carried

apicotomy of an application applications. The severity of the allergic reaction was evaluated by blood cell reactions — specific lysis and agglomeration of leukocytes (RSLL and RSAL) and provocative skin tests.

Testing conducted after a single course of sensitization and apicotomy of an application applications, revealed the lack of red palm oil «Premium Caratino» — sensitizing properties.

When opening the animal pathological changes have been identified data on body weight gain are consistent with the results of morphological and biochemical blood tests, which show that under the influence of the test red palm oil «Premium Caratino» basic metabolism in the organism of white rats were within the physiological range.

Thus, our studies suggest that prolonged detention rats on a diet with the introduction of red palm oil «Premium Caratino» is not accompanied by — or significant that go beyond physiological limits, changes made at integrated monitoring blood parameters in rats. It was found a positive effect of the studied products on the health and body weight gain of white rats.

#### Conclusion

Red palm «Premium Caratino» oil, Malaysia's production — has no negative impact on the health of the animals after prolonged entry into the body, does not cause locally-irritating to the skin and irritating to the mucous membranes, it does not have sensitizing properties.

#### References:

1. Общая токсикология/Под. ред. А. О. Лойта. – СПб.: ЭЛБИ-СПб., 2006. – С. 32–68, 107–108.
2. Методические рекомендации по изучению кожно-резорбтивного действия химических соединений при гигиеническом регламентировании их в воде. – М., 1981. – С. 7–13.
3. Руководство по экспериментальному (доклиническому) изучению новых фармакологических веществ. – М., 2000. – С. 165.
4. Клинические лабораторные исследования. – М.: Медицина, 1984.
5. Рубина Х. М., Романчук Р. А. Вопросы медицинской химии. – М., 1961. – Вып. 6. – Т. 7. – С. 652.
6. Шолохов В. М., Кижжаев Е. В., Верин Д. М. Гигиена и санитария. – М.: Медицина, 1980, – № 2. – С. 60–61.

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## Microelement composition of the skin and scalp hair in healthy subjects and patients with vitiligo

**Abstract:** Mean concentrations of 20 chemical elements in the skin and 23 chemical elements in the scalp hair of healthy subjects and patients with vitiligo, residing in the Republic of Uzbekistan, were established. Comparative analysis of micro- and macroelement composition of the skin and scalp hair in healthy subjects and patients with vitiligo demonstrated pronounced imbalance in concentrations of the most essential elements taking place in vitiligo to be a potential factor to aggravate onset and progression of the dermatosis.

**Keywords:** composition, concentration, microelements, skin, scalp hair, vitiligo.

### Introduction

Microelements are considered as the factors producing a significant effect on the course and orientation of metabolic processes. Reacting with chemical regulators of metabolism, microelements participate in various biochemical processes, stimulate and normalize metabolism [1, 5–28]. Various microelements are necessary for a human organism to develop normally [2, 163–168; 3, 45–48]. Excess or insufficiency of microelements in a human organism has been shown to underlie metabolic disorders and many pathologies [4, 212–220; 5, 67–71]; 6, 1151–1161; 7, 235–244; 8, 261–266]. Vitiligo is one of the pathologies to name here. It is a widely spread human disease with mean prevalence in the world population of 1–2% ([9, 541–544; 10, 505–516; 11, 11–13; 12, 1–9; 13, 893–897]. According to the epidemiological findings, its prevalence in Uzbekistan is 1.2%; among the skin diseases its prevalence is 8.2% ([14, 9–66]. Recently, number of patients with vitiligo has intensively increased among children, young adults and persons of workable age, in particular, significantly deteriorating their life's quality and imparting social value to the dermatosis. Despite sufficient number of studies on the problem of vitiligo, many aspects of this disorder's pathogenesis remain unclear; methods to manage the disease are far from perfect.

Imbalances in microelement composition of human skin and scalp hair are thought to be significant in pathogenesis of vitiligo [15, 38–40]. Copper is necessary to stimulate activity of tyrosinase, a copper-dependent enzyme, participating in the synthesis of melanin. Zinc and manganese take an active part in the synthesis of melanin as well [16, 1–13]. Selenium deficiency leads to reduction in concentration of glutathione peroxidase [5, 70; 7, 239]; in its turn this reduction results in induction of lipid peroxidation in the skin, and, consequently, to intensification of oxidative stress and death of melanocytes [17, 406–411; 18, 9–12; 19, 1–6]. Of note, there are

only few publications on chemical composition both of the human skin and the scalp hair, as well as on the role chemical elements play in the onset and progression of vitiligo. Accordingly, study on the composition and determination of concentrations of chemical elements in the skin and scalp hair of healthy subjects and patients with vitiligo is of theoretical and practical value; the findings of the study are thought to help form novel approach to understanding of mechanisms underlying onset and progression of vitiligo, and develop efficient methods for its treatment. The purpose of the study was to compare compositions of chemical elements and their concentrations in the skin and scalp hair of healthy subjects and patients with vitiligo.

### Materials and methods

The skin biopsies and samples of the scalp hair taken from healthy volunteers and patients with vitiligo referred to the Republican Medical Center of Dermatology and Venereology, Uzbekistan Public Health Ministry were the object of the study. Biochemical investigation was conducted at the laboratory of metabolomics, Institute of Bioorganic Chemistry, Uzbekistan Academy of Sciences. We examined the skin biopsies from 34 patients with vitiligo aged 19 to 63 years and samples of the scalp hair from 37 patients with vitiligo aged 18 to 58 years. Samples of the skin and scalp hair from 33 healthy volunteers of matching age were used as the control ones. Samples of the skin taken from the depigmented areas and from those apparently undamaged in patients with vitiligo were examined separately. Neutron activation analysis was used to determine element composition of the skin and scalp hair from healthy subjects and patients with vitiligo [20, 53–55]. The statistical data were processed by means of Microsoft Excel XP.

### Results and discussion

We have managed to determine presence of 20 elements in the skin biopsies of healthy subjects and patients with vitiligo (Table 1).

Table 1. – Mean concentrations of chemical elements in the skin of healthy subjects and patients with vitiligo ( $\mu\text{g/g}$  of dry tissue)

Chemical elements	Skin of healthy subjects, $M \pm m$	Skin of patients with vitiligo	
		Apparently undamaged area, $M \pm m$	Depigmented area, $M \pm m$
I	137.7 $\pm$ 10.9	10.4 $\pm$ 0.8	10.9 $\pm$ 1.9
Cl	7837.3 $\pm$ 759.5	9140.0 $\pm$ 202.2	8453.3 $\pm$ 291.2
Mn	0.5 $\pm$ 0.01	0.87 $\pm$ 0.09	0.9 $\pm$ 0.03
Na	6530.0 $\pm$ 568.3	5250.0 $\pm$ 69.8	5106.0 $\pm$ 38.6
K	3165.0 $\pm$ 267.06	2556.6 $\pm$ 50.6	2903.3 $\pm$ 93.4
Ca	570.0 $\pm$ 45.1	876.6 $\pm$ 62.9	886.6 $\pm$ 76.03
Cu	23.4 $\pm$ 1.3	11.9 $\pm$ 0.8	9.5 $\pm$ 0.6
Au	0.016 $\pm$ 0.002	0.013 $\pm$ 0.0005	0.016 $\pm$ 0.001
Br	2.73 $\pm$ 0.2	2.56 $\pm$ 0.07	3.1 $\pm$ 0.067
La	0.01 $\pm$ 0.002	0.022 $\pm$ 0.006	0.02 $\pm$ 0.003
Se	0.23 $\pm$ 0.005	0.38 $\pm$ 0.01	0.35 $\pm$ 0.017
Hg	0.001 $\pm$ 0.0002	0.017 $\pm$ 0.002	0.006 $\pm$ 0.001
Cr	2.15 $\pm$ 0.48	3.53 $\pm$ 0.16	5.5 $\pm$ 0.09
Ag	0.015 $\pm$ 0.003	0.026 $\pm$ 0.007	0.014 $\pm$ 0.002
Sc	0.047 $\pm$ 0.0001	0.012 $\pm$ 0.001	0.0075 $\pm$ 0.00051
Rb	2.83 $\pm$ 0.3	2.84 $\pm$ 0.05	3.0 $\pm$ 0.07
Fe	109.3 $\pm$ 3.6	133.7 $\pm$ 7.3	154.3 $\pm$ 3.9
Zn	24.5 $\pm$ 1.3	41.2 $\pm$ 3.2	61.6 $\pm$ 10.9
Co	0.044 $\pm$ 0.003	0.062 $\pm$ 0.004	0.071 $\pm$ 0.002
Sb	0.004 $\pm$ 0.001	0.038 $\pm$ 0.006	0.023 $\pm$ 0.002

### Microelements in the skin of healthy subjects

In healthy subjects proportions of chlorine (Cl), sodium (Na), potassium (K) and calcium (Ca) turned out to be the highest. Thus, mean concentrations of Cl, Na, K, and Ca were respectively 7837.3,

6530, 3165 and 570  $\mu\text{g/g}$  of dry skin tissue. Proportion of iodine was rather high too (137.7  $\mu\text{g/g}$  of dry skin). Mean concentrations of iron (Fe), zinc (Zn) and copper (Cu) were respectively 109.3,

24.5 and 23.4  $\mu\text{g/g}$  of dry skin tissue. Mean concentrations of bromine (Br), chromium (Cr), rubidium (Rb) and manganese (Mn) were respectively 2.73, 2.15, 2.83 and 0.5  $\mu\text{g/g}$  of dry skin tissue. Concentrations of lanthanum (La), mercury (Hg) and silver (Ag) were the lowest; amounts of these elements could be considered as trace. Concentrations of other chemical elements in the skin of healthy subjects ranged from 0.01 to 0.047  $\mu\text{g/g}$  of dry skin tissue.

#### **Microelements in the skin of patients with vitiligo**

As compared with healthy controls, significant differences in macro- and microelement composition of the skin in patients with vitiligo could be clearly seen. Differences in concentrations of iodine were the most significant. Thus, in patients with vitiligo mean concentrations of iodine in the skin biopsies from the depigmented and apparently undamaged areas were 10.8 and 10.4  $\mu\text{g/g}$  of dry skin tissue, respectively, while in the skin of healthy subjects mean iodine concentration was 137.7  $\mu\text{g/g}$  of dry skin tissue. In the skin of patients with vitiligo significant reduction in concentrations of sodium, potassium and copper could be observed. The levels of these elements declined by 27.8%, 9% and 246.3%, respectively, in the depigmented skin areas and by 24.3, 23.8 and 196.6%, respectively, in the apparently undamaged ones. Copper can be seen to decline in vitiliginous skin more sharply. In contrast to normal parameters, in both depigmented and apparently undamaged areas of the skin in patients with vitiligo concentrations of chlorine, manganese, calcium, chrome and zinc increased. Of special note, in vitiligo concentrations of heavy metals, such as mercury (Hg), zinc (Zn), cobalt (Co) and antimony (Sb) were found to increase significantly. Concentrations of other chemical elements in the skin of patients with vitiligo turned out to be in the normal limits. It should be emphasized that upon comparison of composition and concentrations of chemical elements in the depigmented and apparently undamaged skin areas of patients with vitiligo the parameters were found to have changed as compared with those in healthy subjects more significantly in the depigmented ones.

#### **Microelements in the scalp hair of healthy subjects**

According to some authors, concentrations of microelements in a person's scalp hair can provide information about metabolism in his/her organism [5, 70; 6, 1151; 21, 53]. Hence, we studied chemical composition in scalp hair of healthy subjects and patients with vitiligo to determine concentrations of chemical elements there. Neutron activation analysis allowed determining twenty three chemical elements both in healthy subjects and patients with vitiligo (Table 2). Similarly to concentrations of chemical elements in the skin, those of chlorine, sodium, potassium, calcium, iron, copper and zinc in the scalp hair of healthy subjects were found to be the highest, while concentrations of scandium (Sc), cobalt (Co), cadmium (Cd), antimony (Sb), lanthanum (La) and gold (Au) were the lowest. Thus, mean concentrations of chlorine were  $740.0 \pm 32.2 \mu\text{g/g}$  (range: 650–850  $\mu\text{g/g}$ ). Mean concentrations of zinc and iron were respectively  $182.8 \pm 7.3 \mu\text{g/g}$  (range: 160–260  $\mu\text{g/g}$ ) and  $26.2 \pm 2.7 \mu\text{g/g}$  (range 18–34  $\mu\text{g/g}$ ). Mean levels of cobalt and lanthanum in the scalp hair of healthy subjects were respectively  $0.04 \pm 0.003 \mu\text{g/g}$  (range: 0.003–0.048  $\mu\text{g/g}$ ) and  $0.02 \pm 0.00022 \mu\text{g/g}$  (range: 0.014–0.027  $\mu\text{g/g}$ ).

#### **Microelements in scalp hair of patients with vitiligo**

As compared with healthy controls, significant differences in macro- and microelement composition of scalp hair in patients with vitiligo could be clearly seen. First of all, in scalp hair of patients with vitiligo concentrations of chromium (3.6  $\mu\text{g/g}$  vs 0.28  $\mu\text{g/g}$ ) and manganese (4.7  $\mu\text{g/g}$  vs 0.6  $\mu\text{g/g}$ ) were found sharply increased. In addition, as compared with concentrations in the scalp hair of

healthy subjects, concentrations of chlorine, calcium, potassium, cadmium and mercury were found higher in vitiligo, while copper, selenium, cobalt, iodine and silver were deficient. Copper is a vital chemical element and a constituent of some vitamins and hormones, participating in the metabolic processes and cell respiration [2, 164]. It is a constituent of essential enzymes, to name cytochrome oxidase, tyrosinase, ascorbic oxidase and others. A cofactor of superoxide dismutase, copper in human organism is present in the system of antioxidant defense participating in neutralization of oxygen free radicals. Participation in the synthesis of melanin by activation of tyrosinase, a copper-dependent enzyme, is essential function of copper. In its turn tyrosinase converts tyrosine into melanin. Selenium is another essential element producing significant effect on metabolic processes [7, 239]. Selenium deficiency has been established to contribute to reduction of glutathione peroxidase resulting in higher level of lipid peroxidation. Together with glutathione selenium protects cells from damaging effect of peroxy radicals. In scalp hair of patients with vitiligo mean concentration of selenium was 0.3  $\mu\text{g/g}$ ; that is, two times lower than those in healthy subjects. Similarly, concentrations of iodine in scalp hair of patients with vitiligo were found to be two times lower than those in healthy subjects. Iodine deficiency is known to underlie the thyroid function abnormality, as well as onset and progression of the goiter [22, 219–229]. As our findings demonstrate, in vitiligo cobalt deficiency is the most pronounced one. Thus, concentrations of this microelement were found two times lower than in the healthy controls. Of note, concentrations of strontium, gold, lanthanum, cobalt and cadmium were the lowest in scalp hair of patients with vitiligo.

Our findings demonstrate that concentrations of almost all chemical elements both in healthy subjects and patients with vitiligo widely varied. Some authors reported on the similar results in their studies [23, 23–39; 5, 67]. As to concentrations of sodium, calcium, scandium, chromium, cobalt, gold and antimony, our data are consistent with those reported by Rodushkin I. and Alexsson M. D. [23, 26]. At the same time, concentrations of iron, zinc and rubidium in our study were higher than those reported by other authors [16, 4]. According to Fraga C., manganese, iron, copper, zinc and selenium are trace elements, that is, those required in minute concentrations for normal growth and development and, thus, held essential to physiology of a living organism [7, 240]. Deficiency of any of these microelements results in deleterious consequences for health; onset and progression of any pathology associated with the deficiencies can be avoided by adequate supplementation of the microelements lacking.

There is sufficient evidence for significance of mineral content of the human skin for maintaining its metabolism normal and for its role in onset and progression of its pathologies [24, 789; 11, 11–12; 25, 35; 26, 33]. According to Brown H., in the human skin there is a definite correlation between concentrations of calcium and magnesium (Mg) [24, 789–794]. In the skin of elderly persons concentrations of silicon (Si) are found low. To correct the degenerative changes in the skin typical of elderly persons, this author recommends silicon supplementation. Concentrations of zinc are reported low in elderly persons as well. In their study Frydrych et al. found that concentrations of zinc in the epidermis of elderly persons were significantly lower than those in the epidermis of young people [16, 4]. According to these authors, low concentrations of zinc in the epidermis of elderly persons are the result of age-induced reduction in activity of epidermal enzymes. Of note, along with deficit of copper, zinc deficiency is a significant cause of melanogenesis inhibition [16, 4] and, consequently, the onset of vitiligo.

Table 2. – Mean concentrations of chemical elements in the scalp hair of healthy subjects and patients with vitiligo ( $\mu\text{g/g}$ )

Chemical elements	Scalp hair of healthy subjects, $M \pm m$	Scalp hair of patients with vitiligo, $M \pm m$
Na	170.0 $\pm$ 11.40175	335.0 $\pm$ 27.24335
Cl	740.0 $\pm$ 32.24903	841.8 $\pm$ 17.87288
Ca	500.0 $\pm$ 25.0998	1070.0 $\pm$ 43.93177
Sc	0.0046 $\pm$ 0.000346	0.00588 $\pm$ 0.000508
Cr	0.26 $\pm$ 0.030332	3.68 $\pm$ 0.185472
Mn	0.6 $\pm$ 0.028284	4.7 $\pm$ 0.2
Fe	26.2 $\pm$ 2.764055	33.4 $\pm$ 1.32665
Co	0.04 $\pm$ 0.003033	0.0216 $\pm$ 0.001208
Ni	5.0 $\pm$ 0.250998	5.0 $\pm$ 0.250998
Cu	17.0 $\pm$ 0.707107	13.0 $\pm$ 1.140175
Zn	182.8 $\pm$ 7.317103	163.0 $\pm$ 3.962323
K	175.0 $\pm$ 24.18677	310.0 $\pm$ 9.082951
Se	0.5 $\pm$ 0.0251	0.3 $\pm$ 0.022804
Br	0.3 $\pm$ 0.022804	0.81 $\pm$ 0.034205
Rb	0.5 $\pm$ 0.032249	0.5 $\pm$ 0.042778
Ag	0.25 $\pm$ 0.026646	0.1 $\pm$ 0.006892
Cd	0.0294 $\pm$ 0.00275	0.084 $\pm$ 0.054019
Sb	0.02 $\pm$ 0.001517	0.04 $\pm$ 0.003033
I	3.04 $\pm$ 0.150333	1.6 $\pm$ 0.121326
La	0.0208 $\pm$ 0.002223	0.02 $\pm$ 0.001517
Au	0.0412 $\pm$ 0.004543	0.029 $\pm$ 0.00228
Hg	0.03 $\pm$ 0.003225	0.0698 $\pm$ 0.002223
U	0.274 $\pm$ 0.038678	0.1066 $\pm$ 0.02603

From the data above it is evident that to function normally a human organism needs various microelements [2, 164]. According to some authors, there is potential correlation between changes in some bioelements in human organism and onset of some diseases [27, 195–201; 28, 457–460]. For instance, Ren et al. registered in patients with cancers lower concentrations of copper than those in healthy people [29, 1823–1831]. As Łukasiak et al. proved, copper deficiency contributes to atherosclerosis [30, 241–244]. According to these authors, in contrast to healthy subjects, higher concentrations of copper in the scalp hair are registered in patients with type 2 diabetes mellitus, prostatic hyperplasia and arterial hypertension. Excessive accumulation of lead (Pb), cadmium (Cd), arsenic (As) and nickel (Ni) in scalp hair is found associated with higher incidence of disorders in endocrine, nervous and respiratory systems

[3, 45]. Excessive accumulation of magnesium, zinc, copper, manganese, selenium and chromium can be seen to be associated with higher incidence of infectious diseases, as well as those of the skin and hypoderm [3, 47]. Thus, the data above allow concluding that excessive accumulation or deficiency of microelements in the scalp hair of adult people is associated with a variety of diseases.

To sum up, comparative analysis of micro- and macroelement composition of the skin and scalp hair in healthy subjects and patients with vitiligo demonstrated pronounced imbalance in concentrations of the most essential elements taking place in vitiligo to be potential factor to aggravate onset and progression of the dermatosis. Our findings are intriguing both from theoretical and practical points of view, and can be useful in development of efficient regimens for treatment of vitiligo.

#### References:

- Nozdryukhina L. R. Biological role of microelements in animal and human organisms. "Nauka" Publishing House, Moscow (the Russian Federation), 1977, 5–28 (in Russian)
- Trojanowski P., Trojanowski J., Bokinec M., Antonowicz J. Copper in human hair of middle Pomeranian population of Baltic Coastal Zone, 2009, 13:163–186.
- Demidov V. A., Lakarova E. V., Skalnaya M. G., Skalny A. V. Element composition of scalp hair and morbidity in adult population, Bulletin of Orenburg State University, 2011; 15 (134):45–48 (in Russian).
- Baranovskaya N. V., Shvetsova D. V., Sudyko A. F. Local contexts of element composition of scalp hair in children residing in Tomsk region. News of Tomsk Polytechnic University, 2011; 319 (1):212–220 (in Russian).
- Krajeswki P., Chudzik A., Pokrzywnicka M., Kalinka J., Kwiatkowska M. Macro-, micro- and trace elements concentrations in mothers and newborn hair and their impact on pregnant outcome: a review. Archives of Perinatal Medicine, 2009, 15 (2), 67–71.
- Szynkowska M. I., Pawlaczyk A., Wojciechowska E., Sypniewski S., Paryjczak T. Human hair as a biomarker in assessing exposure to toxic metals. Polish Journal of Environ. Stud., 2009, 18 (6), 1151–1161.
- Fraga C. G. Relevance, essentiality and toxicity of trace elements in human health. Molecular Aspects of Medicine, 2005, 26, 235–244.
- Gerhardsson L., Englyst V., Lundstrom N., Nordberg G. Cadmium, copper and zinc in tissues of deceased copper smelters workers. J. Trace Elem. Med. Biol., 2002, 16, 261–266.
- Karadag A. S., Tatal E., Ertugrul D. T. Insulin resistance is increased in patients with vitiligo. Acta Derm Venereol., 2011, 91, P.541–544.
- de Leeuw, J., de Vijlder, H. C., Bjerring, P., Neumann, H. A., 2009, Liposomes in dermatology today, J. European Academy of Dermatology and Venereology, 23, 505–516.
- Verkhoglyad I. V. Balance in micronutrients in patients with vitiligo. Dermatology and venereology, 2014, 17, 11–13.

12. Vanić, Z. Phospholipid vesicles for enhanced drug delivery in dermatology, *J. Drug. Discov. Develop and Deliv.* 2015, 2 (1), 1–9.
13. Salinas-Santander M., Diaz-Garcia D., Rojas-Martinez A. et al. Tumor necrosis factor- $\alpha$ -308 G/A polymorphism is associated with active vitiligo vulgaris in a northeastern Mexican population. *Experimental and Therapeutic Medicine*, 2012, 3, P. 893–987.
14. Arifov S.S., Arifova M.Kh. Vitiligo. "O'qituvchi" Publishing House, Tashkent, 2006 (in Russian).
15. Vaisov A.Sh., Kadyrov E.A., Rakhimova M.A., Muratkhodjaeva Sh.N. Role of microelements in pathogenesis of vitiligo. *Bulletin of dermatology and venereology*, 1985, 9, P. 38–40 (in Russian).
16. Frydrych A., Arct J., Kasiura K. Zinc: a critical importance element in cosmetology. *J. Appl. Cosmetol.*, 2004, 22, 1–3.
17. Dell'Anna, M. K., and Picardo, M. A review and a new hypothesis for non-immunological pathogenetic mechanisms in vitiligo, *Pigment Cell Res.*, 2006, 19, 406–411.
18. Zhavoronkova E. V., Gornostaeva M. A., Korsunskaya I. M. Experience with the use of eltamine for the treatment of vitiligo. *Clin. Dermatol. Venereol.*, 2009, 4, P. 9–12 (in Russian).
19. Laddha N. C., Dwivedi M., Mansuri M. S., Gani A. R., Ansarullah M, Ramachandran A. V., Dalai S., Begum R. Vitiligo: interplay between oxidative stress and immune system. *Experimental Dermatology*, 2013, vol. 22, no. 4, P. 245–250.
20. Zhuk A. I., Osinskaya N. S., Kutlyakova T. D., Mikhelskaya I. N., Azamova S. S. Neutron activation analysis for analysis of scalp hair. *Laboratory Science*, 1987, 1, 53–55. (in Russian)
21. Saiki M., Alves E. R., Jaluul O., Sumita N. M., Filho W. J. Determination of trace elements in scalp hair of an elderly population by neutron activation analysis. *Journal of Radioanalytical and Nuclear Chemistry*, 2008, 276 (1), 53–57.
22. Turakulov Ya. Kh. Metabolism of iodine and thyroid hormones in the thyroid pathology. Chapter IX in "Iodine metabolism and thyroid hormones". Uzbekistan Academy of Sciences Publishing House, Tashkent, 1959 (in Russian).
23. Rodushkin I., Alexsson M. D. Application of double focusing sector field ICP-MS for multielemental characterization of human hair and nails. Part III. Direct analysis by laser ablation. *The Science of the Total Environment*, 2003, 305, P. 23–39.
24. Brown H. The mineral content of human skin, *Journal of Biological Chemistry*, 1927, P. 789–794.
25. Nielsen K. P., Zhao L., Stamnes J. J., Stamnes K., Maon J. The optics of human skin: Aspects important for human health. In: *Solar Radiation and Human Health*, Ed. Espen Bjertness, Oslo: the Norwegian Academy of Sciences and Letters, 2008, P. 35–46.
26. Samanta G., Sharma R., Roychowdhury T., Chakraborti D. Arsenic and other elements in hair, nails and skin scales of arsenic victims in West Bengal, India. *The Science of the Total Environment*, 2004, 326, P. 33–47.
27. Forte G., Alimonti A., Violante N., Di Gregorio M., Senofonte O, Petrucci F., Sancesario G., Bocca B. Calcium, copper, iron, magnesium, silicon and zinc content of hair in Parkinson's disease. *J. Trace Elem. Med. Biol.* 2005, 19, 195–201.
28. Kolmogorov Y., Kovaleva W., Gonchar A. Analysis of trace elements in scalp hair of healthy people, hyperplasia and breast cancer patients with XRF method. *Nuclear Instruments and Methods in Physics Research*, 2000, 448, 457–460.
29. Ren Y., Zhang Z., Ren Y., Li W., Wang M, Xu G. Diagnosis of lung cancer based on metal contents in serum and hair using multivariate statistical analysis. *Talanta*, 1997, 44, 1823–1831.
30. Łukasiak J., Cajzer D., Dabrowska E., Falkiewicz B. Low zinc in patients with metabolic X syndrome (mzX) measured by hair zinc composition analysis. *Rocs Panstw Zakl Hig (Poland)*, 1998; 49 (2): 241–244.

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## The priority of Vertebroplasty for treatment of symptomatic vertebral hemangiomas

**Abstract:** The study included 82 patients having symptomatic vertebral hemangioma with local pain syndrome as a main clinical manifestation. Patients were operated on by use of percutaneous unilateral transpedicular vertebroplasty.

**Keywords:** symptomatic and aggressive vertebral hemangioma, percutaneous vertebroplasty.

Hemangioma is a congenital malformation with a benign vascular tumor process. In 75% of cases hemangiomas are localized in the spine. Vertebral hemangiomas (VH) emissions constitute 2–3% of all spinal tumors and occur in 10–12% of cases in the population [8, 166–168].

**The aim** of our research is the analysis of results of treatment of symptomatic and aggressive VH by the method of puncture vertebroplasty.

**Material and methods:** In the National Center of Rehabilitation and Prosthesis of Disabled people in 2013–2014. method

puncture vertebroplasty operated on 82 patients (45 men and women) with symptomatic VH. The patients were aged 26 to 72 years (mean age 41.2 years). In all the analyzed cases of VH were isolated and localized only to one vertebrae. None of the patients in the VH group was not associated with systemic or genetic diseases.

All patients had local pain syndrome without neurological symptoms and encouraged to consult a neurologist or neurosurgeon.

All patients had a pronounced persistent character of the pain, which is aggravated in the upright position, with tilt, swivel and dur-



ing the movement. The average duration of pain prior to surgery was 3.8 years (range 1.3 to 8 years). Patients taking prescription painkillers, which in most cases prevent pain for a short time. In addition, 14 patients showed a significant reduction in motor activity.

Patients had classical clinical and instrumental examination, including spondylography, CT, and MRI. Spondylography allowed to determine the typical pattern of a lesion of a vertebral body hemangioma in the form of vertical strips or a honeycomb. None of the patients was diagnosed compression fracture of the affected VH vertebral body.

CT was estimated by changes in the spongy tissue of the vertebra and the volume and nature of the lesion of the structures of the vertebra, invasion of the spinal canal. On axial sections of the affected vertebra had a typical picture. In the postoperative period in several patients CT was performed on 2–5th day, which allowed to identify structural changes of VH's, complete filling of the affected vertebra with cement, and the presence of leakage of the cement into the canal or the paravertebral space.

MRI revealed a change in the signal intensity of the affected vertebra and the condition of the nervous structures. Hyperintensive signal in T1 — and T2-modes for MRI in four patients indicated the absence of the aggressive nature of VH and hypointensiv signals in T1 mode and intense accumulation of contrast in the other four patients confirmed the aggressive nature of VH. Thus, MRI study determined the level of proliferative potential (high or low) VH and to identify them in a group of symptomatic or aggressive formations.

Indications for the puncture vertebroplasty served severe pain resistant to analgesics; the presence of VH bodies and posterior structures of the vertebrae with high proliferative capacity without compression of neural structures.

The purpose of the puncture vertebroplasty in symptomatic and aggressive VH: prevention of progressive growth of VH with possible invasion into the spinal canal with compression of nerve structures; prevention of pathologic compression fracture with subsequent kyphotic deformity of the spine; increases in strength and stabilization of the affected segment with prevention of scoliotic deformation.

Thus, the criteria for selection of patients for carrying out the puncture vertebroplasty was considered persistent severe pain, no neurological deficit and confirmation of VH methods of neurovisualisation. Patients with compression of the spinal cord and its roots exposed to surgical decompression followed by reconstruction of the vertebral body are excluded from the analyzed group. The contraindications to puncture vertebroplasty served serious diseases of the cardiovascular and respiratory systems, coagulopathy, intolerance to acrylic resins and the local infectious process.

82 procedures performed puncture vertebroplasty unilateral transpedicular access. The level of intervention matches the level of the lesion. All interventions were performed in patients position laying on the stomach under local anesthesia with fluoroscopic control. With arcs. Puncture of the affected vertebral bodies was done under Benito needle, bone cement based on acrylic resins, solvent. Biopsy was not performed. The needle position was verified radiographically in direct and lateral projections. Standard considered the location of the end of the needle at the border of anterior and middle thirds of the vertebral body in lateral projection. Cement with a syringe, Benito was injected under fluoroscopic control until the beginning of the polymerization in a minute after mixing with the solvent. The flow of cement and the filling structures of the affected vertebra was controlled using a lateral projection of the C-arm. The amount of cement in the affected vertebra has an average of 5.11 ml (from up

to 4,03–5,67 ml). During and after the introduction of cement both needles were left in place in order to prevent the expiration of cement from the site of puncture and epidural hematoma. In all cases prophylactic used antibiotics.

The position of the patient lying on his stomach has not changed in 10–15 min after puncture vertebroplasty. The operation time was 30–40 min. for 3–5 days after surgery, some patients underwent a control CT study. Stay patients the hospital was 24–72 h (average 36 h). Post-operative condition was assessed 24 h, 1 week, 6 months, and subsequently once a year.

**Results and discussion:** The first mention of VH dated 1867, and in 1926. Perman was the first radiological description VH [2, 1577–1582]. VH usually have no clinical manifestations and are discovered accidentally during CT or MRI of the spine. However, in rare cases VH's are aggressive in nature, manifesting symptoms resistant to medication pain and neurological deficit [5, 997–1102]. This occurs in cases of diffuse lesions of vertebrae, pathologic fracture of his body, as well as due to the penetration of the tumor into the spinal canal with compression of nerve structures. In such cases, the treatment choice is a complex problem for patient and surgeon. Conventional treatments are symptomatic VH radiation therapy and surgery aimed at decompression of neural structures with subsequent reconstruction of the vertebral body. These methods do not give lasting therapeutic effect and are associated with high rates of complications and recurrences. Despite the technique of preoperative intra-arterial embolization of VH and (or) puncture of the introduction in it of ethyl alcohol, surgery symptomatic PG is accompanied by a high level of surgical aggression and the blood loss from the tumor [3, 23–26]. Now appeared the possibility of an alternative symptomatic treatment of VH's by the method of puncture vertebroplasty plastics. First puncture of the introduction of cement based on acrylic resin with a persistent positive effect of the French neurosurgeons Galibert and Deramond in 1984 for the treatment of VH is symptomatic of the second cervical vertebra [9, 83–86]. Currently this method minimally invasive surgery is successfully used by many neurosurgical centers of the world, which allows in most cases to avoid open surgical treatment and radiation therapy in patients with symptomatic VH [4, 629–631].

All patients analyzed in the groups after the operation marked regression of pain syndrome, increase physical activity and return to normal life. In 45 patients the pain stopped on the first day after surgery, 37 within five days, although in the first two days there was a significant increase of pain. Thus, all patients achieved a positive result, expressed in the absence of pain, in rejection of analgesics and full social rehabilitation. The observation time after puncture vertebroplasty ranged from 6 to 12 months (average 9 months). In addition, after the puncture vertebroplasty patients was not required further treatment including radiation therapy, intra-arterial embolization of VH's, the puncture needle injection of ethanol or surgical intervention.

In the analyzed series of indications for the puncture vertebroplasty was based on clinical manifestations and radiological data. All patients had prolonged pain resistant to analgesics. The pain was localized in the site of the lesion vertebra and caused the decrease of physical activity. 31 of the 82 patients had evidence of aggressive VH. When evaluating neuroimaging methods (spondylography, CT, MRI) revealed that one patient VH was localized in T4, hit all the vertebral body and spread to legs and back arc; VH 31 patients wore diffuse common with thinning of the cortical bone of the vertebra and the defeat of its posterior. In addition, these patients had hypointensiv signal in T1-MRI

mode, which, according to Cross et al., VH can be attributed to the aggressive group [6, 143–153].

In professional literature there are reports about the use of unilateral transpedicular access when carrying out the puncture vertebroplasty [1, 287–296]. Thus, Kim et al. recommend the use of unilateral pedicle access needle in a vertebroplasty. The number of complications and recurrences in a series of Kim et al. higher than that of other authors. In our work, unilateral transpedicular access when symptomatic VH contributes to a higher degree of filling of posterior VH affected vertebra and avoids the use of additional therapies, as well as to prevent invasion of a tumor inside the spinal canal. Our view is consistent with data from professional literature [9, 311–320]. After the cement in the epidural space we associate with a high degree of aggressiveness VH and having her epidural component.

The results of treatment by the method of puncture vertebroplasty in the analyzed group is comparable to the results of a series Galibert et al. and a number of other authors [7, 341–348]. Over a two-year observation period in all patients in this series was filled with cement to stabilize the vertebrae, there was no secondary deformities and pathological fractures of vertebral bodies.

In the postoperative period one patient was asymptomatic after the revealed cement in the epidural space without compressing the spinal cord. This complication did not require additional treatment and increased length of stay in the hospital. In this case, also obtained a positive effect from the puncture vertebroplasty with regression of pain syndrome and improvement of quality of life. Even one patient for four days after surgery, remained pain at the puncture site not requiring the use of analgesics. Infectious, hemorrhagic and embolic complications in the analyzed series of patients are not marked. Low rate of complications when using puncture vertebroplasty noted by many researchers [10, 13–19].

#### Conclusion

1. Percutaneous vertebroplasty is a safe and effective minimally invasive treatment symptomatic and aggressive VH, which allows to eliminate pain.

2. Percutaneous vertebroplasty to restore lost strength and stability of the affected vertebra and prevent compression of the nervous structures in the future.

3. The use of a C-arm in the puncture vertebroplasty increases the safety of this method.

#### References:

1. Acosta F. L., Dowd C. F., Chin C., et al. Current treatment strategies and outcomes in the management of symptomatic vertebral hemangiomas//Neurosurgery. 2006. Vol. 58. P. 287–296.
2. Bas T., Aparisi F., Bas J. L. Efficacy and safety of ethanol injections in 18 cases of vertebral hemangioma: a mean follow-up of 2 years//Spine. 2001. Vol. 26. P. 1577–1582.
3. Belkoff S. M., Maroney M., Fenton D. C., et al. An in vitro biomechanical evaluation of bone cements used in percutaneous vertebroplasty//Bone. 1999. Vol. 25. P. 23S-26 s.
4. Carlier R., Engerand S., Lamer S., et al. Foraminal epidural extra osseous cavernous hemangioma of the cervical spine: a case report//Spine. 2000. Vol. 25. P. 629–631.
5. Cross J. J., Antoun N. M., Laing J. C., et al. Imaging of compressive vertebral haemangiomas//Eur. Radiol. 2000. Vol. 10. P. 997–1102.
6. Deramond H., Darrasson R., Galibert P. [Percutaneous vertebroplasty with acrylic cement in the treatment of aggressive spinal angiomas]//Rachis. 1989. Vol. 1. P. 143–153.
7. Doppman J. L., Oldfield E. H., Heiss J. D. Symptomatic vertebral hemangiomas: treatment by means of direct intralesional injection of ethanol//Radiology. 2000. Vol. 214. P. 341–348.
8. Galibert P., Deramond H., Rosat P., et al. [Preliminary note on the treatment of vertebral angioma by percutaneous acrylic vertebroplasty]//Neurochirurgie. 1987. Vol. 33. P. 166–168. French.
9. Gangi A., Kastler B. A., Dietemann J. L. Percutaneous vertebroplasty guided by a combination of CT and fluoroscopy//AJNR. Am. J. Neuroradiol. 1994. Vol. 15. P. 83–86.
10. Pedachenko E. G., Kudaev S. V. the Possibility of puncture vertebroplasty in compression fractures of the vertebral bodies in osteoporosis//Neurosurgery. 2006. No. 4. P. 13–19.

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## Headaches in children with attention deficit hyperactivity disorder: clinical manifestations and specific progressing

**Abstract:** The article presents the issues of comorbidity of attention deficit hyperactivity disorder and primary headaches in children: tension headaches (TTH) and migraine. Considering the fact that all children with ADHD have the predisposing factors to the development of tension-type headache (schooling difficulties, family problems, the impact of stress, anxiety and depressive disorders), there is a need to study the clinical manifestations, mechanisms of pathogenesis and characteristics.

**Keywords:** attention deficit hyperactivity disorder, tension headache, migraine, children.

Attention deficit hyperactivity disorder (ADHD) syndrome in childhood is one of the most topical problems of the modern medicine due to its high prevalence, insufficient study of pathogenic

mechanisms, and as a result, high efficiency of the available therapeutic agents. According to the research data, the values of ADHD prevalence in children varies in a quite wide range from 1% to 30%

of population [1–7]. According to comorbidity concept, ADHD in childhood often is accompanied by headaches, which are met in 25% of children with ADHD according to some authors [2]. The most widely spread forms of headaches met in children with ADHD are tension headaches (TH) and migraine [8; 9].

Among the predictors of headaches in childhood there are disorders of attention concentration, slow speed of cognitive activity, emotional instability, hyperactivity, and tense relationships in school [3]. According to population research of T. W. Strine et al., among 4–12 years old children, suffering often headaches, attention disorder and hyperactivity was met 2.6 folds more often [11].

Besides that, the results of the study of ADHD and primary headaches comorbidity are fragment and discrepant. According to the data of special epidemiological study, where the possible association between ADHD and primary headaches was assessed, migraine and TH are comorbide not with just ADHD, but hyperactivity impulse behavior [4].

From the other side, the studies of some authors demonstrate the association between attention disorders in children and both basic types of primary headaches (migraine and TH). There is a hypothesis that migraine and TH form a continuum, which can have some common pathologic physiological mechanisms, while complexes of brain structures provide mechanisms of attention, characteristic personal profile, and mechanisms of headache can overlap [6]. It is possible that, difficulties of schooling and problems of behavior linked with ADHD, which are accompanied with long-term and multiple stresses in family, school, relationships with children of the same age and other people promote formation of TH via the impact of repeated stresses [8, 10].

Thus, both ADHD and primary headaches (migraine and TH) widely spread among children and teenagers are accompanied with the disorders of social-psychological functioning and difficulties of schooling.

**The objective:** was to study the structure and peculiarities of basic clinical characteristics of primary headaches in children with attention deficit hyperactivity disorder.

**Materials and methods of the research:** We followed 102 children (84 boys and 18 girls) from 5 to 12 years old suffering ADHD. Diagnostics of attention deficit hyperactivity disorder and associate tic hyper kinesis was performed on the basis of DSM–V criteria [5]. Assessment of the disease severity was performed with the help of Vanderbilt scale, which is a questionnaire for parents consisting of 50 questions for the evaluation of the degree of lack of attention, hyperactivity and impetuosity, and associate opposition-anxiety states [2].

Diagnostics of cephalgia was performed in compliance with the classification of international society of headache study (IHS — 1988) [11]. Assessment of cephalgia severity was performed with the help of Visual Analogue Scale (VAS). Neurological checking was performed according to the common scheme.

Criteria of inclusion to the study were the following: age of children from 5 to 12; correspondence of clinical manifestations of the pathology to diagnostic criteria of IDC–10, DSM–IV; absence of mental retardation; informed consent of parents to participate in the research. Criteria of exclusion were the age of patients under 5 and above 12 years old, severe focal neurological symptoms, presence of severe somatic pathology, significant decrease of vision and hearing ability, epileptic seizures, and mental retardation.

**Results of the research.** Complaints of headaches were stated by 56.2% of the children with ADHD. There was prevalence of TH among all primary headaches in children; it was diagnosed in 76.2%.

The part of migraine was equal to 19.4% cases, combination of TH and migraine 2.3%, rare forms of headaches 2.1%.

Character of TH in our group was often described as suppressing (41.2%), rare pulsating (14.5%). Though 10.9% of the children characterized TH as suppressing/pulsating (changing its character in each attack), 14.5% as obtuse, 3.6% stinging, 1.8% bursting, and 13.3% various combinations of pain. Bilateral location was determined in 73.3% of the children with ADHD. 38.2% of the children with TH had intensification of pain from usual physical activity, but intensity of TH was weak or moderate in 89.7% of the cases. In 42.4% of school children TH was accompanied by photo/phonophobia. Only 4 children with TH (2.4%) had nausea as associate symptom. In 18.8% of the children TH was accompanied with just anorectic reactions, in 4.2% anorexia and photo/phonophobia. Thus, in the performed study the most specific characteristics of TH in children were intensity and location of pain.

In our study in 6.7% of the children duration of TH was less than 30 minutes (these children were diagnosed possible TH due to incomplete correspondence to TH criteria).

Assessment of attack intensity in headache (H) in childhood did not get sufficient attention in literature until now. In international headache classification the criteria of H expression are not specific for children. We revealed that, the assessment of pain expression according to verbal scale in 100% cases the children with migraine characterized headache as moderate or intensive, and 91.3% characterized it as moderate or intensive according to VAS. 89.7% of school children suffering TH according to verbal scale characterized headaches as weak or moderate, and according to VAS the same assessment was given by 85.8% of the children. According to VAS children, suffering migraine, assessed headache equal to  $6.76 \pm 0.42$  points, and children with TH to  $4.98 \pm 0.15$  points ( $p < 0.001$ ).

Intensity of headaches in children with TH increased in transformation of episodic variants from rare to often ones from 4.41 to 5.09 points ( $p > 0.05$ ), and episodic forms to chronic ones from 5.09 to 5.61 points ( $p > 0.05$ ). In comparison the values of headache assessment in children with often episodes of TH and chronic TH statistically did not differ ( $p = 0.145$ ), though there were reliably statistically significant differences in children with rare episodes of TH ( $p = 0.034$ ).

Assessment of pain expression in migraine without aura was higher, than in children suffering migraine with aura: 8.75 and 5.36 points, respectively ( $p = 0.003$ ). In children with chronic migraine the intensity of headache was a little bit stronger, though statistically insignificant (7.5 points), than in children suffering migraine (6.92 points;  $p > 0.05$ ). Pain assessment according to VAS in CTH and chronic migraine was 5.61 and 7.50 points, respectively ( $p = 0.015$ ). Pain intensity in case of other kinds of headache was between average values of intensity in TH and migraine and was equal to 6.07 points.

Almost in all types of headaches intensity of pain according to VAS was higher in girls, than in boys. According to verbal scale these differences were absent due to less sensitivity of that scale. Though in comparison of the groups of boys and girls with migraine without aura the difference reached the values of statistical reliability ( $p < 0.05$ ).

**Conclusion:** Thus, the performed study showed that attention deficit hyperactivity disorder syndrome (ADHD) can be met in combination with primary headaches, more often tension headache and migraine. Headaches associate with ADHD were considered as unfavorable prognostic factors for long-term progress of ADHD, up to chronic one.

## References:

1. Budchanova N. U., Delyagin V. M., Khondkaryan G. S. Prevalence and peculiarities of clinical manifestations of primary headaches in school children. *Rasprostranyonost I osobennosti klinicheskikh proyavleniy pervichnikh golovnikh boley u shkolnikov*. [Pediatrics]. 2008. № 87 (5). P. 138–140. (in Russian).
2. Zavadenko N. N. Hyperactivity and attention deficit in childhood. – M., 2005. P. 256 (in Russian).
3. Barkley R. A. Attention-deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment. 3rd ed. N. Y., 2005. 770 p.
4. Behavioral and Temperamental Characteristics of Children and Adolescents Suffering from Primary Headache/L. Mazzone, B. Vitiello, G. Incorpora, D. Mazzone//*Cephalgia*. 2006. – № 26 (2). P. 194–201.
5. Diagnostic and Statistical Manual of Mental Disorders. 5th ed. (DSM-V). Washington, 2013. 947 p.
6. Kröner-Herwig B., Heinrich M., Morris L. Headache in German Children and Adolescents: a Population-based Epidemiological Study//*Cephalgia*. 2007. – № 27 (6). P. 519–527.
7. Pennington B. F. Diagnosing Learning Disorders: A Neuropsychological Framework. N. Y.; L., 2009. 355 p.
8. Prevalence and Clinical Characteristics of Primary Headaches among School Children in South Korea: a Nationwide Survey/Y. I. Rho, H. J. Chung, K. H. Lee et al.//*Headache*. 2012. – № 52 (4). P. 592–599.
9. Prevalence of Headache and Migraine in Children and Adolescents: a Systematic Review of Population-based Studies/I. Abu-Arafeh, S. Razak, B. Sivaraman, C. Graham//*Dev. Med. Child Neurol*. 2010. – № 52 (12). P. 1088–1097.
10. Primary Headaches, Attention Deficit Disorder and Learning Disabilities in Children and Adolescents/J. Genizi, S. Gordon, N. C. Kerem et al.//*The J. of Headache and Pain*. 2013. – № 14. P. 54.
11. The Associations among Childhood Headaches, Emotional and Behavioral Difficulties, and Health Care Use/T. W. Strine, C. A. Okoro, L. C. McGuire, L. S. Balluz//*Pediatrics*. 2006. – № 117 (5). P. 1728–1735.

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## Modern view in treatment of burn wounds

**Abstract:** The authors studied 65 patients with burn wounds upper and lower extremities with the use of chelating agent in the treatment of regional lymph and antibiotic biosynthetic wound Parapran coatings. Showed a positive result of the application of lymphatic therapy can reduce wound complications.

**Keywords:** burns, lymphatic therapy, wound dressings, wound complications.

### Introduction

It is important to notice that any combustions, especially extensive, irrespective of their localization, are followed by inflammatory process and the expressed external lymphorrhea (plasmorrhhea) with which, the organism is left by the vital elements, proteins, electrolytes and etc.

Do not forget about the often accompanying the process of burn wound infections [1].

Plasma loss at deep combustions it is shown not only wound loss, but also formation of an edema in surrounding a burn wound of a tissue.

At the disorders of microcirculation resulting in massive stagnation of a blood in vessels the local compensatory augmentation of a limfoproduktion takes place. During this period the lymphatic bed can be one of the main drainage links of an interstitial [2; 3].

Lymphatic system is not only a derivative of venous system, but also highly provides communication of an interstition with other departments of the blood course [3; 4].

Important circumstance of lymphatic system, the factor of accumulating of the damaged cages, microorganisms and toxins with the subsequent neutralization and removal is in their natural way.

Washing away or so-called capture, happens lymphatic capillaries, but not blood microvessels since the wall of the first, without possessing on the histologically structure a basal membrane, is capable to pass through itself the microbial bodies and other corpuscular particles having big molecular weight [2; 3; 4].

Research purpose: to estimate clinical efficiency of application of regional lymphatic therapy in treatment of burn wounds, various localization.

### Materials and methods.

We studied 65 patients with combustions of III And the Art., various localization. From them 30 it is groups sick with a basis by which the complex of medical actions included a regional lymphatic antibioticoterapia (RLAT) and a wound covering «Parapran». 35 patients made control group which received traditional treatment. All studied patients were mainly with combustions of the top or lower extremities.

The clinical assessment of results of treatment was carried out on the basis of a current of a wound process, terms of depression of an edema, cuticularization terms from an initiation of treatment, bacteriological and cytologic researches, by wound pyeses. At patients in dynamics studied changes of the main clinical laboratory indicators.

### Results of researches:

Comparing clinical and datas of laboratory of the compared groups we received the following: against complex treatment of RLAT at 16 (53.3%) patients already by the beginning of 2 days it was noted appreciable and places and full depression of an edema and refocal inflammation, in control group these indicators were shown in later terms for 3–4 days.

From burn wounds prior to treatment of control and main groups strains of *P.aeruginosa* of 20% of *S.aureus*, in other cases of *S.epideridis* were sowed in 40%.

Through 2 days after an initiation of treatment patients of control group had a microorganisms that as before treatment, the microbial contamination didn't change, and was even in certain cases enlarged. In the main group with use of RLAT the microbial contamination decreased with 105,4 to 103,6 on KOE<sup>cm<sup>2</sup></sup> of a wound surface, the vysevayemost of *P. aeruginosa* and *S. aureus* decreased. Against treatment of RLAT by 5th days microorganisms were allocated only at 2 patients, from them at 1-*P. Aeruginosa*, 1 *Acinetobacter* spp.

Depression of level of a microbial contamination of burn wounds against complex treatment with 103,6 to 101,2 on KOE<sup>cm<sup>2</sup></sup> of a wound surface became perceptible. In group of comparison in 2 cases against traditional treatment by 5th days allocation of microorganisms from burn wounds is noted. In 3 cases the two-component association is received (*S. aureus* with *P. aeruginosa*). The microbial contamination of burn wounds against traditional treatment decreased with 105,5 to 103,4 on KOE<sup>cm<sup>2</sup></sup> of a wound surface.

Prior to treatment all patients of the main and control groups had the following cytologic picture: types of cytograms prevailed inflammatory (75%) and inflammatory and regenerator (25%). Against treatment for the 5th days in control, the cytogram type at 25 patients was replaced with regenerator and inflammatory, remaining inflam-

matory and regenerator at 8 (22,8%) and inflammatory at 2 (2,5%) patients. At the same time in group of comparison against RLAT the inflammatory and regenerator type of the cytogram is noted at 2 (6,6%) the patient, at 10 (33,3%) — regenerator and inflammatory and at 18 (60%) regenerator and inflammatory with an autoimmune component.

For the 4th days at 23 (76.6%) the patients who received a regional lymphatic antibioticotherapy the expressed active cuticularization opposite to 15 (42.8%) control became perceptible.

Suppuration of wounds was observed in 2 (6.5%) primary and 5 (14.2%) of the control groups.

Thus, the regional lymphatic antibioticotherapy in complex treatment of victims of combustions referred on prophylaxis and treatments of complications burn wounds significantly influences the current and the result of inflammatory process in a wound, a bacterial contamination, reduces the frequency of complications. As a result of use of RLAT depression of an edema, refocal inflammation becomes perceptible, terms of restoration of an integument decrease. Besides RLAT it: a possibility of more aim administration of medicines to the lesion center (achievement of high concentration of antibiotics), ease and a possibility of use at all stages of treatment, economic efficiency.

### References:

1. Alekseev A. A., Krutikov M. G., Yakovlev V. P. Burn infection. Etiology, pathogenesis, diagnostics, prophylaxis and treatment. – the Monograph – M. Vuzovskaya the book, 2010–416 p.
2. Borodin Yu. I., Sapin M. R., Etingen L. E. and other // General anatomy of lymphatic system. Novosibirsk.: nauka of Sib. otd. 1990, 243 p.
3. Nechepelenko G. V. // Segmentary theory of lymphatic system. – M.: khimiya, 1990, 160 p.
4. Sapin M. R., Borzyak E. I. // Extra organ ways of transport of a lymph. – M of a.: meditsin, 1982, 264 p.
5. Kaye ET. *Curr Clin Top Infect Dis.* 2000; 20: 43–62.
6. Pruitt BA. In: *Infection and the surgical patient.* Polk HC. (Ed.) Churchill Livingstone. 1982; 4: 113.

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## State of neuro-humoral regulation in congenital heart defects in children

**Abstract:** Authors examined 160 patients of children with congenital heart disease (CHD). We studied the cellular and humoral immunity, cytokine, and thyroid status in patients with corticoid children with congenital heart disease in the periods before and after surgery. The authors argue that the state of neuro-humoral regulation (NHR) of the body determines the course of CHD. Natural and after operating for CHD accompanied by dysfunction of the endocrine glands. Operational correction CHD partial or complete removal of the thymus further reduces the innate.

**Keywords:** congenital heart disease, immune system, timic-cortical status, neuro-hu-moral regulation.

Congenital heart defects (CHD) — one of the most common congenital anomalies in children. In recent years there has been an increase in the frequency of CHD due, probably, the use of more advanced methods of functional diagnosis and the increased interest in the issue of the CHD other physicians [1–3].

According to various authors, in the United States are born each year to 30–35 thousand children with CHD, in the Russia 20–22 thousand Children [14; 15].

Natural mortality for all CHD is about 40%, and most patients die in the first year of life and 70% of them — in the first month of life [15]. In the age structure of mortality from CHD and anomalies of the great vessels 91% were children of the first year of life. Among them, about 50% — children up to 28 days of life (neonatal period) [6–9].

According to research L.A. Bokeria and collaborators (2010), children with CHD and low concentrations of total immunoglobulin

A and G in the preoperative period are at risk to develop infectious postoperative complications [7].

Among the dead was diagnosed with congenital pathology of the thymus [4; 5; 10; 11; 13]. In children with the natural course of disease may occur spontaneous reduction of the defect with its almost complete leveling.

According to various authors, the spontaneous obliteration of the ventricular septal defect (VSD) is observed in 15–60% of patients; atrial septal defect (ASD) — from 3–27%; patent ductus arteriosus (PDA) in 3%, i. e. in 0.6% of patients annually. A separate group of patients with small defects do not show random or conservative treatment. Surgical treatment of CHD, in most cases carried out with a cut sternum causing performed partial or total removal of the thymus [12, 14].

**The purpose of the work:** to study the state of NHR of CHD in children.

**Materials and methods:** The study involved 160 children with CHD. Of these, 88 boys and 72 girls between the ages of 1 month to 18 years. Sick children with CHD were in the pediatric cardiology Bukhara regional diversified children's medical center (Bukhara) in the periods 2010–2015.

The control group consisted of 60 healthy children (34 boys and 26 girls). Verification CHD conducted by the WHO requirements, classified according to the International Classification of Diseases (ICD-10).

All patients underwent clinical, immunological, biochemical, laboratory and functional studies. Studied the cellular and humoral immunity, cytokine (IL-8, IL-10, TNF- $\alpha$ ), thyroid (T3, T4, TSH) and corticoid status (cortisol).

The method of mathematical modeling (2000) developed the CHD flow forecasting program for children (Certificate № DGU02417, 15.02.2012).

**Results and discussion.** Patients with CHD children were distributed by M. F. Zinkovskaya into 3 groups:

Group 1 patients with CHD. Surgical intervention in these children should be carried out in the first hours or days of life — 3 (6.8%);

Group 2 patients, who underwent early operative correction of the CHD is not shown due to minor violations of circulatory dynamics — 18 (40.9%);

3 group of patients with inoperable or unrespectable CHD patients by somatic condition — 23 (52.3%).

The observed group consisted of the remaining 116 patients with children with CHD. Among these patients, which is a planned operation, 79 (68.2%), which operative correction of CHD — 37 (31.8%) was carried out.

The structure of the CHD observed group was: VSD — 47 (40.5%), ASD — 12 (10.3%), TGV — 15 (13.0%), tetralogy of Fallot, 25 (21.5%), the PDA — 11 (9.5%).

Indicators immunogram children to the operational period depending on the type of CHD were varied. When VSD and ASD there is a shortage of T-lymphocytes-helper, enhancing killer activity and the level of CD23+ cells, of IgA ( $P < 0.05$ ). In transposition of the great vessels (TGV) there is a deep deficiency of T-lymphocytes and T-helper cells, increasing the suppressor and killer activity. Lev-

els of the proliferative activity of the cells (CD23 and CD95, CIC) also increased. In tetralogy of Fallot — deficiency T cell/helper, increased TNF- $\alpha$ , IgM and IgA.

Postoperatively, during the first 6 months of the period: the ASD observed increase in the index of immune (CD4/CD8); increase in VSD-relative content of NK-cells 2.4-fold ( $P < 0.01$ ) and a 4-fold increase in titer of IL-10 and TNF- $\alpha$ ; in the TGV and tetrad Fallo deficiency of T-lymphocytes with an increase suppressor (CD8) and especially killer (CD16) activity. The level of apoptosis of cells with a molecule (CD95) and IL-8 increased.

Study concentrations of immunoglobulins G, A and M shown IgA reduction in all kinds of CHD.

Analysis of cytokine status of pediatric patients showed a 4-fold increase in titer of IL-10 and TNF- $\alpha$ , which indicates the strengthening of proliferative processes and coagulation at the VSD. Therefore, the results indicate a complex immunomodulatory effects of TNF- $\alpha$ , which is the only cytokine that causes high levels of IL-10. Described more Wanidworanum C., the existence of a unique self-regulation of TNF- $\alpha$  on the basis of feedback from the IL-10 is due to multi-directional immunomodulatory effects of TNF- $\alpha$ , which is manifested in CHD, particularly in the VSD. Timic-cortical status to the operational period showed: when ASD — decline in both total and free T3, free T4 increase; with VSD, decrease in total T3 and total and free T4; nibble at Fallo — decrease in total T3, free T4 increase; TGV with reductions in both total and free T3 and cortisol. In the postoperative period for all types of CHD observed reduction in both total and free T3 and T4- (secondary hypothyroidism), and for the typical TGV also transient hypocorticism.

**Conclusion:** 1. The state regulation of immunity in children with CHD is characterized by activation of the B-cell level against the backdrop of an imbalance in the population of T — lymphocytes.

2. At the CHD, in particular, is characterized by multidirectional VSD immunomodulatory effects of TNF- $\alpha$ . The immune status at the same time aims at enhancing the proliferative processes and coagulation.

3. The state of NHR of the body determines the course of the CHD. At the same time as the children to the operational and postoperative period for CHD accompanied by a dysfunction of the thyroid and thymus, as well as hypofunction of adrenal glands: there is secondary hypothyroidism, and TGV for typical transient hypocorticism.

4. Forecast of the natural history of the CHD depends on the type and size of the defect, as well as the state of the NHR. For small defects, ASD, VSD with normal NHR of the natural process ends closing.

5. For complex types of CHD patients with age is characterized by the formation of a vicious circle. The presence of heart disease and blood vessels contributes to tissue hypoxia, which in turn contributes to the common ARD. Frequent ARD lead to reduced immunity and formation of foci of chronic infection and delay the physical development. The latter in turn is one of the reasons for surgical correction of late, causing a high risk of postoperative complications, reducing mortality and quality of life.

## References:

1. Beshlyaga V.M., Lazoryshynets V.V. Echocardiography in Cardiovascular Surgery of new-borns//Doctor. 2005; 2: 52–5. (In Russia).
2. Vernovskiy G., Rubenstayn S.D. Research in Perinatology. Cardiovascular disease in newborns//K.: “Molod’”. 2004. 5–96 p. (In Ukrainian).
3. Vinogradov K.V. Congenital heart defects in children: incidence and the current state of problem//Journal of “Child Health”. 2007; 6 (9): 13–9. (In Russia).

4. Degtyaryova E. A. Immunological failure and immunorehabilitation in pediatric kardiologi.//M. – 2003. <http://medvuz.com/med1808/t4/15.php>
5. Dudarev I. V. Immunological and hemodynamic characteristics of children with congenital “ heart defects blue and white types//Immunology (Moscow). 2002; 3: 167–70. (In Russia).
6. Zinkovskiy M. Lazoryshynets V., Rudenko N. Principles of treatment of children with congenital heart defect//Doctor. 2003; 2: 23–5. (In Russia).
7. Kim A. I., Bokeria L. A., Podzolkov V. P. et al. Cardiovascular diseases in the newborn: cardiology and surgical problems//Bulletin of the Russian Academy of Medical Sciences. 2003; 12: 77–80. (In Russia).
8. Knyshov G. V. Cardiac surgery: problems and prospects//Doctor. 2003; 2: 9–11. (In Russia).
9. Knyshov G. V. Cardiac surgery in Ukraine: Past, Present and Future//Heart and blood vessels. 2003; 1: 8–14. (In Russia).
10. Kovalchuk L. V. Problems of Clinical Immunology in the light of new ideas about the innate immunity. Lectures on Pediatrics//Immunology (Moscow) 2010; 9: 18–33. (In Russia).
11. Lukyanova I. S., Sopko Y. O. Congenital heart defects in the fetus: the basic aspects of etiology and risk factors//Perinatology and pediatrics. 2004; 2: 47–50. (In Russia).
12. Mutafian O. A. Congenital heart defects in children. – M.: BINON publishers, 2002; 11–21 p.
13. Nagornaya N. V., Vinogradov K. V. Clinical manifestations of congenital heart defects in children//Journal of “Child Health”. 2009; 5 (20): 5–11. (In Russia).
14. Osokina G. G., Abdulatipova I. V., Korsun A. A. The structure of morbidity and mortality in infants in the first year of life//Physiology and pathology of the cardiovascular system in infants in the first year of life/Edited by M. A. Shkolnikova, L. A. Kravtsova – M.: Publishing House “Medpraktika”, 2002; 146–160 p.
15. Cardiology childhood/Edited by A. D. Tsaregorodtseva, Yu. M. Belozerova, L. V. Bregel. – M.: GEOTAR Media. 2014; 784 p.

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## **Correction of respiratory disorders in patients with ARDS on the background of having obesity**

**Abstract:** Obesity significantly alters lung mechanics, and creates the conditions for rapid decompensation of work of respiratory organs at infectious damage of lungs. Early transfer of patients with community-acquired pneumonia with diffuse bilateral infiltration and obesity in the ICU, the use of non-invasive ventilation and early transfer of mechanical ventilation with mandatory implementation of maneuver ‘Recruitment’ can effectively prosthesis lung function in these patients, helping to reduce the duration of mechanical ventilation and decrease mortality.

**Keywords:** community-acquired pneumonia, acute respiratory distress syndrome, obesity, respiratory support.

### **Relevance of the topic**

In recent years the tendency to the serious course of community-acquired virus and bacterial pneumonia becomes perceptible [1; 2]. Reproduction of viruses of influenza and a parainfluenza II type in an cells of epithelium of respiratory tracts and alveoluses leads to destruction of an respiratory epithelium of the lower respiratory tracts and disturbance of production of surfactant. The considerable part of pulmonary tissue damaged. Alveoli's are fallen down and multiple atelectasis develop, that is followed by a resistant hypoxia. Such pneumonia is characterized by the expressed intoxication syndrome, hemodynamic disturbances, a serious respiratory failure with development of the acute respiratory distress syndrome (ARDS). Despite development of medical technologies the mortality at ARDS remains high, making from 24 to 75% and more at development of a syndrome of multiple organ failure [3; 4].

For effective prophylaxis of development and treatment of ARDS it is necessary to consider the specific risk factors which promote development of this syndrome. It is noticed that patients with the overweight and an obesity have the heavy course of the community-acquired pneumonia which was complicated by development of ARDS, and demanded transfer to intensive care unit (ICU) and a long-term mechanical ventilation [1; 5].

Obesity significantly alters lung mechanics, and creates the conditions for rapid decompensation of work of respiratory organs at infectious damage of lungs. Obesity combines two mechanism of respiratory function disorders: lung volume reduction (restriction) and distal airway narrowing (obstruction), which causes predisposition of patients with obesity to development of ARDS.

In this context, the aim of our study was to improve the results of treatment of ARDS with community-acquired viral and bacterial pneumonia in obese patients by optimizing respiratory support.

### **Materials and methods**

We analyzed the results of treatment of 251 patients with severe community-acquired viral and bacterial pneumonia, complicated by the development of ARDS who were treated in the ICU of City clinical hospital of emergency medical care of Minsk.

The study included patients who meet the following criteria: acute onset of the disease; time of onset (fervescence > 38 °C) prior to the development of ARDS is not more than 7 days; diffuse bilateral infiltration on radiographs; respiratory index (RI, PaO<sub>2</sub>/FiO<sub>2</sub>) < 300 mm Hg; no signs of cardiogenic pulmonary edema; the need for respiratory support.

Hypoxemia has been quantified by the PaO<sub>2</sub>/FiO<sub>2</sub> ratio (the ratio of pulmonary arterial oxygen tension to the fraction of inspired oxygen con-

centration). According to the Berlin criteria of ARDS is divided into three forms: mild ( $200 < RI \leq 300$  mm Hg), moderate ( $100 < RI \leq 200$  mm Hg) and severe ( $RI \leq 100$  mm Hg).

An indispensable condition is the use of mechanical ventilation. In patients with mild — non-invasive mechanical ventilation (NIV) with continuous positive airway pressure (CPAP) or mechanical ventilation with positive end-expiratory pressure (PEEP) levels  $\geq 5$  cm H<sub>2</sub>O; in patients with moderate or severe form of ARDS — mechanical ventilation with PEEP levels  $\geq 5$  cm H<sub>2</sub>O; patients with moderate or severe form of ARDS — mechanical ventilation with PEEP levels  $\geq 5$  cm H<sub>2</sub>O.

Exclusion criteria in the study were as follows: age of patients less than 18 years old and over 80 years; if the patient has severe concomitant respiratory diseases: chronic obstructive pulmonary disease, asthma and others. For an objective assessment of the degree of lung injury severity scale used Lung Injury Score (LIS), proposed by J. Murray (1988). On this scale in points allow for 4 indicators: the degree of lung tissue infiltration according to X-ray of the chest, compliance, RI and the level of PEEP. All patients were calculated body mass index (BMI) as the ratio of body weight in kilograms by the square of height in meters. Ac-

Table 1 – The respiratory evaluation index and severity of lung injury by LIS scale depending on the BMI

BMI, kg/m <sup>2</sup>	Category	The number of patients	RI (PaO <sub>2</sub> /FiO <sub>2</sub> ), mm Hg	LIS, points
$\leq 18,5$	underweight	4 (1,6%)	154,2 [113,7–182,4]*	1,7 [1,45–2,0]*
18,5–24,9	normal (healthy weight)	67 (26,7%)	189,1 [156,2–236,9]*	1,9 [1,5–2,1]*
25–29,9	overweight	89 (35,5%)	147,7 [125,3–195,4]*	2,7 [2,0–3,1]
$\geq 30$	obesity	91 (36,2%)	125,2 [99,2–141,7]	2,6 [2,1–3,2]

Note: \* — index of reliability in relation to parameters of patients with obesity ( $P < 0.05$ ).

Thus, the respiratory index in obese patients — 125.2 [99,2–141,7] mm Hg was significantly lower ( $p < 0,01$ ), than in other groups of patients, indicating severe damage alveolar-capillary membrane. In patients with overweight RI was 147.7 [125,3–195,4] mm Hg, in patients with normal body weight RI was 189.1 [156,2–236,9] mmHg; in patients with underweight RI was 154.2 [113,7–182,4] mm Hg.

The biggest number of points in the evaluation of patients received the LIS scale overweight — 2,7 [2,0–3,1] score and obesity — 2.6 [2,1–3,2] points.

The deposition of fat around the edges and in the mediastinum limits the mobility of the lungs and makes it difficult to breath. Excessive fat accumulation in the abdominal cavity violates diaphragm function and limits its excursion. Expiratory reserve volume and functional reserve capacity is reduced, that affects the permeability of the distal airways. By reducing the expiratory reserve volume below the closing volume of a collapse of the alveoli with the development micro atelectasis.

Also decreases the elasticity of the lung tissue by increasing the blood supply vessels of the lungs, increasing resistance and collapse of the distal airways. In order to overcome the rigidity of the chest, and increased airway resistance patient spends a significant amount of additional energy. A progressive increase in load leads to breathing fatigue and weakness of respiratory muscles, which contributes to the development of acute respiratory failure.

Thus, obese patients (n 91) require a special approach to the intensive care, including the start time, the conditions of the selection mode and ventilation parameters. So we changed the tactics of intensive care for this group of patients, and proposed the concept of 'early transfer' in the ICU. Patients with community-acquired viral and bacterial pneumonia and bilateral infiltrates on chest radio-

graphing to WHO recommendations overweight recorded at BMI  $\geq 25$  kg/m<sup>2</sup>, obesity, a BMI  $\geq 30$  kg/m<sup>2</sup>.

Determination of arterial blood gases were performed in patients at the time of admission to the ICU, after transfer to the ventilator, in the process of selection of the ventilation mode setting, but at least 2 times a day with the use of modular analyzer «ABL800 FLEX», Radiometer (Denmark).

Statistical analysis of the results of research carried out on a computer (Windows 8) using the software package Microsoft Excel. Check the normality of the distribution of the results was carried out using W-Shapiro-Wilk test. Since most of the studied parameters characterized nonparametric distribution, the results are expressed as median and interquartile range (Me [q25–q75]). Significant differences were assessed using the U-Mann Whitney test. The difference compared indicators recognized significant at a value of  $p < 0,05$  and  $p < 0,01$ .

### Results and discussion

Among patients with community-acquired viral and bacterial pneumonia and ARDS, overweight has been registered in 89 (35.5%) and obesity in 91 (36.2%) patients. The respiratory evaluation index and severity of lung injury by LIS scale depending on the BMI are presented in table 1.

graph, and obesity (BMI > 30 kg/m<sup>2</sup>) for the prevention of the development of ARDS must will be transfer in an ICU for supervision and treatment for 1–3 days. This approach led to a further significant reduction in the time between admission at the hospital, in the ICU and the beginning of respiratory support.

In obese patients the following tactics respiratory support has been chosen: early non-invasive ventilation (NIV), an early transfer to the mechanical ventilation (translation criteria: PaO<sub>2</sub>/FiO<sub>2</sub> < 175 mmHg after 1 hour of NIV). Mechanical ventilation compliance with key provisions of the concept of 'safe' ventilator.

Given the high risk of hypoventilation and aspiration during tracheal intubation, intubation was performed in all patients in the state with the head of the bed elevated. Criterion for proper placement of the patient — a horizontal line connecting the sternum and the patient's ear. Immediately after intubation to improve oxygenation and to prevent/eliminate atelectasis carry out maneuver 'Recruitment' under the control of hemodynamic parameters.

As a result, transfer into the mechanical ventilation was required 69 (75.8%) of 91 patients with obesity. These patients were divided into 2 groups. The control group consisted of 31 patients who were treated with mechanical ventilation according to conventional techniques (2009–2010). The main group consisted of 38 patients who underwent respiratory support the proposed method (2011–2016). According to age, sex, severity of damage to the alveolar-capillary membrane patients of comparison groups were comparable. Comparative characteristics of patients main and control group are presented in table 2.

As a result of the proposed method the time from admission to hospital before being transferred to the ICU decreased and was in the main group on average  $1,2 \pm 0,4$  hours versus  $2,04 \pm 1,1$  days in the control group.



Table 2. – Comparative characteristics of patients main and control group

Parameters		Main group (n=38)	Control group (n=31)
Sex	male	25 (65,8%)	17 (54,8%)
	female	13 (34,2%)	14 (45,2%)
Age, years		48,9 [42,5–58,7]	48,0 [38,2–53,7]
RI, mmHg		143,0 [127,4–173,2]	137,0±18,2
LIS, points		2,6 [2,1–2,91]	2,7 [2,45–3,1]

Dynamics of changes in RI are presented in Figure 1.

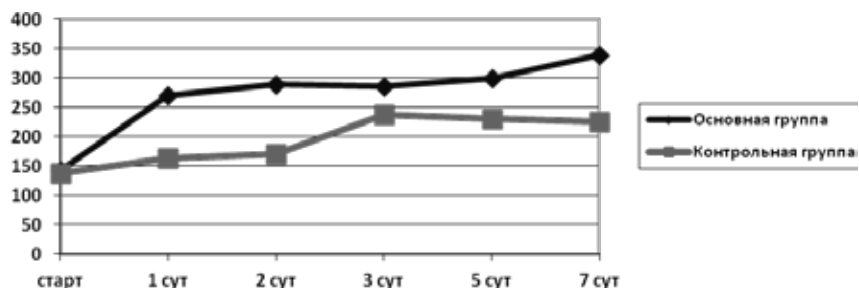


Fig. 1. Dynamics of respiratory index

As shown in the graph presented, in patients of the main group respiratory index increased much faster than the control ( $p < 0,05$ ). This suggests that early and mandatory implementation of 'Recruitment' maneuver in patients with ARDS on the background of obesity is already possible to eliminate atelectasis during the 1st day of mechanical ventilation has led to the progressive improvement of oxygenation. Number of days on mechanical ventilation, decreased from  $11,1 \pm 10,2$  to  $8,2 \pm 3,6$  days. The mortality rate decreased from 42% (corresponding to world statistics) to 15.8%.

### Conclusions

Obesity — a risk factor for ARDS and severe course in patients with community-acquired pneumonia. Early transfer of patients with bilateral infiltrates on chest radiograph and obesity in the ICU, early non-invasive ventilation and early transfer to mechanical ventilation (translation criteria:  $PaO_2/FiO_2 < 175$  mmHg after 1 hour conducting NIV) с mandatory implementation of maneuver 'Recruitment' can effectively prosthesis lung function in these patients, helping to reduce the duration of mechanical ventilation and decrease mortality.

### References:

1. Полушин, Ю. С. Вирусная пневмония грипп А (H1N1), осложненная ОРДС/Ю. С. Полушин [и др.]//Общая реаниматология. – 2010. – № 3. – С. 15–22.
2. Чучалин, А. Г. Грипп: уроки пандемии//Пульмонология. Приложение: «Грипп А/Н1N1: уроки пандемии». – 2010. – С. 3–8.
3. Incidence and outcomes of acute lung injury/G. D. Rubenfeld [et al.]//N Engl J Med. – 2005. – Vol. 353. – P. 1685–1693.
4. Mortality Rates for Patients With Acute Lung Injury/ARDS Have Decreased Over Time/M. Zambon, J.-L. Vincent//Chest. – 2008. – Vol. 133. – P. 1120–1127.
5. Светлицкая, О. И. Острое повреждение легких у пациентов с вирусно-бактериальной пневмонией на фоне избыточной массы тела и ожирения/О. И. Светлицкая, И. И. Канус//Медицинские новости. – 2013. – № 3. – С. 6–10.
6. Body mass index is associated with the development of acute respiratory distress syndrome/M. N. Gong [et al.]//Thorax. – 2010. – Vol. 65. – P. 44–50.

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## Landscape of transition of microorganisms to internal organs during the experimental bacterial translocation

**Abstract:** The purpose of the scientific work was study of the landscape of microorganisms grown (LMG) from the internal organs of laboratory animals in experimental acute obstruction of the small (EAOSI) and large intestine (EAOLI). It has been established that Gram-negative sticks, Gram-positive cocci and anaerobes were identified in the experimental model EAOSI. Anaerobic translocation low level of ability. With the increase in the duration of microorganisms translocation (MT) the shutter all the members are equally spread. EAOSI there is a big difference between the recovered Staphylococcus spp and Enterococcus spp recognized as one of the main microbiological criteria.

**Keywords:** experimental obstruction, the small intestine, the large intestine, landscape of microorganisms, bacterial translocation, Gram-positive cocci.

As you know, representatives of the normal microflora of the human large intestine — in-digen and facultative organisms with balance disorders (dysbiosis), with an increase of permeability through the mucous membrane of the intestine, would be increased passage of viable microorganisms in a variety of internal organs through the blood and lymph. “Bacterial translocation” (BT) this state, along with the name of microorganisms passing on these organs is called MT [2; 9; 10; 11].

There are different opinions about the importance of this phenomenon: the first supporters consider it one of the pathogenetic links of various diseases [1; 3; 7], while others will interpret this as a factor in protecting the organism [4; 6]. Taking into account the usefulness of the experimental studies, we started it.

**Purpose of the work.** The study and evaluation of the LMG from the internal organs of laboratory animals in (EAOSI) and (EAOLI).

**Materials and methods.** During implementation of our scientific research work, we strictly followed the biosecurity rules and principles of ethics in work with experimental material. A total of 368 surveys, white, wild mice, weighing 25 grams and higher, the age of 2–3 months. Feeding and care of laboratory animals, division into groups and preparation those for the experiments were carried out in the traditional methods.

We used an experimental model EAOS and EAOLI with the introduction of our modifications proposed by Kruglyanskiy Y.M. [5] in the formation of an EAOS and EAOLI. Conducted 3 series of research work.

All laboratory animals divided into 4 groups: Group 1 — EAOSI,  $n=72$ ; Group 2 — EAOC,  $n=72$ ; Group 3 — animals, which were opened in the abdominal cavity, but not performed obturation (group comparisons,  $n=72$ ); Group 4 — intact laboratory animals (control group,  $n=24$ ). In turn, 1, 2 groups were divided into subgroups: 1a, 2a — EAOSI EAOC and lasted 24 hours ( $n=8$ ); 1b, 2b — EAOSI and EAOC, lasted for 48 hours ( $n=8$ ); 1c, 2c — EAOSI and EAOK, lasted for 72 hours ( $n=8$ ).

These deadlines are selected as a result of the wall of the intestine obstruction mainly according to the pathological, morphological, clinical changes [3; 5].

Advanced bacteriological study was carried out with respect to microorganisms grown from the internal organs of laboratory animals. Identification and differentiation of the seeded microorganisms carried out by Bergey's [8]. To do this, the nutritional resources of the company «HiMedia» (India) were used.

Statistical analysis of results of biomedical research were carried out on the personal computers with processor “Pentium 4”, using “Excel” special program.

**Results and discussion.** According to the deadlines of the experiment, LMG from the mesenteric lymph nodes (MLN) in the experimental model EAOSI were different. Among all strains, *Escherichia* spp were most common. Particularly attracted the attention that the 24 and 48 hours of experience was grown only *Escherichia* spp ( $n=10$  and  $n=7$ , respectively) as a monoculture. After formation of EAOSI, grown Gram-negative (*Enterobacter* spp, *Citrobacter* spp, *Proteus* spp), Gram-positive (*Staphylococcus* spp, *Enterococcus* spp) and anaerobes (*Bacteroides* spp) as a monoculture not have been grown from the MLN of used laboratory animals.

The association of microorganisms has got a different situation. Although the experience of leadership in quantitative terms even if it is still owned by *Escherichia* spp ( $3 < 0.001$ ) was observed in other microorganisms rawled.

If after 24 hours in strains of microorganisms in the form of the association of sprouts  $45.6 \pm 7.3\%$  ( $n=21$ ), *Escherichia* spp, here in after referred to as *Proteus* spp ( $17.4 \pm 5.6\%$ ,  $n=8$ ), *Enterobacter* spp ( $15.2 \pm 5.3\%$ ,  $n=7$ ), *Staphylococcus* spp ( $10.9 \pm 4.6\%$ ,  $n=5$ ), *Citrobacter* spp ( $8.7 \pm 4.2\%$ ,  $n=4$ ), *Enterococcus* spp ( $2.2 \pm 2.1\%$ ,  $n=1$ ). *Bacteroides* spp as monocultures and associations have not been grown.

After obturation, 48 hours later, growth of microorganisms increased in amount, but it remained similar to the above tendency. According to the the division of interest was as follows: *Escherichia* spp  $47.4 \pm 4.6\%$  ( $n=55$ ), *Proteus* spp  $26.7 \pm 4.1\%$  ( $n=31$ ), *Enterobacter* spp  $8.6 \pm 2.6\%$  ( $n=10$ ), *Staphylococcus* spp  $7.8 \pm 2.5\%$  ( $n=9$ ), *Citrobacter* spp  $6.7 \pm 1.8\%$  ( $n=9$ ), *Enterococcus* spp  $0.9 \pm 0.8\%$  ( $n=1$ ).

Experience the next term (72 hours) quantitative microorganisms along with the more detached from their ratio to one another also changed. *Proteus* spp, *Escherichia* spp on the reduced rate of other microorganisms on a significant scale has not changed. 72 hours, depending on the level of MT in the following sequence: *Escherichia* spp ( $36.6 \pm 4.2\%$ ,  $n=48$ ), *Proteus* spp ( $21.4 \pm 3.6\%$ ,  $n=28$ ), *Enterobacter* spp ( $16.0 \pm 3.2\%$ ,  $n=21$ ), *Staphylococcus* spp ( $12.2 \pm 2.9\%$ ,  $n=16$ ), *Citrobacter* spp ( $11.8 \pm 2.7\%$ ,  $n=16$ ), *Enterococcus* spp ( $0.8 \pm 0.7\%$ ,  $n=1$ ), *Bacteroides* spp ( $0.9 \pm 0.6\%$ ,  $n=1$ ). It is noteworthy that, irrespective of the length of experience did not change the amount of *Enterococcus* spp, and *Bacteroides* spp. We believe that this EAOSI MT rate is low, it means that translocations ability and the ability of other Gram-sticks low against Gram-positive cocci. The evaluation of the intensity of BT EAOSI pathogenetic mechanism is based on the formation of an experimental model of EAOSI that this situation should be taken into account.

Experimental model EAOSI MLN has grown compared to the corresponding period of microorganisms (Figure 1) percent of strains of *Escherichia* spp other increases decreased with increasing duration of the experience. We believe that this form of association due to other microorganisms.

Experimental model EAOSI obturation the next 24, 48, 72 hours microorganisms rawled MLN from a lot of different changes in the liver retained. Liver only form of monoculture, *Escherichia* spp collected: 9 strain after 24 hours, 48 hours, 12 stamps, and 72 hours after 9 stamps. Other microorganisms only in the form of associations failed. *Escherichia* spp, 24 hours later, all the grown strains of  $50.0 \pm 10.2\%$  ( $n=12$ ), 48 hours after it was  $43.1 \pm 6.5\%$  ( $n=25$ ), 72 hours after the  $47.5 \pm 5.0\%$  ( $n=47$ ), respectively. Common interest between the difference is not statistically reliable ( $p > 0.05$ ).

Thus, the level of *Escherichia* spp met in the increase of the amount, depending on the duration of the experiment thought about it, measured in relation to the other microorganisms.

After 24 hours, *Proteus* spp and *Staphylococcus* spp respectively  $16.7 \pm 7.6\%$  ( $n=4$ ) and  $20.8 \pm 8.3\%$  ( $n=5$ ), established, 48, and 72 hours after they are respectively were as follows:  $27.6 \pm 5.9\%$  ( $n=16$ ),  $12.1 \pm 4.3\%$  ( $n=7$ ) and  $20.2 \pm 4.0\%$  ( $n=20$ ),  $11.1 \pm 3.2\%$  ( $n=11$ ). *Enterobacteria* (*Enterobacter* spp, *Citrobacter* spp), along with the number of microorganisms as defined above, interest rates can not compete. *Enterococcus* spp, and *Bacteroides* spp MLN parameters were similar results, that is, detecting significant changes in the risks associated with a period of EAOSI and reliable.

The results also differ in terms of the number of microorganisms on the divorce, or a ratio of one significant difference was detected. This member received compensation in the form of monoculture, mainly *Escherichia* spp. Identification of these microorganisms in the

form of the association are the advantages clearly visible. 48 hours after the association's stamp form of 20 and 9 ( $45.0 \pm 11.1\%$ ), which is owned by *Escherichia* spp, 5 ( $25.0 \pm 9.7\%$ ), *Staphylococcus* spp, and 4 ( $20.0 \pm 8.9\%$ ), *Proteus* spp, and 2 ( $10.0 \pm 6.7\%$ ), *Enterobacter*

spp. The rest of the microorganism (*Citrobacter* spp, *Enterococcus* spp, *Bacteroides* spp) identified this term. This trend re-mained after 72 hours. Treeless *Citrobacter* spp ( $9.1 \pm 6.1\%$ ,  $n = 2$ ), *Enterococcus* spp ( $4.5 \pm 4.4\%$ ) were identified.

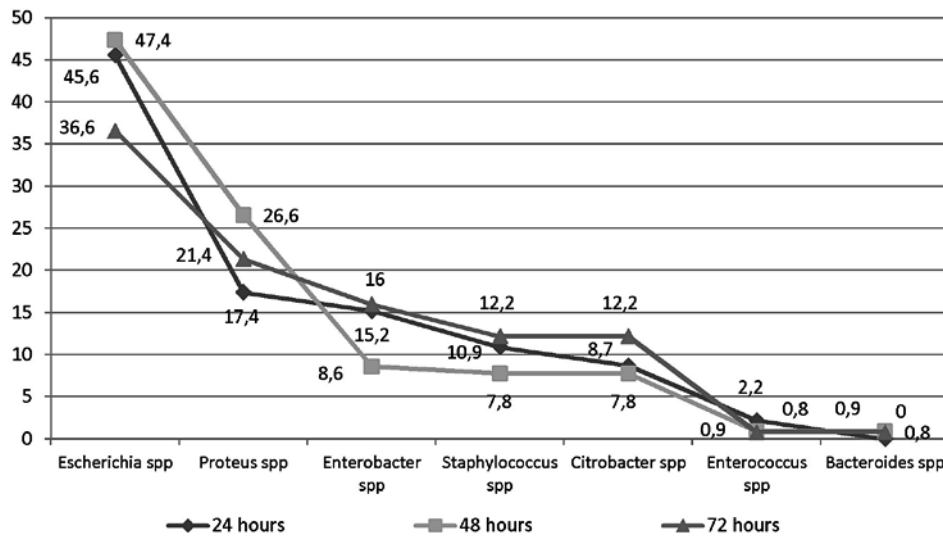


Figure 1. Experimental EAOSI MLN of the results of the study, compared to the corresponding period of sprouts and microorganisms, %

Lungs seedling also done a lot of *Escherichia* spp charged with distinction. Due to a lack of statistical analysis of the number of strains collected, we find it necessary to comment on all the numbers, but the trend of the previous commented exchange want to admit the rest.

Research at the next stage of our game was similar to the above research. Experimental model MLN strains of microorganisms from EAOSI to germinate, such as *Escherichia* spp. 24 hours later after obturation monoculture 6 stamp detached, the association is in the form of 23 stamps. This form of association for all strains of microorganisms to  $47.9 \pm 7.2\%$ , respectively. Followed by *Enterococcus* spp ( $14.6 \pm 7.2\%$ ,  $n=7$ ), *Proteus* spp ( $12.5 \pm 4.8\%$ ,  $n=6$ ), *Enterobacter* spp ( $12.5 \pm 4.8\%$ ,  $n=6$ ), *Citrobacter* spp ( $8.3 \pm 4.0\%$ ,  $n=4$ ), *Staphylococcus* spp ( $4.2 \pm 2.9\%$ ,  $n=2$ ) busy. This term has not been identified *Bacteroides* spp. The main difference from the experimental EAOSI *Enterococcus* spp's a lot to be identified.

48 hours later a changed ratio of microorganisms. This term *Escherichia* spp ( $45.6 \pm 5.6\%$ ,  $n=36$ ), followed by *Proteus* spp ( $15.2 \pm 4.0\%$ ,  $n=12$ ), *Enterobacter* spp ( $12.7 \pm 3.8\%$ ,  $n=10$ ) respectively. Other strains of *Enterococcus* spp slightly less ( $11.4 \pm 3.6\%$ ,  $n=9$ ) were collected. It is run pilot EAOSI less than the total number of strains, compared with 1.5 times (116 stamps 79 stamps) have been identified.

72 hours after the results are a little different, if EAOSI at the same time from the as-association, a total of 131 in the form of stamp collection, at 1.2 times this figure (160 strain). *Escherichia* spp, the total number of strains from  $38.1 \pm 3.8\%$  ( $n=61$ ), respectively. Lack of reliable compared to the previous terms of this indicator ( $P < 0.05$ ) after 72 hours of *Enterococcus* spp ( $17.5 \pm 3.0\%$ ,  $n=28$ ).

Each model offers 72 hours after the results of the comparative study of the landscape of the MLN has grown microbes in Figure 2.

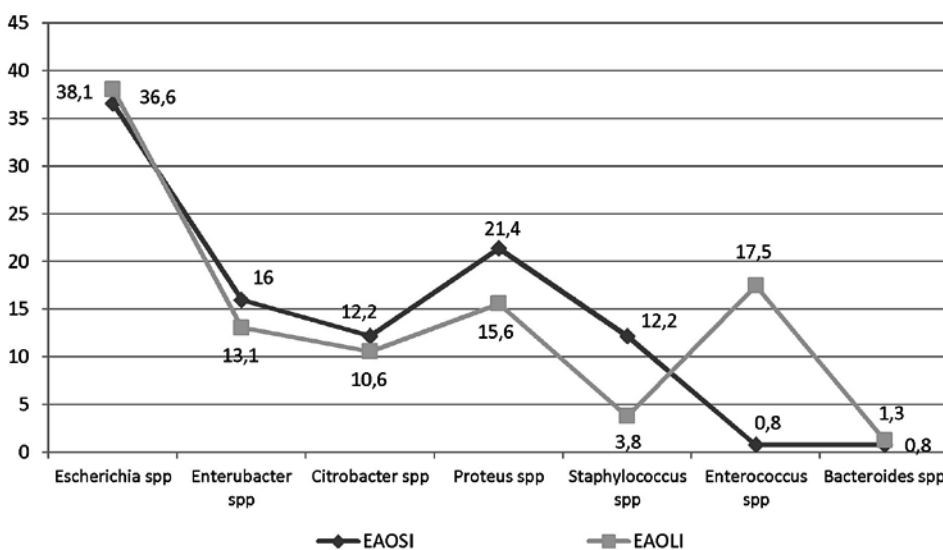


Figure 2. Experimental EAOSI and 72 hours later after the obturation in the EAOSI, MLN of the microbes collected from the landscape, %

Figure 2 shows that both views of the model identified by microorganisms in the form of association clearly shows differences in the level of invention. In each case, the intensity of BT leading difficult to distinguish microorganisms.

Results of experimental liver has LMG MLN figures are similar. At the same time, micromonocultural concerning the association found that only 24 and 48 hours respectively 3 (*Escherichia* spp) and 5 (*Escherichia* spp) case. As the leadership of the association, in the form of MLN *Escherichia* spp. *Escherichia* spp 24 hours after  $50.0 \pm 11.2\%$  ( $n = 10$ ) identified in the case, other microorganisms (*Proteus* spp, and *Enterobacter* spp, *Citrobacter* spp, *Enterococcus* spp),  $50.0 \pm 11.2\%$ . Unlike EAOSI not identify *Staphylococcus* spp.

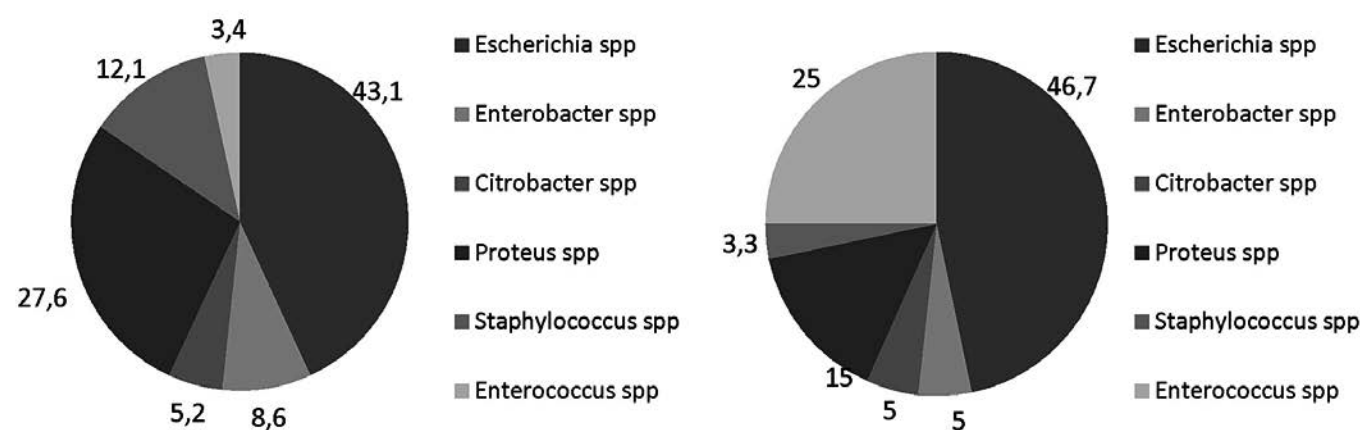


Figure 3. Experimental EAOSI and after the obturation 48% of the liver has LMG

Experience the next term (72 hours), the number has grown strains compared to the previous period to 2.0 times (119 stamps 60 stamps). The percentage of microorganisms different from each other, positive results have been obtained. At the same time, *Escherichia* spp liver microorganisms him after  $48.7 \pm 4.6\%$ , respectively. This option MLN has grown *Escherichia* spp, which is more than 1.3 times the amount of reliable, EAOSI index ( $p > 0.05$ ).

At the same time *Enterobacter* spp ( $6.7 \pm 2.3\%$ ,  $n = 8$ ), *Citrobacter* spp ( $5.9 \pm 2.2\%$ ,  $n = 7$ ), *Proteus* spp ( $16.8 \pm 3.4\%$ ,  $n = 20$ ), *Bacteroides* spp ( $1.7 \pm 1.2\%$ ,  $n = 2$ ) compared to the same pe-riod of the indicators EAOSI whether significant difference ( $p > 0.05$ ), *Staphylococcus* spp ( $1.7 \pm 1.2\%$  and  $11.1 \pm 3.2\%$ ) and *Enterococcus* spp ( $18.5 \pm 3.8\%$  and  $2.0 \pm 1.4\%$ ) on the parameters of the difference was significant ( $p < 0.001$ ).

Identification of a spleen is also dominated by the amount of microorganisms *Escherichia* spp, and 48 hours later in the form of the Association charged him 7 of 14 stamps. *Enterobacter* spp, *Citrobacter* spp, *Staphylococcus* spp not identified, but even if it is less than 72 hours after their rawled. 48 and 72 hours in other strains of *Proteus* spp and *Enterococcus* spp significantly greater in the head. Thus, the increase in the number of *Enterococcus* spp can be seen as a remarkable situation.

MLN results obtained from the lungs, liver and spleen variables are no similar laws similar trend *Escherichia* spp other microorgan-

48 hours after the results were completely different, the leadership is still *Escherichia* spp ( $46.7 \pm 6.4\%$ ), followed by *Enterococcus* spp  $25.0 \pm 5.6\%$ , ( $n = 15$ ) and *Proteus* spp ( $15.0 \pm 4.6\%$ ,  $n = 9$ ) out. These results suggest that changes in the parameters of the EAOSI trend similar to that of the case (58 stamps of 60 stamps), were differences in the ratio of one of the microorganisms.

If EAOSI *Proteus* spp  $27.6 \pm 5.9\%$  ( $n = 15$ ), *Staphylococcus* spp  $12.1 \pm 4.3\%$  ( $n = 7$ ), *Enterococcus* spp  $3.4 \pm 2.4\%$  ( $n = 2$ ) is charged, this is one of the parameters of a credible difference ( $p < 0.05$ ) respectively  $15.0 \pm 4.6\%$  ( $n = 9$ ),  $3.3 \pm 2.3\%$  ( $n = 2$ ) and  $25.0 \pm 5.6\%$  ( $n = 15$ ) (Figure 3).

isms to germinate. Due to a lack of statistical analysis of the number of strains collected from all found that the numbers are interpreted in an illegal.

**Conclusions.** 1. It has been established that Gram-negative sticks, Gram-positive cocci and anaerobes were identified in the experimental model EAOSI. Experience all the time (24, 48, 72 hours), the amount of *Escherichia* spp other strains  $\frac{1}{2}$  part. Across all strains  $\frac{3}{4}$  enterobacteria. The ability to translocation against Gram-negative bacteria are Gram-positive cocci 3–4 times higher.

2. Anaerobic (*Bacteroides* spp) tranlocation low level of ability and experience with in the quantitative aspects of change.

3. All members of the growing MT the shutter time in a uniform distribution, and all indicators MLN clearly seen in the liver, spleen, and in particular the lungs, the microorganisms in the form of monoculture and association met thought about it, was not evident in the intensity of BT.

4. Experimental model of EAOSI LMG MLN been identified by credible distinction, which is, first of all characterized by an increase in the number of strains allocated 2.0 times, second 48, and 72 hours later, *Enterococcus* spp, *Escherichia* spp put to the next problem.

5. Experimental EAOSI there is a big difference between the recovered *Staphylococcus* spp and *Enterococcus* spp recognized as one of the main microbiological criteria.

## References:

1. Almagambetov K. K., Bondarenko V. M. Simulation of translocation of intestinal microflora on conventional animals // Medical journal – Moscow, 1991; 8: 11–7. (In Russian).
2. Galeev Y. M., Popov M. V., Salato O. V. Methods of study of the propagation of bacterial cells // Siberian Journal of Medicine. – Irkutsk, 2011; 3: 18–23. (In Russian).
3. Gostishchev A. N., Afanasiev Y. M., Kruglyanskiy D. N., Sotnikov V. K. Bacterial translocation in acute intestinal obstruction // Journal of Medical Sciences – Moscow, 2006; 9–10: 34–8. (In Russian).

4. Gritsenko VA Properties of E. coli isolated from mice with bacterial translocation after immobilization stress//Medical journal – Moscow), 2000; 2: 37–41. (In Russian).
5. Kruglyanskiy Y. M. Bacterial translocation with obstructive ileus (experimental research): Abstract. Dis. cand. med. sciences. – Moscow, 2007; 24 p.
6. Nikitenko V. I., Tkachenko E. I., Stadnikov A. A. Translocation of bacteria from the gastro-intestinal tract – a natural defense mechanism//Experimental and clinical gastroenterology – Moscow, 2004; 1: 48–53. (In Russian).
7. Nurmukhamedov H. K. Bacterial translocation in infectious-toxic shock in infants//Infection, immunity and pharmacology – Tashkent, 2004; 1: 103–4. (In Russian).
8. The determinant of bacteria Burgi. Edited by J. Holt, N. Krieg, Sneath P., J. Staley, Williams C. – Moscow: “Mir” 1997; Vol. 1–2.
9. Ergashev V. A., Nuraliev N. A. The phenomenon of bacterial translocation and location of microorganisms in its formation//Infection, immunity and pharmacology – Tashkent, 2014; 3 (2): 236–9. (In Russian).
10. Berg R. D., Garlington A. W. Translocation of certain indigenous bacteria from the gastro-intestinal tract to the mesenteric lymph nodes and other organs in a gnotobiotic mouse model//Infection and immunology, 1979; 23 (2): 403–11.
11. Berg R. D. Bacterial translocation from the intestines//Jikken Dobutsu, 1985; 34 (1): 1–16.

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## Using immunocorrection therapy in patients with chronic pancreatitis

**Abstract:** The immune system studied in 36 patients with chronic pancreatitis (CP) and 32 healthy individuals. In patients with CP showed a deficiency of T-lymphocytes and subset tension humoral immunity and cytokine profile. Using Thymoptinum (dose of 0.8–1.0 mg per course) in conjunction with conventional treatment in patients with CP led to an increase in cellular immunity and stabilization of cytokine levels.

**Keywords:** the immune system, T- and B-link immunity, cellular immunity, humoral immunity, link, immunotherapy, pancreatitis.

Changes in the environment, technology, food industry, lifestyle and spreading “western food” are the reason of growing the diseases of the pancreas. Over the past 30 years, marked by the global trend to an increasing in the incidence of acute and chronic pancreatitis (CP) is more than 2 times [2; 3; 10].

CP prevalence, increasing morbidity and temporary disability due to disability is an important social and economic problem of modern medicine. In the structure of morbidity gastrointestinal organs CP is from 5.1 to 9%, and in general clinical practice — from 0.2 to 0.6% [3, 5–7; 12].

Inflammation in the pancreas can develop due to malfunction of the immune system, which are based on allergic reactions, as well as response to bacterial factor [1; 5; 8].

However, immune disorders and their correction in patients with CP are still poorly studied to the present time.

**The purpose of the work** — studying of the immune system parameters and conduct immunocorrecting treatment in patients with CP.

**Materials and methods.** 36 patients were examined (33–65 ages) with a diagnosis of CP. The diagnosis was carried out on the basis of complaints, medical history, and objective laboratory tests, instrumental data: ultrasound, fibrogastroduodenoscopy, survey radiography of abdominal organs. The control group consisted of donors from 32 healthy subjects (25–55 ages).

The concentration of serum immunoglobulins (SI) classes A, M and G were determined by radial immunodiffusion (Mancini G., 1965).

The parameters of cellular immunity (T-lymphocytes and a subpopulation, B-lymphocytes) were identified using monoclonal antibodies (LLC “Sorbent Service”, Russia) [4]. Quantification

of levels TNF- $\alpha$ , IL-6, IL-4 in serum performed using reagents set ProCon (LLC “Protein contour”, St. Petersburg) by ELISA.

Immunotherapy was carried out in 15 patients. Thymoptinum (Uzbekistan) was used as an Immunological drug. 0.8–1.0 mg per treatment (dose 100 mg/day for 8–10 days). The indicators of immunity was studied twice: before — and after 1 month after treatment).

**Results and discussion.** In patients with CP found immunodeficiency cell component: 0.7-times whatever suppression of the total lymphocyte pool — T (CD3) —  $35.3 \pm 2.6\%$  as compared with the control group —  $52.4 \pm 1.8\%$  ( $p < 0.001$ ); 0.8-fold decrease in the absolute number of T (CD3)-cells ( $p < 0.05$ ).

Also determined the oppression subpopulations of T-lymphocytes, have the helper-suppressor function — Th (CD4) —  $29.5 \pm 1.1\%$  ( $p < 0.001$ ) and  $341.8 \pm 32.1$  cells/1 mcl blood ( $p < 0.001$ ) (control in  $36.5\% \pm 0.7$  and  $616.4 \pm 44.3$  cells/1 mcl of blood, respectively), the contents of Ts (CD8) —  $13.8 \pm 1.4\%$  ( $p < 0.05$ ) and  $127.3 \pm 9.8$  cells/1 mcl blood ( $p < 0.01$ )

On the side of B (CD19) — cell link, opposite, the tendency to increase as the relative parameter —  $20.6 \pm 2.3\%$  ( $p < 0.05$ ), which was 1.4 times higher than those of the control group values, such and totally — 1.7-fold increasing —  $385.8 \pm 33.4$  cells/1 mcl of blood (in the control —  $230.1 \pm 26.7$  cells/1 mcl of blood).

An appreciable activation of B-cell immunity against the background suppression of T cells in CP reflected in the SI spectrum. For example, attention is drawn to the increasing in IgA production to  $3.97 \pm 0.41$  g/l ( $p < 0.05$ ), which may be a reflection of the organism immune adjustment CP patients in response to enzymatic intoxication.

It was found authentically a high content of IgG —  $22.42 \pm 0.75$  g/l ( $p < 0.001$ ) (in control of  $15.9 \pm 0.94$  g/l). IgM concentra-

tions were within thenormal  $1.7 \pm 0.2$  g/l ( $p > 0.05$ ). Under the influence of conservative treatment did not happen recovery of T (CD3)-cell, and its subset profile. At the same time there was a tendency in decreasing SI classes IgA and IgG.

Analysis of the spectrum of cytokines has shown that in patients with CP during the aggravations markedly increases the parameters of pro-inflammatory cytokines: TNF- $\alpha$  up to  $202.6 \pm 22.3$  pg/ml (normal —  $24.5 \pm 5.1$  pg/ml,  $p < 0.001$ ) and IL-6 was increased 6 times ( $317.4 \pm 53.5$  pg/ml and  $47.8 \pm 11.2$  pg/ml, respectively, at  $p < 0.001$ ). The level of anti-inflammatory cytokine IL-4 have increased by 4.3 times compared with the norm, which was statistically confirmed ( $157.5 \pm 36.7$  pg/ml and  $32.6 \pm 14.3$  pg/ml, respectively,  $p < 0.001$ ).

Thus, in patients with CP have found secondary immunodeficiency, for which we used to eliminate Thymoptinum applied in combination with basic therapy (antifermental agents, spasmolytics, antibacterial and other drugs).

Immunotherapy resulted to an increasing in both relative —  $54.7 \pm 3.2\%$ , and the absolute values of T (CD3)-lymphocytes —  $992.3 \pm 64.8$  cells/1 mcl of blood. At the same time, increasing and stabilization were observed in Th (CD4) and Ts (CD8). This immunoregulatory index consisted 2.2.

IgA concentration is moderately decreased during the treatment process. There was a trend in increasing IgM to  $2.23 \pm 0.2$  g/l IgG to  $23.7 \pm 1.62$  g/l after 1 month after the treatment, however, it should be noted that in the period of remission was highest IgG levels, that was probably due to the severity and duration of the pathological process, as well as the reduction of reparative processes in the pancreas.

Carrying out traditional treatment in patients with CP was noted moderate decreasing levels of TNF- $\alpha$ , IL-6 ( $p < 0.05$ ; compared with the data before the treatment) and a weak increase in IL-4 and  $172.3 \pm 41.1$  pg/ml. Influenced by immunocorrective therapy conducted on a back-ground of the traditional treatment, in patients with CP was revealed marked reduction of pro-inflammatory cytokines: TNF- $\alpha$  to  $118.4 \pm 29.1$  pg/ml, IL-6  $133.6 \pm 51.8$  pg/ml. Moreover, it was observed the reduction in production of anti-inflammatory cytokine IL-4  $95.2 \pm 27.4$  pg/ml.

It should be emphasized that our data is quite combined with the works of other authors in this research direction [9; 11].

Positive picture of changes in the immune system, in most cases combined with the improvement of the clinical course of CP, which was reflected in the reduction of toxicity, reducing the intensity of pain and improving the condition of patients.

Conclusions:

1. The CP patients was observed significant changes in the functioning of most of the parameters of the immune system, namely the profound suppression of T (CD3)-lymphocyte subpopulations and the tension of immunity.

2. In patients with CP it was revealed a trend in the growth rates of pro- and anti-inflammatory cytokines, to some extent characterized by the pathological process that occurs in the pancreas.

3. The combination of traditional treatment and Thymoptinum is effective in patients with CP, as it contributed to the restoration and stabilization of most of the parameters of the immune system.

#### References:

1. Akhmedov V. A., Budygin A. L., Dolgikh V. T. The participation of immunological mechanisms in the pathogenesis of chronic recurrent pancreatitis//Siberian Journal of Medicine. 2011; 3: 72–4. (In Russian).
2. Bornman PC, Botha JF, Ramos JM, et al. Guideline for the diagnosis and treatment of chronic pancreatitis//S Afr Med J. 2010; 100 (12, Pt 2): 845–60.
3. Conwell D. L., Banks P. A. Chronic pancreatitis//Curr. Opin. Gastroenterol. 2008; 24 (5): 586–90.
4. Filatov A. V., Bachurin P. S., Markova N. A. et al. The panel of monoclonal antibodies against antigens of human lymphocytes//Exp. oncol. 1989; 11 (2): 28–36. (In Russian).
5. Gubergrits N. B., Skopichenko S. V. Practical pancreatology. Donetsk; 2007; 243 p. (In Russian).
6. Ohlobystin A. V., Bayarmaa N. Modern possibilities of therapy of chronic pancreatitis//Doctor. 2010; 2: 10–14. (In Russian).
7. Kuhn RJ, Gelrud A, Munck A, Caras S. CREON (Pancrelipase Delayed-Release Capsules) for the treatment of exocrine pancreatic insufficiency//Adv Ther. 2010; 27 (12): 895–916.
8. Kulik I. A., Boyko V. V., Shevchenko A. N. et al. The immunological status of patients with chronic recurrent pancreatitis//“Innovations in Science”: a collection of articles based on XXIII International correspondence scientific-practical conference. (12 August 2013); Novosibirsk: “SibAK”, 2013; 141–150 p. (In Russian).
9. Lazarchuk T. B. Dynamics parameters T- and B-links of immunity patients with chronic pancreatit patients//Bull. of the Sci Ach. 1999; 2: 76–9. (In Ukrainian).
10. Lopatkin T. N. Chronic pancreatitis: risk factors, prognosis and treatment//Clin. Farmacol. and ter. 2005; 1: 21–3. (In Russian).
11. Nazarenko D. P., Konoplja A. I., Ivanov S. V. et al. Effects Immunocorrecting polyoxidonium and immunofana in acute pancreatitis//Kursk scientific-practical. Bulletin “Man and his health”. 2005; 4: 45–51. (In Russian).
12. Nair R. J., Lawler L., Miller M. R. Chronic Pancreatitis//Am Fam Physician. 2007; 76 (11): 1679–88.

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## Etiology intrauterine growth retardation

**Abstract:** The most common risk factors for preterm birth children with Intrauterine growth — socio-biological, maternal, placental, fruit factors.

**Keywords:** Intrauterine growth restriction, preterm infants.

**Relevance.** Delay Syndrome fetal development is a topical issue for modern obstetrics and pediatrics, as it is a major cause of perinatal morbidity and mortality, and may lead to serious consequences for child development.

**Results and discussion.** In this regard, an attempt was made to evaluate the etiology of intrauterine growth retardation, highlighting recommended in the literature four basic groups of disease risk factors. The first group — social and biological risk factors. For this refined age of women giving birth, their profession and occupation. It was found that 9.8% of the cases mentioned the birth of children with intrauterine growth retardation from age nulliparous and in 1.9% of cases — from young nulliparous. When accounting profession and occupational exposures revealed that the majority of women (41.2%) were disabled (housewives), in most cases, having a low level of material in the family; 9.8% of women in childbirth were pupils and students who have psychological and physical stress, as well as insufficient and unbalanced nutrition have extremely adverse effects on fetal development. For students of the frequency of occurrence is followed by women engaged in heavy physical labor (9.7%) and women working in hazardous work (3.9%). It is such a profession as a painter, pressovschitsa, shtampovschitsa and work in paint shops.

The second group of risk factors is a so-called maternal factors that lead to fetal growth retardation. Here, in addition to women's nutritional defects (deficiency of protein, vitamins, zinc and other trace elements) are various contributing factors maternal health: pregnancy pathology, bad habits, intake of certain medications. For example, among mothers related diseases in 31.3% of cases, there is cardiovascular disease (various options neurocirculatory dystonia, rheumatism, varicose veins), in 29.4% of cases — pelvic inflammatory disease (appendages of the uterus), 11, 7% — hormonal disorders (obesity, hypothyroidism ovaries, adrenal hyperplasia, neuroendocrine syndrome). Furthermore, frequency of occurrence, observed kidney disease (chronic pyelonephritis, nephroptosis) and infectious diseases of mother (hepatitis, acute respiratory viral infection, syphilis, trichomoniasis).

Lead among chronic pathologies of pregnancy takes placental failure (88.2%) that progresses rapidly when the duration of gestation the placenta begins to exceed the ability to provide nutrients to the fetus. Chronic fetoplacental insufficiency was present in all women with post-term pregnancy, and 2/3 of women with nor-

mal pregnancy on the background of comorbidity. This is followed by the previously tolerated abortion (medical abortions — 35.3%, spontaneous abortions — 1.9%), worsening during this pregnancy, and the presence of a long period of infertility (13.7%), the threat of termination of pregnancy (54.8%), toxemia of pregnancy (49%), anemia (45.1%), gestational pyelonephritis.

The third group of factors — placental risk factors. These include Xia defects in placental development (17.6%), placental abnormalities (19.6%), entanglement umbilical cord around the baby's body parts (17.6%), it is absolutely short umbilical cord (1.9%). These structural abnormalities of the placenta, as well as its attachment led to a decrease in the surface area involved in the exchange of substances between mother and fetus. This sposobst-Vova and pathology that occurs at birth: Early passage of okoloplod-waters (47%), the presence of obschervanomerno narrowed pelvis (29.4%), seeking to-tional labor (15.7%), post-partum hemorrhage (7.8%).

The fourth group of risk factors (fruit factors) have been identified in this group of children. These include multiple pregnancy, chromosomal diseases, hereditary metabolic abnormalities, congenital malformations, intrauterine generalized infection

Follow-up monitoring of children with intrauterine growth during the year revealed that the vast majority of them (82.9%) were observed neurologist. The predominant clinical syndromes were pyramidal insufficiency syndrome, movement disorders, neuro-reflex excitability, hypertensive, asthenoneurotic syndromes. Positive dynamics on the background of the treatment was observed in the vast majority of children (63%) and only 37% of children continue to be supervised by a neurologist in the second year of life with minimal cerebral dysfunction.

**Conclusions.** Thus, according to the survey, the most common risk factors for preterm birth children with intrauterine growth are as follows:

1. Pathology of pregnancy and childbirth (chronic fetoplacental insufficiency, and the threat of interruption of pregnancy toxicosis, anemia, previous abortions).
2. Systemic and infectious diseases such as mother-of before the pregnant, and during it (cardiovascular disease, inflammatory diseases of the genital organs and kidney, hormonal dysfunction, various infectious diseases-nye).
3. Unbalanced and poor nutrition during pregnancy (almost complete lack of fruit and vegetables needed in their diet).

### References:

1. Kornev MY, NA Korovin, Zaplatnikov AL Health prenatally infected children//Infectious diseases. – 2005. – № 2. – P. 48–52.
2. Nayola D.E., Demmler G.J., Nelson C. T. Early predictors of neurodevelopmental outcome in symptomatic congenital cytomegalovirus infection//J. Pe-diat. – 2001. – Tom.38, № 3. – P. 325–331.
3. Intrauterine growth: Study guide. – 3<sup>rd</sup> edition. – Smolensk: SSMA, 2001. – 46 p.

## Instrumental correction of scoliotic disease in children and teenagers in the Republic of Uzbekistan

**Abstract:** The article presents therapy results of 71 patients with scoliotic disease treated by means of three-stage surgical correction method. It was noted that segment reconstruction and instrumental correction was more successful than other modern world analogies, and it was a selective method in the complex radical therapy of severe ( $95-186^\circ$  Cobb) forms of scoliotic disease among children and teenagers.

**Keywords:** scoliotic disease, surgical correction, children and teenagers.

**Topicality.** The therapy of axis deformations of vertebral column is one of the most difficult problems of the modern vertebral surgery. In spite of the significant success in the surgery of vertebral axial deformations in the recent decades, instrumental correction is still difficult for vertebral surgeons and the result of operations are not always satisfactory for orthopedists and the patients. The main reason is that the majority of surgeons make an accent on the application of various correction and fixation devices, paying little attention to the whole impact complex [1]. The surgical method of instrumental correction of scoliotic deformations most widely spread in Europe according to CDI [3] is not always effective and safe. The volume of correction after the application of that technology among the patients with average angle of scoliotic drift equal to  $55^\circ$  deformation correction is only 54.5%, and at the remote terms only 41.9% of the corrections are preserved [1]. The number of complications is still high — 26% [2], among them acute neurological disorders can reach 17% [4]. Sometimes it is possible to stop progression of vertebral deformation, to prevent development of inner organs' involvement, to protect a patient from various complications and to normalize social aiming only by means of complex surgical operations. For the successful salvation of these problems it is rational to follow the principle of step-by-step therapy.

**The aim** of the research was the estimation of three-stage reconstructive correction method efficiency for the severe forms of scoliotic vertebral deformations.

**Materials and methods of the research.** From 2001 to 2014 on the territory of Uzbekistan 71 patients were operated with the application of three-stage surgical correction method. The average age of the patients was  $16.6 \pm 5.8$  years (13–33 years old). The average angle of scoliosis in the group was  $125.4 \pm 2.60$  (from  $95^\circ$  to  $186^\circ$ ) Cobb, Risser's symptom — 3.4. It was mostly in thoracic-lumbar 57.7% (41) and thoracic 42.3% (30) location. Pathologic kyphosis was detected in 71.8% (51) with average central angle of projection hyperkyphosis  $91.6 \pm 1.9^\circ$  ( $42^\circ-181^\circ$ ), misbalance of corpus to coccyx in 71.8% (51). The average kyphosis angle of T1-T12 was equal to  $45 \pm 2.6^\circ$  ( $5^\circ-108^\circ$ ), L1-L5 lordosis ( $-$ )  $49.9 \pm 1.2^\circ$  ( $108^\circ-+36^\circ$ ). According to etiology there was prevalence of idiopathic 49.3% (35) and dysplastic 23.9% (17) scoliosis. Congenital abnormalities and systemic pathology (neurofibromatosis, Ehlers-Danlos syndrome) was 14.1% (10) and 12.7% (9) correspondingly. 74.6% (53) of the patients had complicated anamnesis, associated pathology and complications, such as pyelonephritis, cholecystitis, osteoporosis, syringomyelia, hypothyroids, hyposomia, myelopathy, myocarditis, sepsis and others.

**Results of the research.** At the first stage of three-stage correction course we performed correction of vertebral deformation on the value of functional component of deformation mobility achieved in the process of conservative extension preparing. Single-shaft telescopic distractor with 4–5 hooks for sublaminar fixation to vertebrae was attached along concave side of deformation. The second stage included transpleural mobilization diskectomy (average 5.2 disks (from 3 to 7)) with segment reconstruction of vertebral bodies and intervertebral spondylosis with auto transplants. The procedure was finished by additional correction of deformation with periosteum resection of 3–6 ribs, segment resection of dorsal parts of vertebral column along the arch and dorsal spondylosis with bone transplants. For the correction of the deformation we applied single-shaft and double-shaft endocorrectors (patent № IAP 03203, dated 22.09.2006). The surgical correction was performed in three stages (totally 241 operations), average 3, 2-stage operations per a patient and 19.6 days (14–25 days) for a stage. Average 49.2 days for the complete therapy term. The average mean for scoliosis correction was 46.7% (31.2–58.6%) after the first stage and 64.1% (43,7–79,2%) at the end of the correction. And the average remaining angle of scoliosis curve after correction was  $44.1^\circ$  ( $23^\circ-92^\circ$ ). There was registered growth increase to 12.5 cm (4–29) because of prolongation of body length. Complications occurred in 10.8% of the children. These were: 3 pyramidal disorders, 5 soft tissues fistulas (St. Aureus, Ps. aeruginosae), 1 liquorrhea, and 3 exacerbations of chronic diseases. All complications were eliminated by means of prolonging of hospitalization term to 4.3 days average.

The average value of correction defeat in 2 years was  $6.5 \pm 1.45^\circ$ , or 7.5% of the total value of the achieved correction. At the term from 3 to 5 years —  $3.8 \pm 1.22^\circ$ , or 4,4% correspondingly. The average volume of pathologic kyphosis correction was  $62.3 \pm 2.73^\circ$ . Correction of the pathologic kyphosis in the cases of thoracic and thoracic-lumbar location was approximated to the physiological level in all the patients, among them 8 patients had hypercorrection and hypokyphosis state. Pathologic kyphosis correction defeat in 2 years was  $4.6 \pm 0.5^\circ$ , or 7.4%, while at the term from 3 to 5 years  $3.8 \pm 0.31^\circ$  more, or 6.1%. In one of two patients with lumbar location of pathologic kyphosis we were successful to form physiological lordosis, and in the second one — hypolordosis. The balance of frontal axis was recovered to  $87.4 \pm 3.8\%$  average. The loss of the balance within 2–5 years of monitoring didn't exceed 1,5%. Hyperlordosis was changed to 44.2%, to physiologic size, average up to  $35.8 \pm 1.54^\circ$  in the group. In the process of the correction we achieved growth increase to  $10.3 \pm 1.24$  cm (6–27 cm) by means of increasing body length. In 2 years there was average loss of body length to  $2.9 \pm 1.26$  cm, and at the terms from 3 to 5 years



to  $0.8 \pm 0.01$  cm more. There were noted 5 complications and it was 3.9% of the number of the performed operations and 10.8% of the operated patients. Three patients had 4 additional operations for the elimination of complications. All patients were stand to a vertical position on the 3–5th days after correction and discharged home on the 8–19 days after the final stage without external immobilization. In a month the patients could start studying and working with some limitations, and in 6 months without any limitations.

**Conclusion.** Thus, the step-by-step segment reconstruction and instrumental correction is better than other modern world analogies and it was a selective method in the complex radical therapy of severe ( $95 - 186^\circ$  Cobb) forms of scoliotic disease among children and teenagers. For the maintenance and maximal safekeeping of scoliotic deformation correction in the short and longer period it is necessary to apply step-by-step surgical method, which provides significant deformation correction to 73%.

#### References:

1. Kuleshov A. A. Surgical therapy of severe secondary scoliotic vertebral deformation. // Bulletin of traumatology and orthopedics under the name of N. N. Priorov. 2006; 2: 51–53.
2. Mikhailovski M. V. Surgical correction of vertebral deformation in case of neurofibromatosis: CDI application / M. V. Mikhailovski, A. M. Zaidman, M. N. Lebedeva // Vertebral surgery. 2008; 3: 8–15.
3. Helenius H., Remes V., Yrjonen T. Harrington and Cotrel-Dubousset Instrumentation in adolescent idiopathic scoliosis. Longterm functional and radiographic outcomes // J. Bone Jt. Surg. – 2003. – V. 85 – A, № 12. – P. 2303–2309.
4. Richards B. S., Herring J. A., Johnston C. E. Treatment of Adolescent Idiopathic Scoliosis Using Texas Scottish Rite Hospital Instrumentation // Spine. – 2000. – Vol. 25. – № 6S. – P. 69–76S.
5. Hamzaoglu A., Ozturk C., Aydogan M., Tezer M., Aksu N., Bruno M. B. Posterior only pedicle screw instrumentation with intraoperative halo-femoral traction in the surgical treatment of severe scoliosis ( $> 100^\circ$ ). Spine. 2008; 33 (9): 979–983.
6. Rinella A., Lenke L., Whitaker C., et al Perioperativ halo-gravity traction in the treatment of severe scoliosis and kyphosis. Spine. 2005; 30: 475–482.

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## Assessment of genetic factors in patients with various forms of Nephrotuberculosis

**Abstract:** Studies showed high prevalence of nephrotuberculosis forms among people with unfavorable and relatively unfavorable combinations of genetic markers. Definition of various combinations of genetic markers associated with chronic renal failure can be used for the determination of risk groups of that disease.

**Keywords:** nephrotuberculosis, genetic markers.

**Topicality.** Recently great attention is paid to the definition of interrelation of tuberculosis with genetic markers [5; 6]. Some authors studied various genetically determined factors, including haptoglobin (Hp) phenotypes, activity of glucose 6-phosphate dehydrogenase (GPDG), inactivation of hydroside isonicotinic acid (HINA) with appearance and development of lung tuberculosis [2; 3]. In statistical processing of the results of the definition of genetic markers combinations in patients with lung tuberculosis some authors found 24 combinations of Hp phenotype, HINA inactivation type and activity of erythrocyte enzyme of GPDG [2].

Definition of genetic markers and peculiarities of its combinations' distribution in patients with tuberculosis has a perspective in the prognosis of the progress character, efficacy of the therapy of that disease [1; 4]. We did not find any studies of nephrotuberculosis (NT) in the available literature.

**The objective** of that study was assessment of the combination of genetic markers in clinical progress of various forms of nephrotuberculosis.

**Materials and methods.** We examined 237 patients with nephrotuberculosis carriers of various combinations of genetic markers. Among the examined patients 64 (27.0%) had limited forms of NT, 173 (73.0%) spread forms of NT. There were 118 men

and 119 women (49.8% and 50.2% respectively), in other words almost similar.

For the revealing of various combinations of genetic markers we determined haptoglobin (Hp) phenotypes by means of disk electrophoresis in polyacrylamid gel in compliance with N. S. Osina's method (1982); activity of erythrocyte glucose-6-phosphate dehydrogenase (GPDG) by means of A. S. Asatyan's method (1969); type of hydroside isonicotinic acid (HINA) inactivation by means of G. N. Grebennik's method in modification of G. O. Kaminski (1996). According to complex combinations of these genetic markers with the help of Kazakov's et. al. method (1999) four combinations of genetic markers were determined:

1. Unfavorable — combination of homozygous phenotypes of Hp 2–2 or Hp 1–1+ weak type HINA+ inactivation, diminished activity of erythrocyte GPDG;
2. Favorable — combination of heterozygous Hp 2–1+ phenotype, strong type HINA+ inactivation, normal or increased activity of erythrocyte GPDG;
3. Relatively unfavorable — combination of two unfavorable and one favorable genetic marker;
4. Relatively favorable — combination of two favorable and one unfavorable genetic marker.

Functional status of kidneys was studied according to the data of creatinin concentration and urea in blood and glomerular filtration according to endogenous creatinin. Among the patients we followed chronic renal failure (CRF) was revealed in 131 (55.3%). Among them the most often observed was compensated stage of CRF (71.0%), less often latent (19.1%) and intermittent (9.9%) stages of CRF. We studied prevalence of various stages of CRF in patients with nephrotuberculosis and various combinations of genetic markers (CGM).

**Results and discussion.** In the study of the character of carrying of the genetic markers we revealed the difference in the prevalence of various forms of nephrotuberculosis. Thus, in patients with unfavorable and relatively unfavorable CGM, spread forms of NT were revealed 5.2 and 6.2 folds more often ( $86.2 \pm 6.4\%$ ;  $83.8 \pm 3.5\%$ ) than limited forms ( $13.8 \pm 6.4\%$ ;  $16.2 \pm 3.5\%$ ,  $P < 0.001$ ). In patients with favorable and relatively favorable CGM spread forms of nephrotuberculosis were observed 1.4 times more often ( $57.9 \pm 42.1\%$ ) than limited forms of nephrotuberculosis ( $58.3 \pm 41.7\%$ ;  $P > 0.2$ ;  $P < 0.05$ ). So among the patients with unfavorable and relatively unfavorable CGM there is prevalence of spread forms of nephrotuberculosis.

The represented results of functional testing of kidneys of the patients with nephrotuberculosis and various CGM testify that the results of the functional status of kidneys in patients with unfavorable and favorable CGM differ. The level of urea in blood was increased 2 fold (10.4 and 5.3 mmol/l, respectively,  $P < 0.001$ ), creatinin in blood 1.5 fold (148.5 and 96.3 mkmol/l respectively,  $P < 0.001$ ) in the patients with unfavorable CGM, than in the patients with favorable ones. Glomerular filtration in patients with unfavorable CGM was 1.7 fold decreased in comparison with the patients with favorable CGM (78.2 and 130.8 ml/min, respectively,  $P < 0.001$ ). In the comparison of average means of creatinin amount in blood and glomerular filtration in patients with relatively unfavorable and relatively favorable CGM practically does not differ (109.6 and 99.0 mkmol/l and 95.9 and 112.4 ml/min, respectively,  $P > 0.5$ ). In spite of it, urea in blood was increased 1.4 fold in the patients with relatively unfavorable CGM, than in the patients with relatively favorable CGM (7.3 and 5.4 mmol/l, respectively,  $P < 0.001$ ).

Thus, these studies of the functional status of kidneys in nephrotuberculosis indicate that the patients with unfavorable and relatively unfavorable CGM have greater degree of kidney exposure than in the patients with favorable and relatively favorable CGM.

Among 131 (55.3%) patients with CRF the most often observed is the compensated stage of CRF (71.0%), less often latent (19.1%) and intermittent stages (9.9%). There were no patients with terminal stage of CRF. In limited forms of nephrotuberculosis there were 6fold more patients without CRF, than with CRF ( $P < 0.001$ ).

Vise versa in spread forms of nephrotuberculosis there were 2.4 fold more patients with CRF than without ( $P < 0.001$ ). The study of the prevalence of CRF various stages is of great interest for the nephrotuberculosis patients with various CGM. Among the patients with unfavorable CGM there were 3.1fold more people with CRF than without CRF ( $P < 0.001$ ). Oppositely among the patients with favorable CGM, there are 1.4 fold less patients with CRF than without. Analogically, among the patients with relatively unfavorable CGM, there are 1.9 more people with CRF than without it ( $P < 0.001$ ). Oppositely among the patients with relatively favorable CGM there are 1.6 less people with CRF than without it ( $P < 0.01$ ). In various cases of CGM the most often revealed ones were patients in the second stage of CRF. So, with unfavorable and relatively CGM there were 4.5 fold more patients with the second stage of CRF than with the first one. Among the patients with favorable and relatively favorable CGM there were 3 fold more patient with the second stage of CRF than these with the first stage. Among the patients with unfavorable and relatively unfavorable CGM the third stage of CRF was revealed 1.7 fold more often than among the patients with favorable and relatively favorable CGM.

Thus, among the patients with unfavorable and relatively unfavorable CGM we revealed patients with CRF 2.5 fold more often than without it ( $P < 0.001$ ). Among these patients the most often met were ones with the second stage of CRF and it was more expressed in the patients with unfavorable and relatively unfavorable CGM.

**Conclusion.** The study of genetic background revealed associations of various CGM with diverse forms of nephrotuberculosis. Among the patients with unfavorable CGM limited forms of nephrotuberculosis were revealed in 13.8% cases, and spread forms in 86.2% (6.2 fold more often). Among the patients with relatively unfavorable CGM limited forms of nephrotuberculosis were revealed 5.2 times less (16.2%), than spread ones (83.8%). Patients with favorable and relatively favorable CGM had spread forms of nephrotuberculosis 1.4 times more often than limited forms (57.9 and 58.3%; 42.1 and 41.7% respectively). Patients with nephrotuberculosis with unfavorable and relatively unfavorable CGM had severe progress and complications of the disease 2–3 times more often and more expressed, than among patients with favorable and relatively favorable CGM. Nephrotuberculosis patients with unfavorable and relatively unfavorable CGM had severe prognosis, requiring special attention, long term therapy including surgery for prevention further progressing with development of CRF. It was determined that patients with nephrotuberculosis carriers of unfavorable CGM had progressing dysfunction of kidneys manifestation of which was rise of urea amount (2fold) and creatinin in blood (1.5 fold), decrease (1.7 fold) of glomerular filtration.

#### References:

1. Nersesyan A. A., Merkuryeva Y. A., Kornilova Z. K. Clinics, diagnostics and therapy of urologic tuberculosis // Prob. tub. – 2006. – № 9. – P. 5–15.
2. Pavlova M. V. Skvortsova L. A., Kondakova M. N., Kovaleva R. G. The role of complex genetic prognosis in therapy and prophylaxis of tuberculosis of respiratory organs in teenagers // Prob. tub. – 2005. – № 11. – P. 30–34.
3. Chernik R. B., Kazakov K. S., Pyatayeva E. V. Importance of the definition of genetic markers in the prognosis of the severity of internal thoracic tuberculosis in children // Materials of the Vth congress of phtysiatrists and pulmonologists of Uzbekistan. – V, 2000. – P. 84–87.
4. Kamishan I. S. Possibilities of express diagnostic methods for tuberculosis of kidneys / I. S. Kamishan, A. N. Mams, P. I. Stepanov // The problems of tuberculosis and lung diseases. – 2006. – № 9. – P. 39–43.
5. Correlation of ESAT-6-specific gamma interferon production with pathology in cattle following Mycobacterium bovis BCG vaccination against experimental bovine tuberculosis / H. Vordermeier [et al.] // Infect. Immun. – 2002. – Vol. 70. – P. 3026–3032.
6. Archakova L. I. Perfection of the therapy on the basis of immunogenic factors study in the formation of tuberculosis of lungs: Abstract of Doct. diss. / L. I. Archakova. – SPb., 2009. – 38 p.

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## **Industrial traumatism among «Ferganaazot» workers and systematic analysis methods for determination of priority measures for its prevention**

**Abstract:** In this article is given main reasons, indicators of injury, among main occupational groups of «Ferganaazot» workers. In order to prevent occupational injuries, improve an efficiency of the implemented preventive measures, development of targeted activities it is necessary to carry out a systematic analysis of occupational injuries causes, based on certainty and relevant registration acts on accidents at work.

**Keywords:** injuries, production, working conditions, workers, methods of analysis, risk, labor protection.

One of the main tasks of labor protection in production is creation of healthy and safe labour conditions that causes need of a high-quality preparation for this area of the working personnel, in particular performing activities in workplaces with especially dangerous and dangerous labour conditions.

According to an assessment of International association of social safety and the International Labour Organization (ILO), in the world annually there are 125 million occupational accidents as a result of which 1,1 million people, 25% from them of impact of hazardous and dangerous substances are died. In the European Union countries annually there are about 7 million cases of an industrial traumatism [1, 860–867]. In Russia in production 650 people monthly are died, 1000 people reach disability and about 20% of people work in the conditions which are not answering to sanitary and hygienic regulations. Therefore, it is possible to make a conclusion that a specific weight of workplaces with harmful and dangerous labour conditions grows and owing to an industrial traumatism leading to economic losses in raises production [2].

An industrial injury (labor mutilation) is a consequence of action on an organism of various external, dangerous production factors. More often the industrial injury is determined as a result of mechanical impact in case of tripping-over, falls or contact with mechanical equipment. By nature impact, industrial injuries can be mechanical, thermal, chemical and electric. Basic reasons of an industrial traumatism are technical which arise owing to design shortcomings, machines defects, mechanisms, engineering procedure imperfection, lighting insufficiency, protective equipment defect, lack protective facilities, mechanization and automation insufficient of hard and harmful work. Sanitation hygienic reasons which are connected with requirements violation of sanitary standards (temperature humidity regime), lack of sanitary and amenity facilities and devices, lack of a workplace organization, etc. The organizational reasons, are connected with abuse of regulations of vehicle operation and equipments, a bad organization of handling works, violation of a work-rest schedule (overtime works, idle times, etc.), abuse of safe engineering regulations, untimely instructing, low labor and productive discipline, lack of proper control of production process, lack of warning labels, etc. [3, 13–15]. Besides, for female workers of many productions leading to an injury rate the psychophysiological reasons connected with labor discipline violation, intentional self-traumatizing, over fatigue, bad health, family problems, etc. are the most frequent reasons.

According by studying goal of the reasons of an industrial traumatism in production of JSC «Ferganaazot» features of labour conditions and engineering procedure have been revealed. A labor activity of the primary professions occupied in this production are characterized by high work rate, use of a manual work in labor-intensive processes, adverse sanitary and hygienic conditions, implementation of chemical reactions at high temperatures, getting in a height which in a complex are created a risk for an industrial traumatism. Professional groups of service technicians, masters, cars drivers of various brands, being a risk group, are exposed to mechanical impact of technical shortages: engineering, machines defects, devices, aggregates, transporters, imperfection of engineering procedure, insufficient mechanization and automation of hard and harmful work. Besides, violations by workers of safety regulations and production instructions also lead to an injury rate in production. When studying an industrial traumatism for 2014–2015 among the examined workers, it has been revealed that most often there were closed fractures of the upper extremities at service technicians of various sites — 15,7%, urea production equipment operator — 11,8%. The highest rates of an injury rate by closed fractures of the lower extremities were revealed at riflemen and equipment operators with identical value — 11,8%. Cases of an industrial traumatism were revealed: rib fractures at engine drivers, service technicians in 2014; isolated cases of a vertebra fractures at the equipment operator and a burn at the electric welder in 2015. Established cases of an industrial traumatism in JSC «Ferganaazot» were indicated a need of systematic analysis, with a subsequent development of precautionary actions.

Considering that one of the most important conditions of fight against an industrial traumatism in JSC «Ferganaazot», so it is important to make a systematic analysis of the reasons of its origin which is based on reliability and care of registration of accidents. There are monographic, topographical and also statistical methods of an industrial traumatism analysis are widely used in practice [4, 90–91]. The monographic method provides a multilateral analysis of the injury reasons directly in workplaces. At the same time study an organization and labour conditions, equipment condition, stock, tools. This method is effective at statistical analysis of status of labor condition protection. The topographical analysis method allows establishing a place of the most frequent cases of an injury rate. For this purpose on the plan scheme of an entity where workplaces and equipment are designated, note a number of accidents for an analyzed period. It allows paying more attention to improve-

ment of labour conditions in workplaces where most often there are accidents. The statistical analysis method is based on studying of quantitative indices of reports about accidents at entities and in organizations. At the same time frequency coefficients and severity of an injury rate are used generally. The frequency coefficient ( $C_f$ ) determines a number of accidents on 1000 workers for an accounting period and is calculated by a formula:

$C_f = \frac{An \cdot 1000}{Aw}$ , where are

**An** — a number of accidents for an accounting period with disability over three days;

**Aw** — an average number of workers.

A coefficient of injury rate severity ( $C_s$ ) shows an average number of disability days, happens by one accident for an accounting period and identified by a formula:

$C_s = \frac{Dt}{An}$ , where are

**Dt** — total days quantity of disability because of accidents;

**An** — a number of accidents for an accounting period.

Conclusions: Based of a comprehensive analysis of labour

conditions of JSC “Ferganaazot” implementation of preventive actions for injury prevention in the following directions is necessary: organizational and technical, sanitary and hygienic, treatment-and-prophylactic. Carrying out these actions in the production shall be included: observance of requirements of regulatory legal acts for labor protection; corresponding sanitary consumer services of workers; a constant control and automation of production processes in the most life-threatening workers sites; providing and an operating control behind serviceability of the equipment, ensuring protection with individual protective equipment, overalls, etc.; to bring the standard indicators by KMK 2.01.05.-98 illumination levels, noise, microclimate parameters in a workplace. Obligatory in the production to organize training and knowledge examination again gone to work workers, workers of especially hazardous occupations by the main methods of a safe labour conditions organization in the field of labor protection, carrying out introduction training in a workplace, periodic (repeated), unplanned and current instructing of workers in safe engineering.

### References:

1. Судак С. Н. Анализ производственного травматизма в России и Мурманской области за 2005–2009 годы // Вестник Мурманского Государственного технического университета – Мурманск, 2011. Выпуск № 4, Т. 14, – С. 860–867.
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## Algorithm of diagnosis and surgical treatment of postoperative chylothorax

**Abstract:** The analysis of 14 patients with postoperative chylothorax. Evaluated the effectiveness of the treatment of chylothorax. Developed an algorithm for the treatment of postoperative chylothorax.

**Keywords:** thoracic surgery, postoperative complications, triglycerides in pleural fluid, VTS.

**Actuality of the problem.** Chylothorax — a pathological condition characterized by the accumulation of lymph in the pleural cavity of various etiology. The phenomenon was first described Bartolet in 1633 [5]. Chylothorax often a postoperative complication of thoracic surgery, catheterization subclavian vein [1; 2; 3], the frequency of which is from 0.1% to 2.5% of the patients with thoracic pathology. Less commonly, it can be due to malformation of the lymphatic system of the lungs or chest cavity. Also chylothorax may be a manifestation of malignancy, trauma of neck or thoracic cavity.

Remain not fully developed approaches to the treatment of

chylothorax: indications for conservative and surgical approaches, terms and methods of surgical interventions [4].

**Objective:** to develop the optimum tactics of surgical treatment of postoperative chylothorax.

**Material and methods** studied the results of examination and treatment of 14 patients with postoperative chylothorax: 12 of them among the 6895 operated patients in Center for thoracic surgery of the Krasnodar Regional Clinical Hospital from 2003 to 2008 were 0.17% and 2 patients in the RSCS named after acad. V. Vahidov among 1899 operated on for different diseases

of the lungs and mediastinal organs in the period from 1999 to 2010. In all patients, the diagnosis is confirmed by laboratory and instrumental methods. Men were 11 (78.57%) and 3 women (21.43%), the average age was  $45.5 \pm 4.34$  years (range, 23–72 years). Pleural effusions were unilateral in all patients by surgery. The cause of chylothorax in all patients had surgery on the chest. These procedures included thoracotomy with resection of lung and mediastinal lymph node dissection (9 patients), lung resection without lymph node dissection (2 patients), the removal of mediastinal tumor (2 patients), and pneumonectomy with intrapericardiac treating vascular lung root. The average concentration of triglycerides was  $13.7 \pm 2.12$  mmol/L.

#### Results and discussion.

It should be noted that in all these cases, the allocation of a large quantity of discharge from the drainage prompted suspicion on lymph expiration. In all 14 cases, the first day of the drains was allocated more than 1.5 liters of fluid. Pleural effusion is rated as milk in 4 (28.6%) patients, in all other cases serohemorrhagic fluid. All patients started after the detection of chylothorax treated with conservative measures. All patients were prescribed a diet with a

decrease in the amount of fat. In 5 patients in the conservative treatment measures was included Sandostatin (20–100 mg per day intravenously with 400 ml saline solution).

Conservative measures were effective in 2 patients. The two patients after conservative therapy started the selection of lymph decreased by 2 times, reduced to 50–100 ml over the next 2–3 days, on the 7th day completely stopped. After a preliminary X-ray control of the chest drainage tube removed. 12 patients were operated on, 11 is clipping VATS thoracic duct, in one case conversion and ligation of thoracic duct.

At January 1 patients despite the behavior of conservative treatment of discharge from the drainage had a tendency to decrease, and they are subject to repeated surgical procedures. 1 patient made PTS sanitation inspection of the pleural cavity, conversion, ligation of thoracic duct. Following the reoperation was observed complications. Drainage tubes are removed at 3–4 hours.

Based on our experience of treatment of postoperative chylothorax and literature data we offer our algorithm of surgical treatment of postoperative chylothorax.

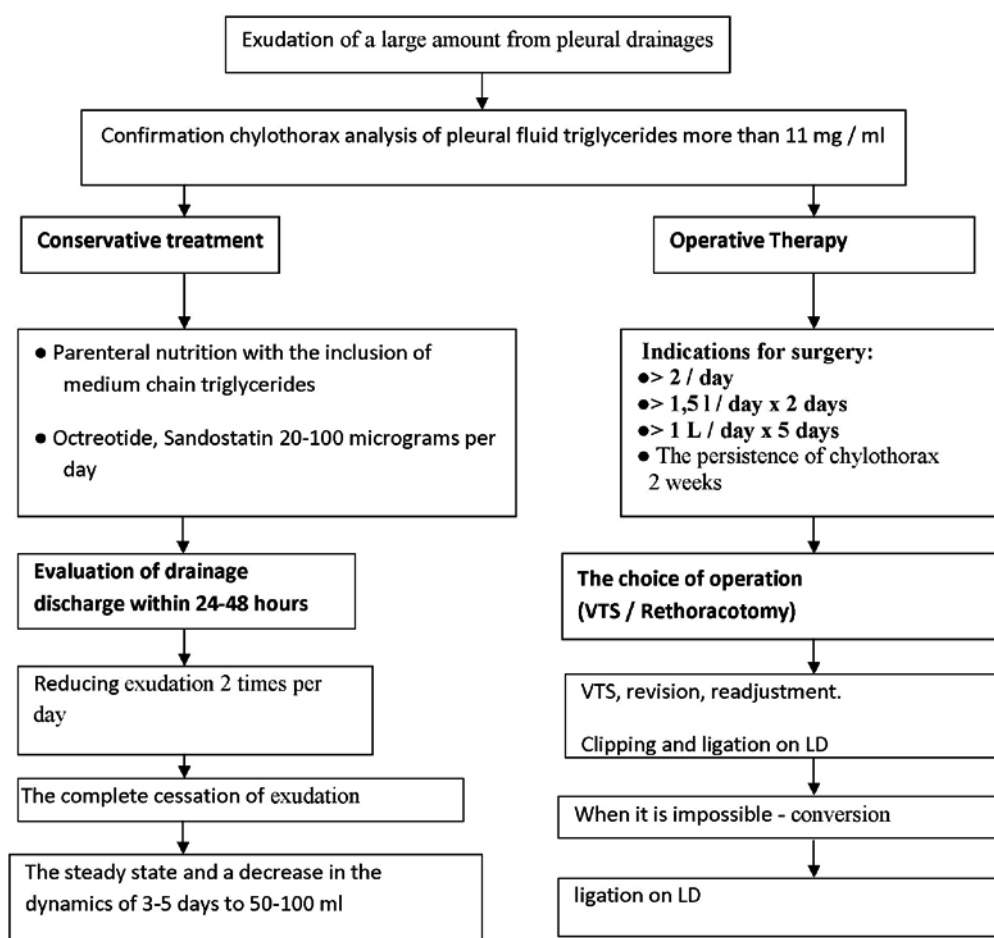


Fig. 1. Algorithm of the diagnosis and surgical treatment of postoperative chylothorax

In this way, our data suggest a high performance combination of conservative and military-technical cooperation in the treatment of postoperative chylothorax. In the absence of effect

of conservative measures during the first 3 days and significant losses lymph surgical treatment.

#### References:

1. Ashcraft K. U., Holder T. M. Pediatric Surgery. Saint Petersburg, 1996 Vol. 1. P 220–221.
2. Spiridonov A. A., Arakelyan V. S., Malinin A. A., Pirtshalaishvili Z. K., Abalmasov K. G. // Annals of Surgery. – 2003. – № 2. – P. 44–45.
3. Beghetti M., La Scala G., Belli D., Et al. // J. Pediatr. – 2000. – Vol. 136, – № 5. – P. 653–658.
4. Fahimi H., Et al. // Ann. Thorac. Surg. – 2001. – Vol. 71. – P. 448–450.
5. Maldonado F., et al. // Mayo Clinic Proceedings. – 2009. – Vol. 84, – № 2. – P. 129–133.

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## Morphological changes in kidneys after experimental acute brain ischemia in rats

**Abstract:** The morphological study of the kidneys and the brain after acute brain ischemia in rats proved the existence of angio-cerebro-renal relationships due to hemodynamic disorders and endothelial dysfunction. Considering the secondariness and the mediation of renal injury in experimental ischemic stroke, angio-cerebro-renal dysfunction in ischemic stroke may be caused by violation of central regulation, vascular-hemodynamic disorders and general systemic inflammatory response.

**Keywords:** ischemic stroke, kidneys, rats, experiment.

**Introduction.** Stroke is the leading cause of death and disability among the working population in most countries of the world. In the United States annually about 700 thousand people suffer an ischemic stroke, while in Russia this rate is more than 450 thousand people, and in Uzbekistan — more than 40 thousand people. About 15% of stroke patients die within first weeks of the disease, the majority of survivors after stroke lose the ability to work and in need of constant care [7; 9; 19]. This makes stroke an urgent problem of not only medical, but also socio-economic significance.

The role of kidneys in stroke has not been well studied. It is known that the pathogenesis of stroke is closely associated with hypertension, heart diseases and atherosclerosis, which are among the most important causes of acute disorders of cerebral hemodynamics [2]. In turn, renal disorders are the important risk factor for cardiac and cerebrovascular complications [6]. Population-based and epidemiological studies have shown that even the earliest subclinical disorders in renal function are suggested as an independent risk factor for cardiac and cerebrovascular complications, as well as for repeated violations and mortality. To date, several main controlled trials have been conducted that assessed the relationship of the severity of chronic kidney disease (CKD) with risk of development of cardiovascular complications and mortality [5; 18].

The brain, heart and kidneys in the human body function independently from each other. However, high consumption of oxygen and energy is common for them that determines their high sensitivity to hypoxia [12; 16]. Vascular system performs a communicative function, and any changes of the vascular wall (endothelium), changing the indicators of central and peripheral hemodynamics, would contribute to the changes of transcapillary exchange, development of hypoxia and hypotrophy of tissues [8]. In turn, at local necrotic processes in brain ischemia, decay products, entering the blood, circulate, contributing to the development of response of the endothelium, and are excreted by the kidneys that can lead to changes of the renal parenchyma, i. e. worsening the course of both primary and secondary damage of organs and tissues [2]. At the same time, polypharmacy and a large number of drugs used in stroke, their inadequate use, complicate the kidneys function that, in general, affects the state of stroke patients and impairs the prognosis.

It is known that the study of mechanisms of disease in various experimental models contributes to solving medico-social problems arising in connection with the prevalence of stroke. However, there is no sufficient data concerning morphological changes in the kidney after ischemic stroke in the available literature that prompted us to conduct the present study.

**The purpose of the study** was to investigate the morphological status of kidneys in the model of experimental ischemic stroke in rats.

### Materials and Methods

#### *Production of experimental acute brain ischemia*

Forty-two male outbred white rats weighing 220–280 g. at the age of 4–7 months were taken for the experiments. Rats were kept in vivarium conditions with free access to food and water. 21 rats (main group) were anesthetized with etaminal (50 mg/kg, i. p.). Anesthetized rats were laid on their back and a midline neck incision made. The left common carotid artery was carefully exposed and isolated. Then, the artery was doubly ligated with 3–0 silk suture for 40 minutes with subsequent reperfusion and full restoration of cerebral blood flow by elimination of the ligature and wound closure. In 10 rats under the same anesthesia, skin incision of the neck over the carotid artery was made followed by suturing of the skin (false-operated group). 11 rats were intact. After the surgical operation, the rats were maintained under an infrared heat lamp until awake to avoid a decline in body temperature.

The animals care and the experiments were conducted in accordance with the requirements of International rules for the humane treatment of animals “Guide for the Care and Use of Laboratory Animals” as contained in the Sanitary rules for equipment and maintenance of experimental biological clinics (vivariums) and conducted in compliance with the rules adopted in the European Convention for the protection of laboratory animals used for experimental and other scientific purposes (ETS N 123), Strasbourg (18.03.1986). All experimental procedures involving animals were approved by the Institutional rules for laboratories, vivariums, animal care and use.

#### *Assessment of neurological state of animals*

The animals were observed daily for 7 days. The Stroke-index MC Graw scale was used to assess the neurological status of animals

at 1–2 hours after surgery and in dynamics at the 1<sup>st</sup>, 3<sup>rd</sup> and 7<sup>th</sup> days of the experiment.

#### *Morphology, microscopic preparations and images taking*

At 1<sup>st</sup>, 3<sup>rd</sup> and 7<sup>th</sup> days after acute brain ischemia, the animals decapitated under ether anesthesia. Then, the brains and kidneys were removed. In accordance with the periods of observation, the main group of rats was divided into 3 groups of 7 animals each. The pieces of brain and kidney tissues no more 1x1 cm were immediately immersed in 2.5% solution of glutaraldehyde for fixation with subsequent wiring according to standard methods in alcohols of increasing concentration. After embedding in Epon-Araldite mixture (Fluka AG, Araldite Accelerator 964 + Epon Hardener DDSA, CH-9470, "Buchs", Switzerland). Ultrathin sections were cut on the ultramicrotome LKB-V ("Broma", Sweden). These were used for methylene blue and fuchsin staining for morphological evaluation. After staining, formed microscopic images of the studied tissues were taken with the aid of light-optical microscopy on the microscope "Mikromed-2" (Russia) with fixed digital camera Scope Tek DCM-510 (USB 2.0) ("Leitz", Germany) connected to a computer Pentium-4 with the pre-installed software "Scope Photo". The images were printed on a color printer "Epson".

#### **Results of the study and their discussion**

##### *Neuronal cell death and neurological state of the rats after acute brain ischemia*

At the day of surgery, in rats were objectively observed weakness and hypotonia of the limbs on the contralateral side to the lesion, narrowing of the palpebral fissure (voluptas) on the side of the lesion. The animals could not rest on the feet, did not respond to the injections on the side of paresis, lost the appetite, became sloppy, careless and aggressive. One week after the operation, 9.52% of rats died and the surviving animals showed neuronal deficit of different severity.

At the first day after acute brain ischemia, the evaluation of neurological state in rats showed that nearly all (90–100%) animals had moderate neurological deficit in the form of sluggishness and slowness of movements. Significant neurological impairment, manifested in the form of manege movements in a circle and paralysis of the limbs, was observed in 30–40% of cases. Neurological deficit gradually increased in a time-dependent manner by the 7<sup>th</sup> day after the experiment.

It is reported that in the absence of hypotension, occlusion of common carotid artery generally does not cause neuronal cell death. However, other studies show that common carotid artery occlusion in Slc/Wistar rats induces neuronal cell death due to the patency of the posterior communicating arteries [11]. Thus, acute cerebrovascular occlusion, even if subsequent reperfusion made, induced failure of the cerebral circulation and acute neuronal cell death in the brains of adult rats.

Morphological investigations showed that at the first hours after acute brain ischemia pathological changes of neurons in the brain were characterized by polymorphism. Chromolysis of varying severity was noted. Brain edema, manifested by swelling and increase in the sizes and pallor of neurons, as well as by occurrence of pale extracellular fields of neuroglia, was revealed. Changes in the brain affect mainly separate nerve cells and blood vessels. These changes fit into the conventional morphological pattern of experimental ischemic stroke, the model of which was reproduced by the common standard methodology [1].

##### *Morphological signs of the kidneys function after acute brain ischemia*

Morphological structure of the kidneys after acute brain ischemia differed from that of the intact and false-operated rats. Macroscopic study of false-operated animals marked that kidneys visu-

ally were bean-shaped, capsule was smooth, shiny, easily removed, exposing a smooth surface of kidneys. After cut, renal tissue was reddish-brown, the boundary between the layers of the kidneys was clear. There was a picture of glomerulonephritis and pyelonephritis as the result of an inflammatory response in 90% of rats in the main group.

Microscopically, already at the 1<sup>st</sup> day of acute brain ischemia, hypertrophy of the glomeruli, focal or segmental proliferation of mesangial cells was revealed in the kidneys (Image 1). This, perhaps, indicates inflammatory reaction in response to hemodynamic disturbances.

Changes in the tubulointerstitial apparatus were not less important. In 100% of cases the lumens of the proximal and distal tubules contained infiltrates of unknown etiology.

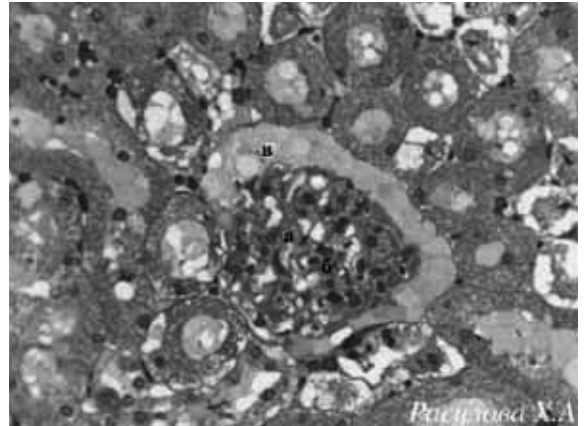


Image 1. Kidney of rats at the 1<sup>st</sup> day of acute brain ischemia. Hypertrophy of glomeruli, focal and segmental proliferation of mesangial cells. Staining with methylene blue and fuchsin. Magnification: Ob. 40. Oc. 10

Production of cytokines (activating fibroblasts) with lymphocytes infiltration of the glomerulus, the erosion of the basal membranes of tubules and glomerulus and the ingress of infiltration of the glomerulus into the urinary space were observed (Image 2). We hypothesize that the appearance of infiltration may be due to cross-reactive antibodies to the basal membrane of tubules and glomeruli. This proves the involvement of immunological mechanisms in the kidney damage.

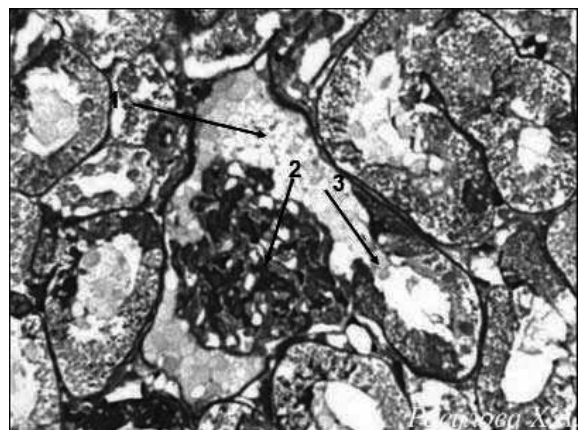


Image 2. Kidney of rats at the 1<sup>st</sup> day of acute brain ischemia. The violation of the proliferation of mesangial cells (2). Production of cytokines (activating fibroblasts) with lymphocytes infiltration of the glomerulus (1). The erosion of the basal membranes of tubules and glomerulus and the ingress of infiltration of the glomerulus into the urinary space (3). Staining with methylene blue and fuchsin. Magnification: Ob. 40. Oc. 10



The glomerulus damaged in 100% of animals at the 1<sup>st</sup> day after acute brain ischemia. In mesangial area were observed deposition of fibrin. This further leads to damage of the epithelium of the capillaries. The capillaries were significantly enlarged, erythrocytes were visible. There was vascular damage in the intertubular region (Image 3).

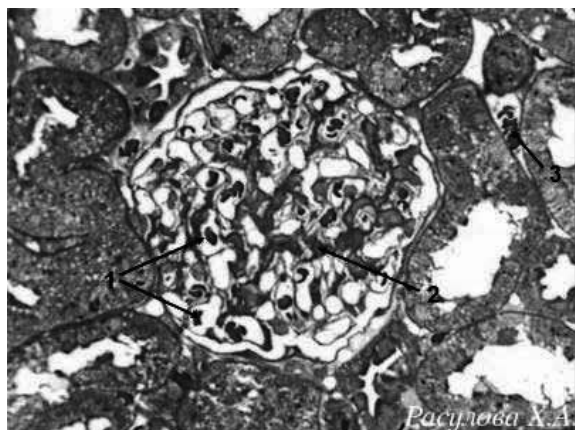


Image 3. Kidney of rats at the 1<sup>st</sup> day of acute brain ischemia. Glomerular damage. Deposition of fibrin in mesangial area (2). Significant dilation of the capillaries of the glomerulus with visible erythrocytes (1). Vascular damage the intertubular region (3). Staining with methylene blue and fuchsin. Magnification: Ob. 40. Oc. 10

At this period, there was marked vasodilation of the capillaries of the glomerulus with erythrocytes aggregation like “coin columns” (Image 4). This was an evidence of the violation of blood rheology in the vascular system, particularly in the microvasculature. Erythrocytes aggregation creates favorable conditions for thrombus formation and deceleration of blood flow. On the other hand, erythrocytes aggregation is a compensatory response and lead to a faster delivery of oxygen to those tissues, which are in need of its presence. Because particularly erythrocytes carry oxygen, and their aggregation promotes oxygen rapid transportation to extensive system of capillaries. Slowing of blood flow at erythrocytes aggregation was noted in venules, whereas in the arterioles the resistance to blood flow was much less that promotes more rapid movement of the conglomerate of erythrocytes (columns) with oxygen in the desired direction. Under these conditions, the aggregation abilities of erythrocytes have a positive effect on the outcome of the disease.

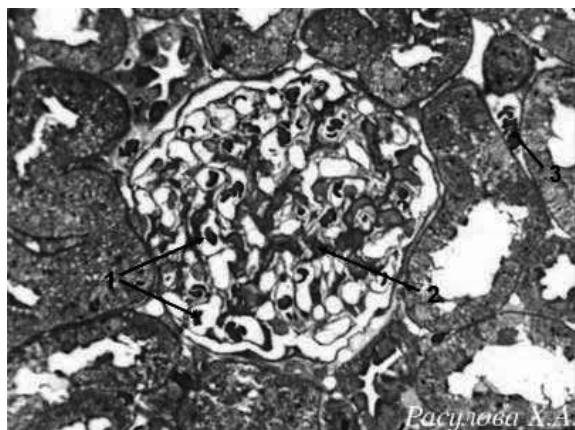


Image 4. Kidney of rats at the 1<sup>st</sup> day of acute brain ischemia. Vasodilation of the capillaries of the glomerulus with erythrocyte aggregation like “coin columns”. Staining with methylene blue and fuchsin. Magnification: Ob. 40. Oc. 10

At the 3<sup>rd</sup> day of the experiment, we found that after acute brain ischemia in the kidneys were observed dissolution of the

basal membrane of the glomerulus and the migration of macrophages into the urinary space (Image 5). This lead to the appearance of the lymphocytic-macrophage infiltration in the capsule of Shumlyansky-Bowman.

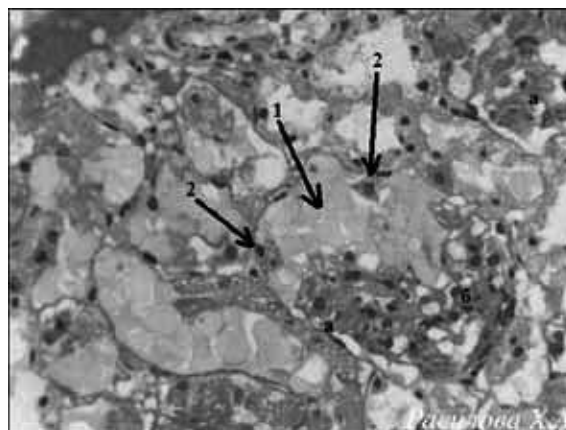


Image 5. Kidney of rats at the 3<sup>rd</sup> day of acute brain ischemia. Infiltration in the urinary space (1). Dissolution of the basal membrane and migration of macrophages into the urinary space (2). Staining with methylene blue and fuchsin. Magnification: Ob. 40. Oc. 10

Simultaneously, there was destruction of the vascular glomerulus, significant gaps of the basal membrane of the capillaries of the glomerulus. There were determined zones of fibroid necrosis in the loops of the glomerulus (Image 6).

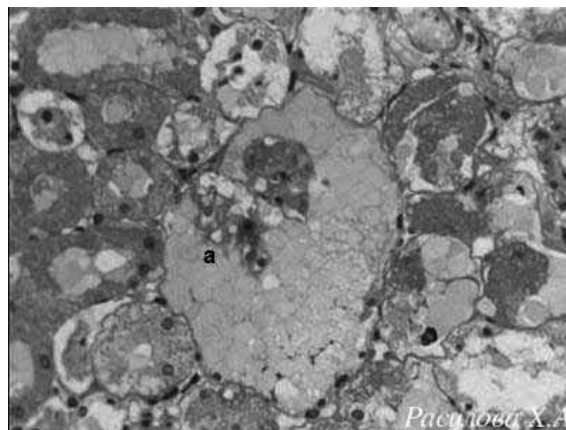


Image 6. Kidney of rats at the 3<sup>rd</sup> day of acute brain ischemia. Destruction of the vascular glomerulus. Significant gaps of the basal membrane of the capillaries of the glomerulus (a). Zones of fibroid necrosis in the loops of the glomerulus (a). Staining with methylene blue and fuchsin. Magnification: Ob. 40. Oc. 10

At the 7<sup>th</sup> day, there was complete disappearance of the glomerulus and its replacement by fibrin (Image 7). 70% of animals observed a picture of acute renal failure (shock kidney), which was associated with impaired blood supply, ischemia of the kidneys with subsequent necrosis of the epithelium of the renal tubules and development of acute renal failure — uremia. At shock kidney, disorders of blood circulation and reduction of water filtration in the renal tubules cause oliguria and anuria, followed by uremia.

Thus, morphological changes in the kidneys after acute brain ischemia demonstrated the picture of nephrosclerosis. The most typical changes were in the blood vessels and the tubulointerstitial apparatus. In the glomeruli, changes were characterized by ischemic disorders (thickening and wrinkling of the capillary walls with a gradual loss of permeability and formation of ischemic



wrinkling), proliferation of mesangial matrix with subsequent formation of focal and segmental hyalinosis and sclerosis. These structural changes were considered by several authors as morphological markers of hypertensive renal damage [3; 10; 13; 14; 15]. There were infiltrates of different origin and changes of peritubular capillaries in the tubules. Scarring, atrophy of prostaglandin synthase cells of the renal medulla were almost always present in the interstices. Analyzing the data of the literature [10; 17] and our own observations, we can conclude that sclerosis identified in the renal interstitium reflects the loss by the kidney its depressant properties and is essential morphological substrate of hypertension and ischemia.

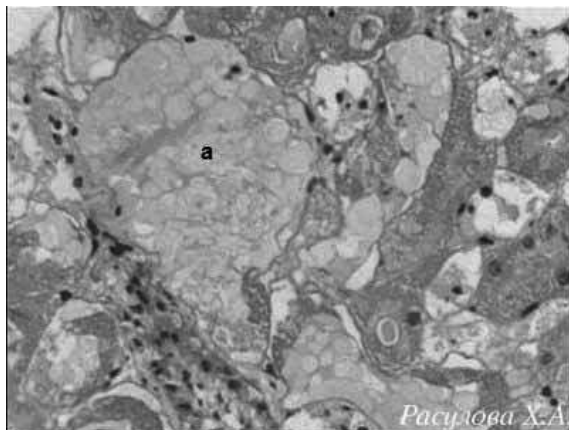


Image 7: Kidney of rats at the 7<sup>th</sup> day of acute brain ischemia. Global defeat of the glomerulus and its replacement by fibrous formation. Staining with methylene blue and fuchsin. Magnification: Ob. 40. Oc. 10

The mechanism of structural damage of the kidneys at the present stage appear to be consistent with the following processes in the kidney. Increased hydrostatic intraglomerular pressure, which is transmitted uniformly in all directions, leads to the loss of negative charge and violation of the permeability of the basal membrane of glomeruli [13; 14]. Prolonged exposure of the increased hydrostatic intraglomerular pressure on the mesangium area leads to the deposition of low molecular weight proteins and albumin in it. This causes expansion of the mesangium and proliferation of mesangial cells, as well as destruction of small processes of the podocytes. Fur-

ther, this leads to the development of focal and segmental hyalinosis and sclerosis [10].

The studies of American researchers [4] have shown that hemodynamic changes lead to hyperfiltration, which is a mechanism of adaptation when reducing the number of functioning nephrons of different origin. Despite the considerable smaller mass of functioning renal parenchyma, the kidneys retain their essential functions and maintain homeostasis a certain time. It should be noted that the state of hyperfiltration characterizes not only extremely high values of glomerular filtration rate (GFR), but also no increase or decrease of GFR in response to stimulation. Hyperfiltration is an early sign of violations of intraglomerular hemodynamics. On the one hand, this process has a compensatory nature, on the other — damaging effect on glomerular structure and accelerating the development of pathological process in the kidney [10].

#### Conclusions

Thus, the harmful effect of brain ischemia on the kidneys is of no doubt. The kidney may act as a direct initiator and “behind the scenes director” of the development of acute brain ischemia or be on-target. Glomerular hyperfiltration, microalbuminuria, proteinuria, focal-segmental glomerulosclerosis, sclerosis of the renal interstitium may serve as morphological markers of the development of hyperperfusional renal damage. In this regard, the need for the use of pharmacological drugs that improve renal hemodynamics, preventing or slowing the progression of chronic renal failure, is obvious. Nephrosclerosis is the end point of continuous ischemia and hemodynamic disturbances. Severe damages of vital organs-targets in stroke, particularly the kidneys, and difficulties of correcting their functions determine the urgency of the problem of effective nephroprotection in stroke patients.

Our data support the hypothesis of clear angio-cerebro-renal relationships and the similarity of structural changes in brain and renal tissues in rats after acute brain ischemia that caused by hemodynamic disorders and endothelial dysfunction. Considering the secondariness and the mediation of renal injury in experimental ischemic stroke, angio-cerebro-renal dysfunction in ischemic stroke may be caused by violation of central regulation, vascular-hemodynamic disorders and general systemic inflammatory response that is manifested as morphologically, as functionally.

#### References:

1. Abzalova Sh. R., Kaldybaeva A. O. Influence of brain ischemic injury on the morphological changes in the liver in experiment//Eurasian Scientists Union (ESU). – 2015. – No.7 (16). – P. 17–20. [In Russian].
2. Aryev A. L., Ovsyannikova N. A., Aryeva G. T. Risk factors for development and progression of renal, cardiovascular and cerebrovascular diseases are the similar (the opinion of geriatrician)//Nephrology. – 2011. – No. 1. – P. 76–83. [In Russian].
3. Batyushin M. M. Nephrology: keys to a difficult diagnosis: Elista: Jangar, 2007. – 175 p. [In Russian].
4. Brenner B. M. Effect of candesartan cilexetil (TCV-116) on renal function in renal allograft model//16 Sc. Meeting ISH. – Glasgow, Prelim. Progr., 1996. – P. 12 (2).
5. Brosius F. C., Hostetter T. H., Kelepouris E., Mitsnefes M. M., Moe S. M. et al. Detection of chronic kidney disease in patients with or at increased risk of cardiovascular disease: a science advisory from the American Heart Association Kidney And Cardiovascular Disease Council; the Councils on High Blood Pressure Research, Cardiovascular Disease in the Young, and Epidemiology and Prevention; and the Quality of Care and Outcomes Research Interdisciplinary Working Group: developed in collaboration with the National Kidney Foundation//Circulation. – 2006. – Vol. 114. – P. 1083–1087.
6. Daminov B. T., Egamberdiyeva D. A., Abdullayev Sh. S. Clinical significance of arterial hypertension in patients with diabetic nephropathy//Med. J. Uzbekistan. – 2010. – No. 4. – P. 56–60. [In Russian].
7. Go A. S., Mozaffarian D., Roger V. L., Benjamin E. J. et al. Heart Disease and Stroke Statistics – 2013 Update. A Report From the American Heart Association//Circulation. – 2013. – Vol. 127. – P. e6–e245.
8. Koren-Morag N., Goldbourt U., Tanne D. Renal dysfunction and risk of ischemic stroke or TIA in patients with cardiovascular disease//Neurology. – 2006. – Vol. 67. – P. 224–228.
9. Madjidova Y. N., Rasulova Kh. A. Ischemic stroke (cerebral infarction): clinics, diagnosis, treatment. – Guideline: Tashkent, 2011. – 232 p. [In Russian].

10. Malkov P. S., Oleynikov V. E., Tomashevskaya Yu. A. Structural and functional changes in the kidneys in arterial hypertension//Intern. Med. J. – 2004. – No. 1. – P. 135–138. [In Russian].
11. Nanri M., Watanabe H. Availability of 2VO rats as a model for chronic cerebrovascular disease//Nippon Yakurigaku Zasshi. – 1999. – Vol. 13. – P. 85–95.
12. Rasulova Kh. A., Daminov B. T. Modern and perspective way to neurology and nephrology in the format P4 in the aspect of cerebro-renal interrelations//Therapeutic Bulletin of Uzbekistan. – 2015. – No. 1. – P. 42–47. [In Russian].
13. Ryabov S. I., Natochin Yu. V. Functional nephrology. – Saint-Petersburg: Sotis, 1997. – P. 304. [In Russian].
14. Ryabov S. I., Rakityanskaya I. A., Ryabova T. S. Mechanism of development of fibrosis of the renal tissue//Nephrology and dialysis. – 2007. – No. 3. – P. 345. [In Russian].
15. Tareeva I. E., Kozlovskaya N. L., Krylova M. Yu. et al. Platelet abnormalities in pregnant women with chronic glomerulonephritis and hypertension//Ter. archive. – 1996. – No. 10. – P. 52–55. [In Russian].
16. Tugusheva F. A., Zubin I. M., Mitrofanova O. V. Oxidative stress and chronic kidney disease: a literature review//Nephrology. – 2007. – Vol. 11, No. 3. – P. 29–47. [In Russian].
17. Shulutko B. I. Mechanisms of progression of nephropathy//Proceed. IV annual Saint Petersburg's nephrol. seminar. – 1996. – P. 97–107. [In Russian].
18. Van der Velde M., Matsushita K., Coresh J. et al. Lower estimated glomerular filtration rate and higher albuminuria are associated with all-cause and cardiovascular mortality. A collaborative meta-analysis of high-risk populations cohorts//Kidney Int. – 2011. – Epub ahead of print.
19. Yakhno N. N., Vilensky B. S. Stroke as a health and social problem//Russ. Med. J. – 2005. – No. 12 (13). – P. 807–815. [In Russian].

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## **Sexual development and biochemical values of hepatic function in dynamics with background various methods of hormonal therapy in adolescent girls with congenital estrogen deficit**

**Abstract:** The results of the performed research confirm the possibility of administration of both 17-beta estradiol and tefestrol in the complex of hormonal therapy for teenager girls with hypo gonadism. Patients with diseases of hepatic-biliary system and its chronic forms in history should prefer tefestrol in combination with didrogestosterone

**Keywords:** hypogonadism, female teenagers, hormone replacement therapy.

Disorder of sexual development can be caused by a wide range of pathological states, where, together with various congenital diseases of reproductive system, an important role is played by primary or secondary deficiency of ovarian function. Ovarian deficiency (hypo gonadism) is a pathological state, conditioned by decrease of estrogen level in organism (or weakening of effect in tissue), manifested by underdevelopment of internal and external sexual organs, no secondary sexual traits, and disorder of fertility [1]. We can isolate primary (hyper gonadotropic) hypo gonadism, caused by lesion of ovaries; and secondary (hypo gonadotropic) hypo gonadism, conditioned by decrease of gonadoliberin and/or gonadotropin secretion [3].

In spite of the diversity of clinical forms of estrogen deficiency states in girls today it is generally accepted that hyper gonadotropic and stable hypo gonadotropic hypo gonadism, conditioned by congenital diseases of hypothalamus and pituitary, requires long-term hormonal therapy, the aim of which is compensation of congenital deficit of sexual hormones. At least feminization of appearance and development of secondary sexual traits should be achieved [2].

The therapy with sexual hormones and similar agents in children and teenagers is peculiar, and it is preconditioned by good knowledge of pediatric and adolescent physiology, pharmacology, and pharmacodynamics of various estrogen-containing agents. It is compulsory for optimal choice and success of the therapy. Hormonal therapy started in adolescence requires long term application on

one hand, and following safety rules, on the other. In the modern time in hormonal therapy in teenagers herbal agents are preferred due to softer effect, in comparison with its predecessors — synthetic estrogens. Prescription of these agents lead to significant improvement of psycho-emotional status of teenagers, formation of more complete self-perception of a person, it promotes correction of clinical symptoms of hypo gonadism. The choice of an agent for long-term administration should be done using forms with minimal amount of side-effects [4].

**The objective of the research** was assessment of the parameters of sexual development and several biochemical values of functional metabolic activity of liver in girls with hypo gonadism together with various methods of compensatory hormonal therapy.

**Materials and methods of the research.** We examined 42 patients in age groups from 13 to 15 and from 16 to 18 years old with hypo gonadotropic and hyper gonadotropic hypo gonadism, the parameters of sexual development of which had 3 years and more retardation (II–III degree of sexual development retardation). Patients of the 1 group (64 teenagers) administered an agent for traditional hormonal therapy, containing 17-beta-estradiol and didrogestosterone (14 tablets, containing 2mg 17-beta-estradiol, 14 tablets containing 2mg of 17-beta-estradiol and 10mg of didrogestosterone). Patients of the 2 group (60 teenagers) administered estrogen-like agent tefestrol in combination with 10mg of didrogestosterone. All examined patients before and together with the therapy had clinical

anthropometry, assessment of the degree of sexual development (assessment of secondary sexual traits with calculation of summary score of sexual development), USD of womb and ovaries. Functional metabolic activity of liver was evaluated according to the definition of ALT, AST, total bilirubin, alkali phosphatase, cholin esterase in blood serum. Laboratory tests were performed using «Boehringer Mannheim» and «Bicon» sets (Germany). The control group involved 20 teenager girls of the similar age with physiologic puberty.

**The results and discussion:** Analysis of the results obtained after 12 months therapy in compared groups showed that together with the performed therapy alterations of anthropometric parameters had some differences. So, in the 1 therapeutic group average growth in 13–15 years old subgroup was equal to 6.2 cm, and in 16–18 years old group 1.0 cm. Body mass index in the 1 group had no statistically significant changes compared with that value prior to the therapy (Table 1).

Table 1. – Anthropometric parameters before and at the term of the therapy

Parameters	Groups	Age					
		13–15 years old			16–18 years old		
		Before therapy	In 6 mo	In 1 year	Before therapy	In 6 mo	In 1 year
Height	I	152.1±2.2	154.2±1.8	158.4±1.9*	160.1±1.8	160.2±1.7	161.1±1.6
	II	151.2±3.1	153.8±3.4	156.2±3.7	155.7±2.9	157.0±2.9	154.4±2.8
Weight	I	43.8±2.0	45.3±2.3	49.3±2.3	47.9±2.0	49.2±2.0	50.2±2.2
	II	44.4±1.8	46.9±1.9	49.6±2.6	47.4±1.2	52.1±1.1	53.2±1.0
BMI	I	19.0±0.9	19.1±0.97	19.9±1.0	18.8±0.92	19.2±0.92	19.4±0.97
	II	19.4±0.6	19.9±0.62	20.3±0.66	19.1±0.6	21.2±0.7*	22.3±0.9**
BIP	I	0.61±1.96	2.68±0.28**	3.95±0.42**	1.25±0.37	3.0±0.33**	3.96±0.38**
	II	1.1±0.3	2.5±0.28**	3.7±0.11**	1.6±0.5	2.7±0.6	3.8±0.42**

Note: \* — reliability of the data between the values before and after the therapy (\* —  $P<0.05$ ; \*\* —  $P<0.01$ )

In the 2 group with identical growth we revealed reliable increase of BMI in comparison with similar parameter before the therapy, indicating a greater gaining weight rate in the patients administering estrogen-like agent tefestrol.

Summary score of sexual development reflects the degree of secondary sexual traits expression. At the initial application from the total number of the examined patients 92 (72.58%) had Ma0 Ax0 P<sub>B0</sub> formula of sexual development, 21 (16.93%) patients Ma0 Ax1 P<sub>B1</sub>, and Ma1 Ax1 P<sub>B1</sub> eleven (8.87%) patients. Average formula of sexual development in patients in one year, independently of the performed method of hormonal therapy was Ma2 Ax2 P<sub>B2</sub>. Summary score of sexual development in compared groups before the therapy was identical. In the I group it was 0.61±1.96 in 13–15 years old subgroup, and 1.25±0.37 in 16–18 years old subgroup; in the II 13–15 years old subgroup it was equal to 1.1±0.3, and 1.6±0.5 in 16–18 years old group. In one year administration of hormonal therapy the summary score of sexual development in both groups independently of the age was equal and reliably higher than the similar parameters before the therapy (see Table 1).

The greater differences were revealed in ultra sound scanning of ovaries at the time of the therapy in both groups. Patients of the I group had reliably greater sizes of womb: width 30.8±1.5mm versus 21.4±1.9mm ( $p<0.001$ ), length 34.4±1.4mm versus 26.6±1.7mm ( $p<0.01$ ). In one year the sizes of womb in the patients of the I group were still reliably greater in comparison with similar parameters of the patients of the II group: length 39.8 ±1.2mm and width 36.2±1.2mm versus 32.2±2.1mm ( $p<0.01$ ) and 27.4±1.7mm

( $p<0.001$ ). Reaction similar to menstrual in 48 (75.0%) patients of the I group appeared after 2 cycles of 28-day administration of the agent; in 10 (15.62%) patients after 3 cycles, in 6 (9.37%) after 4 cycles. In the II group of patients administering tefestrol in combination with didrogesteron for 2 cycles reaction similar to menstrual one appeared in 21 (35%) cases; in 21 (35%) after 3 cycles, in 18 (30%) after 4 cycles of administration. Duration of the reaction similar to menstrual in the I group was 4±1 days and 3±1 days in the II.

Tolerance to hormonal agents in both groups was satisfactory. Though in the I group five patients had nausea, two had chloasma on face. In the II group of patients there were no side effects of hormonal therapy.

Before the therapy and in 6 months of the therapy all the examined patients had assessment of functional metabolic activity of liver (Table 2).

Analysis of the obtained data showed that the amount of total bilirubin in both therapeutic groups was in the limits of normal values and did not change within the period of the therapy. The values of alkali phosphatase and cholin esterase demonstrated increase of these values independently of the age with background therapy in the I therapeutic group, and the rise of the absolute value of alkali phosphatase was reliably significant and was equal to 114.8±13.8 versus 154.0±10.1 ( $p<0.05$ ). The values of ALT and AST in 6 months of the therapy also demonstrated reliably significant increase, but absolute values stayed in the limits of normal figures. In patients of the II group all values stayed unchanged within the whole follow-up period.

Table 2. – Biochemical values of girls with hypo gonadism in comparative aspect

Values	Control (n=40)	Examined groups			
		2 group (n=64)		3 group (n=60)	
		Before therapy	In 6 mo	Before therapy	In 6 mo
ALT	7.5±0.73	5.75±0.97	10.3±3.9*	9.3±1.8	11.0±1.4^
AST	18.1±0.93	11.1±1.72^	18.7±2.4*	19.0±2.1	16.0±0.99
Bilirubin	9.3±0.86	7.3±0.49	7.5±0.55	11.1±0.9	9.8±1.0
Alkali phosphatase	127.4±12.9	114.8±13.8	154.0±10.1*	160.3±27.3	137.8±22.9
Cholin esterase	8166.9±409.2	7714.4±412.9	8732.7±443.3	12329.8±1570.4^	9360.5±426.6

Note: \* — reliability of the data between the values before the therapy and in 6 months ( $P<0.05$ ); ^ — reliability with control ( $P<0.05$ )

According to scientific literature data the effect of estrogen administration depends on the way of intake. Oral intake of estradiol has effect on the lipoprotein level as it is linked with its entrance to liver, further biotransformation, alteration under the influence of steroid exchange of lipids and proteins in liver. Under the influence of hormonal therapy with tablet agents due to the effect of primary passage through liver there are alterations in hepatic metabolism. Tablet estrogens (or metabolites) increase the pool of free cholesterol of liver and increase saturation of bile with the latter. Moreover, estrogens can potentially affect the composition of bile acids pool: during the therapy percent ration of xenodesoxycholic acid amount decreases. That acid prevents formation of gall-stones more than other bile salts. It is supposed that unfavorable hepatobiliary effects can be linked with

the increase of estrone concentration in administration of oral forms of the therapy. If taken for a long term estrogen containing agents cause isolated cholestasis syndrome, which is rarely diagnosed clinically. The data we achieved testify the probability of the development of cholestasis syndrome in patients of the I group, who administered 17-beta estradiol. While the patients of the II group, who administered tefestrol, had no clinical laboratory deviations in hepatic-biliary system.

**Conclusions.** The results of the performed research confirm the possibility of administration of both 17-beta estradiol and tefestrol in the complex of hormonal therapy for teenager girls with hypo gonadism. Patients with diseases of hepatic-biliary system and its chronic forms in history should prefer tefestrol in combination with didrogesterone.

#### References:

1. Jukovski M. A., Golubeva P. V., Chkhenze L. V. On the problem of diagnostics and therapy of disorders of sexual differentiation in children. *Pediatrics*. 1998, 1; 11: 43–49. (in Russian).
2. Irgasheva S. U. Clinical-hormonal characteristics and the choice of therapeutic tactics in retardation of sexual development of girls. *Obstetric and gynecological diseases journal*. 2008; LVII (4): 85–88. (in Russian).
3. Kobozeva N. V., Kuznetsova M. N., Gurkin U. A. *Gynecology of children and teenagers*. St. Petersburg: 1999. (in Russian).
4. Fuad I. K. Some forms of hyper gonadotropic amenorrhea (clinical progress, diagnostics); thesis ... *Cand. Med. Scien. Moscow*; 1988. (in Russian).
5. Schultz B. HRT and Body compartments: breast and liver. *Menopause review*. 1997; II (2): 1997.

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## **Influence of catacyn and benzonalum on $Ca^{2+}$ – accumulation capacity of mitochondrion of a liver of the rats poisoning with toxic of a cobra naja naja pxina Echwald**

**Abstract:** It is fixed, that after injection in an organism of animals of Benzonalum or catacyn  $Ca^{2+}$  accumulation capacity of mitochondria of liver is decreased. Injecting of cobra's toxic in an organism of animals bring to increasing of entering of  $Ca^{2+}$  in mitochondria. At injecting in an organism of Benzonalum or catacyn on phone of poisoning of an animal with cobra's toxic it takes place suppression of  $Ca^{2+}$  — accumulation capacity of mitochondria.

**Keywords:** catacyn, benzonalum, cobra, naja, oxina, snake, poison, toxic.

**Background.** It is known, that benzonalum and catacyn have effect of antihypoxants and immediately influence on gas oxygenous metabolism and power metabolism Mx at hypoxia [1; 2]. It is known, that antihypoxants — gutimin and a natrium hydroxybuturate are effective both as prophylactic using and after a poisoning of snakes [3; 4]. The problem on possibility of direct acting of antihypoxants of catacyn and benzonalum on calcium accumulation capacity of mitochondrion of different elements of animals on background of action of toxins of snakes is remained openly [5; 6; 7].

Well-known, that ions of  $Ca^{2+}$  regulates many intracellular processes, including the formation of energy. Regulation is realized or direct allosterical action of  $Ca^{2+}$  in ferments — targets, or indirect, by activation/retardation of various protein kinases and protein phosphatases, considered customary, that ions  $Ca^{2+}$  can modulate activity of ATF in mitochondrion for the bill of activation of several dehydrogenase of Kreb's cycle [8; 9]. It is known, that  $Ca^{2+}$  can modulate the activity of translokaz of adenia nucleotides [10]. The top speed of synthesis and hydrolysis of ATF in mitochondria of a liver of a rat is watched after adding to breathing mitochondria of

$5 \cdot 10^{-7} M Ca^{2+}$ . Lowering of  $Ca^{2+}$  to  $10^{-8}$  or its increasing to  $10^{-6} M$  is resulted to a braking of oxidized phosphorylation and hydrolysis of ATF [11].

**The purpose** of the produced job is the research of action of benzonalum and catacyn on transport  $Ca^{2+}$  mitochondria of cells of a liver of healthy animal and poisoned of cobra.

#### **Material and methods**

In experimental researches there were used white rats in mass of the average 200–230g. Animals were maintained on a blended ration in good aerated, light premises, in wood cage (50×30 cm) till 8–10 rats in each. Forage and water to rats were given without limitation.

Animals have been separated on 4 groups on 10 animals in each. Animals of first, second and third groups were injected intramuscular with toxic of Central Asia cobra naja naja oxina Echwald in a dose of 160 mg/kg of weight. Through two minutes animals of the second and third groups were injected catacyn or benzonalum on 50 mg/kg of weight in addition. The fourth group of rats received a physiologic solution. Through 15 minutes after injecting of toxic of

a cobra the animals were decapitated. Toxic of the Central Asian cobra received from institute of Zoology of Academy of Sciences of Uzbekistan. Samples of toxic of a collection of 2002, exsiccated in desiccators over calcium chloride have been used.

Mitochondria from cells of a liver of rats got on special method [12]. Transfer of Ca<sup>2+</sup> through mitochondria membrane was registered by the metrical method pH, grounded on fluctuation of 2H<sup>+</sup>/Ca<sup>2+</sup> of metabolism of mitochondria [13]. At consecutive adding of several portions of chloride calcium to suspension of mitochondria, the absorbing of Ca<sup>2+</sup> in exchange for protons is replaced by a spontaneous going out of accumulated Ca<sup>2+</sup>. It is connected with damage of membranes of the mitochondrion, called basically the activation of phospholipase A<sub>2</sub> and phospholipase D with larger concentration of Ca<sup>2+</sup>, separate of oxidative phosphorylation, fluctuation of membrane penetrating, and also opening of cyclosporine A — a sensitive pore [14; 15; 16]. Than it is more Ca<sup>2+</sup> mitochondrion can accumulate till its self arbitrary free throw out, there are more stable membrane structures to damage action of these ions. Depending on a number of conditions of stoichiometry, the change of Ca<sup>2+</sup> on protons can vary [17]. As in the presence of phosphate in the quality of penetrate anion the stoichiometry of 2H<sup>+</sup>/Ca<sup>2+</sup> of metabolism is constant and is approximately equally 1, in experiments the medium of an incubation maintained 120 mmol tris-KCl, 10 mmol tris-HCl, 5 mmol a succinate, pH 7.4, rotenone (1mg/ml) and 1 mmol phosphate. The system was supported with solution of HCl of known concentration. Protein is determined on method of Lowry O. H. et al. [18].

**Results and discussion** It is fixed, that after injecting in an organism of animals of Benzonalum and catacyn Ca<sup>2+</sup> the accumulating capacity of mitochondria of a liver is decreased (tab. 1). So, injecting in an organism of Benzonalum of 50 mg on kg of mass of body of Ca<sup>2+</sup> the accumulating capacity of mitochondria of a liver is decreased on 32,4% from monitoring level, and catacyn — on

26,8%. Decrease of Ca<sup>2+</sup> accumulating capacity of mitochondria with higher indicated antihypoxants is connected with inhibition of absorption function of mitochondria of ion Ca<sup>2+</sup>, or catacyn and benzonalum which are increased the content of glycoprotein specifically connected with Ca<sup>2+</sup> or they are activated rianodine receptor [19]. Adding of rianodine to insolate mitochondria has been resulted to suppression of transport of Ca<sup>2+</sup> and inhibited higher amplitude swelling of mitochondria.

The results, received in the present series of researches, are allowed to know, that catacyn and Benzonalum are inhibited the influx of Ca<sup>2+</sup> in a mitochondria.

Table 1. – Influence of Benzonalum and catacyn on Ca<sup>2+</sup> accumulating capacity of Mitochondria of a liver of rats (M±m; n=8–10) (M±m; n = 8–10)

Preparations	Ca <sup>2+</sup> — accumulating capacity, nmol/mg of protein
Control	82,8 ± 3,7
Benzonalum	56,0 ± 3,2
Control	84,3 ± 4,4
Catacyn	61,7 ± 3,9

Remarks: here and in tabl.2 the medium of an incubation is maintained: 120 mM KC1, 1 mM KH<sub>2</sub>PO<sub>4</sub>, 5mM a succinate, 10 mM tris-Hcl (pH 7,4), 1 mg/ml rotenone.

In a following series of experiments, influence of Benzonalum and catacyn on Ca<sup>2+</sup> accumulation capacity of mitochondria of a liver of animals on phone of toxic of a cobra (tab.2) has been learnt. It is fixed, that under the influence of toxics the absorption of ions of calcium in mitochondria of a liver of rats raises on 68,6% from norm's level. In the presence of Benzonalum it has been compounded only — 17,4%, catacyn — 20,4%. It means, that Benzonalum and catacyn decreases.

Table 2. – Influence of toxic effect of cobra on Ca<sup>2+</sup> accumulation capacity of mitochondria of a liver of rats on phone of Benzonalum and catacyn (M±m; n = 8–10)

Indexes	Ca <sup>2+</sup> — accumulation capacity, nmol/mg of protein			
	Healthy animals	The animals who have received toxin of cobra		
		Control	Benzonalum	Catacyn
Liver	91,4 ± 5,9	154,1 ± 12,6****	107,3 ± 8,2	110,1 ± 6,7
%	100	168,6	117,4	

Ca<sup>2+</sup> accumulation capacity of mitochondria, that is almost completely remove a negative effect of toxic of a cobra. In our opinion, toxic of a cobra calls the progressive increase of Ca<sup>2+</sup>, gives a signal to implementation of Ca<sup>2+</sup> cycle on a mitochondrial membrane. This increase is prolonged until then while job of systems of an entrance and going out of Ca<sup>2+</sup> will be not lead to critical increasing of Ca<sup>2+</sup> till 1–3μM. In these conditions there is take place the induction of Ca<sup>2+</sup> of dependent unspecific penetration of the inside membrane (so-called «membrane's time»). It is escorted by higher amplitude of swelling of mitochondria, damaging of the outward membrane

and releasing in a cytosol and is dissolved by proapoptical agents. To them it is concerned the cytochrome c, become localize in intermembranous area, apoptozinducycal factor, a number of caspaz, which one immediately participate in stage of starting up apoptical reactions, and also factor of Smas/DIABLO which are promoted an apoptosis and inactivates inhibitors apoptical proteins. Thus, at injecting in an organism of Benzonalum and catacyn on the phone of poisoning of an animals with toxic of a cobra there is a suppression of Ca<sup>2+</sup> transport and inhibition of higher amplitude swellings of mitochondria.

#### References:

- Zijaeva. A.V., Juldashv N.M., Mahmudov S. A. The Pathology. P. 28–30. (1996).
- Juldashv N.M., Zijaeva A. V. Information letter, Tashkent, the certificate – № 0003. P. 3 (1994).
- Kurmukov A. G., Nazrullaev A., Ahmerov R. N. Med. J. Uzb. – № 1. P. 1, 7–9 (1990).
- Nazrullaev S. S. Autoref. of dissert. P. 20. (1994).
- Vinogradov V.M., Pharm. Amidin Units. P. 106–114. (1972).
- Valtseva I. A., Strelkov V.M., Trudy R. P. 1 MMI. P. 84, 56–57. (1975).
- Bogrova T. A. Actual questions of Neuropathology and Neurosurgery. P. 9, 5–10 (1976).
- Chichkanov G. G., Bogomolov A. K. Bull. Exper. Biol. P. 3, 44–47 (1982).

9. Mashkovsky M. D. Pharmacology, (1987).
10. Novikov V. E. Pharm. Toxicol., P. 6, 9–11 (1991).
11. Evtodienko J. V., Azarashvili T. S. Biol. Chem., P. 65, 9, 1210–1214 (2000).
12. Scheider W. C., Hogeboom G. H. Cancer Res., P. 19, 1–22, (1951).
13. Almatov K. T., Ahmerov R. N. Human Physiol. Animals, P. 1, 50, (1993).
14. Gegehgans A. I. Dissert., P. 177, (1970).
15. Brockemeier K. M. Biochemistry, P. 16440–16449, (1995).
16. Madesh M., Balasubramanian K. A. Biophys., P. 346, 2, 187–192, (1997).
17. Ganitkevich V. Y. Exp. Physiol. – V. 88. – N 1. P. 91–97. (2003).
18. Lowry O. H., Rosenbrough N. J. J. Biol. Chem. – V. 193. – N 3. P. 265–275. (1951).
19. Deriabina J. I., Isakova E. P., Zviagilsky R. A., Biochemistry. – V. 69. – № 1. P. 114–127. (2004).

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## The state of hepatobiliary system in juvenile rheumatoid arthritis

**Abstract:** The Article is dedicated to the results of the clinical-biochemical, biophysical and pathomorphological study of liver in the patients with juvenile rheumatoid arthritis. Liver injury was found in 64.8% of patients with JRA, showing the signs of mesenchymal inflammation, hypoalbuminemia, hyperbilirubinemia, hyperenzymemia. The importance of elastography in the early diagnosis of liver fibrosis in patients with JRA was determined. The results of morphological studies of liver of the deceased JRA patients treated with methotrexate showed that, in contrast to patients who did not receive methotrexate, the development of more severe disorganized, dystrophic and immunopathological processes with transition to the sclerotic and fibromatous changes was noted.

**Keywords:** biochemistry of liver, hepatotoxicity, juvenile rheumatoid arthritis, methotrexate, pathomorphology, fibrosis, elastography of liver, juvenile rheumatoid arthritis.

**Relevancy.** Diffuse disease of connective tissue, which includes juvenile rheumatoid arthritis (JRA), is one of the most severe and socially important forms of chronic pathology in children. The tendency to early disablement and possibility of system manifestations with involvement of internal organs in the pathological process necessitate timely diagnostics of complications and choice of adequate therapy. Hepatobiliary system is vulnerable in JRA patients. Its reasons include autoimmune processes on the one hand, and effect of drugs on the other hand.

Hepatotoxic reactions appearing during the application of background therapy of JRA depend on the duration of use and dose of drugs [4]. It is known that the possibility of adverse reactions increases with the increase of the amount of simultaneously used drugs. It is established that if a patient takes five or six drugs simultaneously, the possibility of an adverse effect reaches 80% [1, 12].

The analysis of published information in respect of most often used non-steroidal anti-inflammatory drugs (NAID) in JRA and golden standard of treatment — methotrexate (MTX), certifies about high possibility of liver injury. Hepatotoxicity of drugs used in rheumatology leads to the slow-down of the processes of bio-transformation of exo- and endobiotics, their accumulation in circulating blood and development of endogenous intoxication, worsening of pathological process and toxicity of used drugs [2; 3; 6]. Methotrexate suppresses the activity of methylenetetrahydrofolate reductase, which leads to the increase of the level of homocysteine and, in the future, to the enhancement of fatty infiltration of hepatocytes, development of inflammation, Ito-cells activity and liver fibrosis [7, 14]. Methotrexate can cause the increase of liver ferments activity, development of fibrosis and cirrhosis of

liver during long-term treatment [11]. However, the data about the frequency and severity of fibrosis and cirrhosis of liver during the use of methotrexate in doses used in rheumatic diseases is ambiguous [10].

As a result of the progress of pathological process, consecutive stages of fibrosis develop in the liver, for the diagnostics of which the elastography of liver, a non-invasive method, has recently become the safest and most informative [5; 9; 13]. With regard to the above stated, the problem of early diagnostics of liver injury, enhancement of the efficiency of JRA therapy with the simultaneous ensuring of the minimum of adverse effects of drugs is very relevant both, from the point of science and practical pediatrics.

**Aim of research:** to study clinical-biochemical, biophysical and pathomorphological characteristics of injury of hepatobiliary system in juvenile rheumatoid arthritis.

**Material and methods of research.** 91 patients with JRA aged from 1,5 to 17 were examined, out of which, there were 18 patients oligo- and 73 patients with poly-arthritis variants of disease.

Out of 91 patients, there were 50 (54,9%) boys and 41 (45,0%) girls. The duration of disease was from 1 to 10 years.

59 children showed clinical signs of liver injury (main group), and 32 children with JRA without liver injury were included in the experimental group. The criteria of inclusion were the absence of earlier diseases of hepatobiliary system, absence of anti-bodies to the viruses of hepatitis B, C and D, which were determined by immune-ferment method. Ultra-sound (US) examinations of hepatobiliary system was conducted on the device SSD-630 «Aloka» (Japan). Elastography of liver was conducted with the help of the device «FibroScan 502 TOUCH» («EchoSens», France).

The activity of ferments of serum glutamic pyruvic transaminase (SGPT), gamma glutaminetransferase (GGTP) and alkaline phosphatase (ALP), content of total protein, albumins, bilirubin and its fractions, total cholesterol, thymol test were determined on the automated multiple-unit apparatus "Autohumolizer F1" ("Human", Germany) with the help of special sets of chemicals. The results of 12 autopsy examinations of children and teenagers who died of rheumatoid arthritis during the last 10 years (2005–2014) were studied at the Republic pathologicoanatomic center. Histological sections from the liver were stained with hematoxylin and eosin for general morphological study; to identify collagen fibers, the sections were stained in accordance with van Gieson's method and mucopolysaccharides were defined according to Schick test.

The statistical processing of the obtained data was conducted on personal computer with the help of the applied programs package « Microsoft Office» and « Statistica 6.0».

**Results of research.** It was found from the anamnesis that in 64 (70,3%) children, the development of JRA was promoted by trigger factors, among which acute respiratory diseases take the first place.

Burdened perinatal anamnesis was found in 70 (76,9%) children and 21 (23,1%) patients had burdened anamnesis on rheumatic diseases. 35 (38,5%) children were considered almost healthy before the appearance of JRA.

The performed studies showed that 59 (64,8%) out of 91 patients had the symptoms of hepatobiliary system injury. Reactive hepatitis was detected in 37 patients and other 22 patients showed the signs of chronic hepatitis. According to the data of ultrasound diagnostics, the growth of liver (+1 cm-2,5 cm), slight increase of parenchymal echogenicity of the liver and enhancement of vascular pattern. Primarily, the liver injuries were characterized during US by diffuse changes of parenchyma of the liver, increased echogenicity, reactive hepatitis and hepatomegalia. Liver injuries related to drugs usually manifest themselves with the increase of liver ferments without symptoms, i. e. take place sub-clinically being a «biochemical finding» (anicteric variant of acute drug-induced hepatitis). The patients with the duration of the disease of 1–3 years showed functional disorders from the side of the liver manifested in the disruption of enzymatic status. 57,9% reported complaints about nausea, vomiting and unstable stool. Classic clinical signs of hepatitis were not observed in them. The increase of the level of aminotransferase without symptoms can be observed during the use of non-steroidal anti-inflammatory drugs, cytostatic agents, immunodepressants, which are major drugs in JRA treatment. During long-term use of listed drugs, severe hepatitis can develop. Hence, attention should be paid to the isolated increase of aminotransferase activity, because it can certify about the development of drug-induced pathology of the liver.

The diagnostics of drug-induced hepatitis poses a complex problem. Several criteria allowing clarifying the diagnosis and confirming that originated symptoms are actually drug-induced are proposed: chronology of appearance of complications; regress of clinical symptoms after the discontinuation of treatment; relapse of a complication after repeated drug administration; absence of other possible etiology; results of laboratory-instrumental studies.

During the diagnostics of drug-induced hepatitis, we relied upon the chronological criteria, absence of other possible etiology and results of laboratory-instrumental studies. We couldn't use the regress of the clinical signs of complication after the discontinuation of treatment because long-term cancellation of background

therapy will lead to the aggravation of the underlying disease (JRA). The signs of hepatitis with all typical clinical-laboratory manifestations and confirmed with US were observed in the patients in the course of progress of the disease and further use of drugs, often in increased doses. The latter was noted in the patients with the duration of disease of 3–5 years and more. The study of clinical manifestations of liver injury shows that the complaints about the pain in the right hypochondrium and stomach were made by 2/3 of the patients with the duration of the disease of 3–5 years and more; the reduction of appetite was observed in more than half of the patients; icterus of skin cover was revealed in half of the patients; all patients showed the increase of liver size. Biochemical studies established the increase of aminotransferase activity in 9 (15,2%), GGTP and ALP — in 21 (35,6%), hyperbilirubinemia — in 38 (64,4%) and direct bilirubin — in 10 (16,9%) children. 44 (74,6%) children show the signs of hepatodepression manifested with hypoalbuminemia and partly, in 10 (16,9%), — hypoproteinemia. The increase of thymol test was noted in all 59 (100%) patients, which certifies about the presence of the signs of mesenchymal inflammation. This coincided with high frequency of increased echogenicity during US of liver, diffuse parenchymal changes.

The analysis of biochemical indicators of blood serum of JRA patients without involvement in the pathological process of the liver showed significant reduction of the level of albumins by 1,17, the increase of SGPT by 1,17 times against the background of preservation of the guideline values of the activity of GGTP (Table 1). The level of direct bilirubin significantly increased by 1,63 times against the background of preserved normal values of the total and indirect bilirubin. The increase of thymol test by 1,58 times should be especially noted.

At the same time, more expressed changes of biochemical indicators of blood serum were observed in JRA patients with liver injury. Thus, albumin content significantly decreased by 1,5 and 1,27 times, the activity of SGPT increased by 1,54 and 1,32 times, GGTP — by 1,4 and 1,51 times, corresponding to the values of almost healthy people and JRA groups without liver injuries. Here-with, the content of total, direct and indirect bilirubin increased significantly by 1,56, 1,63 and 1,55 times relative to normal values; total and indirect bilirubin — by 1,37 and 1,55 times relative to the indicators JRA children without liver injury. The indicator of thymol test was increasing sharply, exceeding the values of almost healthy people and group of patients without liver injury by 2,77 and 1,75 times respectively.

A wide scatter of researched indicators was observed, which, in our opinion, is related to the range of used drugs. The most changes were typical for patients with the use of NSAID complex, prednisolone, plaquenil and methotrexate.

The data obtained by us coincides with the evidence of clinical manifestations in children with hepatitis. Children of this group complained about headaches, weakness, reduction of appetite more often; asthenovegetative syndrome was expressed more distinctly etc. They were manifested with high frequency in children, who were receiving a combination of several drugs, especially in combination with methotrexate.

According to the data of conducted liver elastography, 19 (71%) of patient out of 25 JRA patients had no signs of fibrosis (F0). 4 (16%) patients were diagnosed with minimal fibrosis (F1) and 2 (8%) — with moderate fibrosis (F2). Severe fibrosis and cirrhosis were not found.

Table 1. – Biochemical indicators of blood serum of JRA patients, M±m

Indicators	Almost healthy	JRA patients	
		Experimental group	Main group
Total protein, g/l	68,30±0,61	68,62±0,88	63,24±1,03
Albumins, g/l	43,28±2,14	36,84±1,98 <sup>a</sup>	28,93±0,61 <sup>a, b</sup>
SGPT, u/l	25,34±1,31	29,54±1,66 <sup>a</sup>	38,93±0,61 <sup>a, b</sup>
GGTP, u/l	31,42±2,21	29,04±1,48	43,92±2,52 <sup>a, b</sup>
ALP, u/l	127,3±9,8	158,9±10,3	224,17±16,6 <sup>a, b</sup>
Total bilirubin, mmol/l	10,80±0,92	12,32±0,81	16,91±0,46 <sup>a, b</sup>
Direct, mmol/l	1,73±0,09	2,83±0,11 <sup>a</sup>	2,82±0,21 <sup>a</sup>
Indirect, mmol/l	9,07±0,63	9,49±0,65	14,09±0,43 <sup>a, b</sup>
Total cholesterol, mmol/l	3,79±0,16	3,87±0,12	4,24±0,16 <sup>a, b</sup>
Thymol test, rel. u.	2,22±0,11	3,51±0,28 <sup>a</sup>	6,16±0,27 <sup>a, b</sup>

Remarks: a — differences between the indicators of almost healthy people and JRA patients, statistically significant, b — differences between the indicators of children with JRA without and with liver injury, statistically significant.

The assessment of fibrosis was conducted according to META-VIR scale. The mean indicator of elasticity of liver was 3,5±0,5 kPa for F0, 5,8±0,5 kPa for F1 and 6,5±1,5 kPa for F2 stages of fibrosis respectively. The indicators of fibrosis stage in the group of JRA patients with liver injury were spread in equal ration between F0, F1 and F2.

The results of pathomorphological studies showed that the development of disorganized, dystrophic and immune-pathological processes were noted in the liver of deceased JRA children. Disorganized changes of vascular walls and interstice of liver develop first, which are manifested in the edema of inter-cellular substance, shredding of fiber structures, collapse of the elements of connective tissue. These changes are more expressed in the wall of the central vein and Disse's space. The disorganization of the central vein wall and sinusoids was accompanied with the development of dis-circulation of the liver in the form of diapedetic bleeding. Venous dis-circulation led to the development of dystrophic changes from the side of parenchyma of the liver and they were manifested in the form of hyaline-drop and vacuolar dystrophy of hepatocytes. The histochemical study designed to reveal mucopolysaccharides in the composition of stroma-vascular components and glycogen in the cytoplasm of hepatocytes by the method of Schick reaction found that the content of mucopolysaccharides increased in the stroma in the form of more intensive staining of inter-cellular substance in pink-red color, which certifies about the accumulation of glycozaminoglycans typical for disorganized processes of connective tissue. From the side of the parenchyma of the liver, the reduction of Schick positive substance in cytoplasm was noted, which proves the enhanced disintegration of glycogen and prevailing of protein and vacuolar dystrophy of hepatocytes.

The development of deeper disorganized processes in the form of mucoid, fibrinoid swelling and myxomatosis of the connective tissue of the wall of liver vessels was observed in the liver of children suffering from JRA for a long time. Herewith, it was noted that the wall of the central vein of the liver was thickened at the expense of fibroelastosis and myxomatosis of fiber structures, which expand towards the sinusoid wall. These changes led to paralytic expansions of sinusoids, perivascular bleeding and pigment formation. Beam location of hepatocytes is destroyed in the form of formation both, disorderly located and subjected to cytolysis and apoptosis of hepatocytes. Nuclei of the latter are in the condition of karyolysis, karyopyknosis. Herewith, the cholestasis is manifested in the form of accumulation in the internal side of the cytoplasm of hepatocytes in the form of numerous small brown pigment inclusions.

Basic pathomorphological changes of immune-pathological character of JRA are revealed around the vessels of liver triads, which developed by appearing of expressed cellular infiltrate from lymphoid and histiocytic cells admixed with eosinophils (fig. 1, 2). Cellular infiltrate mainly encircles arterial vessels of triads and spreads towards the parenchyma of the liver along the sinusoids. Herewith, the vessel walls are in the condition of mucoid and fibrinoid swelling. Activated lymphoid cells, which are tightly born to liver cells, appear in the parenchyma, especially in the Disse's space. Hepatocytes located around the triads are subject to dystrophic changes and cholestasis. Histochemical study showed significant reduction of Schick positive substance in the cytoplasm of hepatocytes in all functional zones of the liver.

The results of morphological study showed that in the liver of deceased JRA children who didn't receive methotrexate, the development of both, general morphological changes in the form of disorganization and dystrophy of connective tissue of the wall of the vessels and immune-pathological processes in the form of periportal lympho-histiocytic infiltrate admixed with eosinophils and mucoid, fibrinoid swelling of the wall of the vessels and connective tissue, interstice of the liver were observed. The results of morphological study of deceased JRA children who received methotrexate in the total dosage from 1,5 to 3 g showed that, unlike the patients who didn't receive methotrexate, the development of more expressed disorganized, dystrophic and immune-pathological processes with the transition to sclerotic and fibromatous changes was noted. At the increase of the dose of methotrexate, proliferative activity of histiocytic cells with the accumulation of fibrillary substance in the wall of sinusoids and central vein with the development of fiber connective tissue was observed; herewith, such fibrous was more expressed in the wall of the central vein.

Based on the obtained data, one can make the following **conclusions**:

1. Most JRA patients (64,8%) showed the liver injury manifested in all cases with the signs of mesenchymal inflammation, hypoalbuminemia — 74,6%, hyperbilirubinemia — 64,4%, cholestasis — 35,6% and hyperensymemia — 15,2% to 2 norms.

2. Non-invasive methods of diagnostics of the liver fibrosis — ultrasound elastography, allow revealing the phenomena of fibrosis and conducting the monitoring of MTX-toxicity of the liver in JRA patients. The advantage of elastography of the liver is the simplicity of performance, non-invasiveness, quickness in obtaining the result and possibility of repeated studies.



3. The depth and severity of pathomorphological disorders depend on the dose and duration of used drugs of background therapy and are characterized by: disorganization and dystrophy of connective tissue and wall of the vessels, lympho-histiocytic infiltrate of the wall of the vessels and connective tissue, interstice of the liver,

till fatty dystrophy of hepatocytes, expressed proliferative activity, both histiocytic and lymphoid cells with the formation of the foci of granulomatous inflammation and expressed fibromatosis in the wall of the central vein.

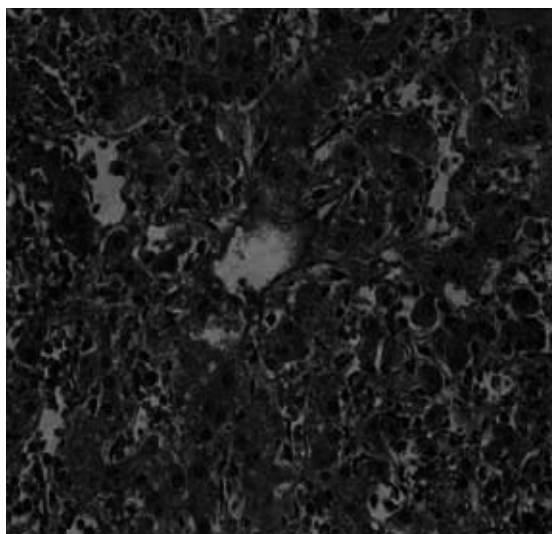


Fig. 1. 14 year old child with JRA. Myxomatosis of the wall of the central vein and sinusoids, paralytic expansion of sinusoids, apoptosis of hepatocytes. Stain: G-E. Uv: oc.10, ob.20

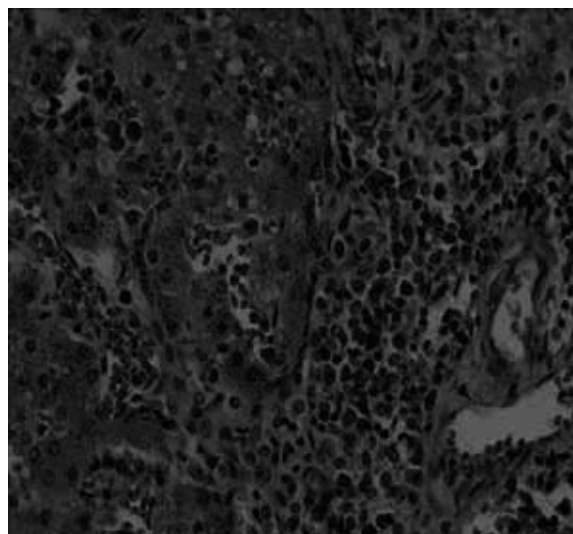


Fig. 2. Same 14 year old child with JRA. Lympho-histiocytic infiltration around the triad admixed with eosinophils, lymphocytes in the Disse's space, cholestasis. Stain: G-E. Uv: oc.10, ob.20

#### References:

1. Aithal G. Hepatotoxicity related to ant rheumatic drugs.//Net. Rev. Rheumatol., – 2011. – № 7 (3). – C. 139–150.
2. Analli M., Scioscia C., Grattagliano I., Lapadula G. Old and new antirheumatic drugs and the risk of hepatotoxicity.//Ther. Drug Monit., – 2012. – № 34 (6). C. 622–628.
3. Bueverov A. O. Possibilities of treatment of drug-induced liver injuries in the conditions of the need to continue the use of hepatotoxic drugs.//Curing doctor. – 2009. – № 2. – P.40–42.
4. Gepe N. A., Podchernyaeva N. S., Lyskina G. A. Manual on child rheumatology. – M.: GEOTAR-Media, 2011. – P. 162–325.
5. Goryacheva L. G., Kotev M. Ya., Efremova N. A. Elastography of the liver in child practice.//Journal of infection studies. – 2009. – № 2/3. – Vol. 1. – P. 64–68.
6. Zholobova E. S., Konopelko O. Yu., Gesheva Z. V. Hepatotoxicity of non-steroid anti-inflammatory drugs used in child rheumatology.//Pediatrics. – 2009. – № 5. – P.154–160.
7. Ignatyeva T. M. Drug-induced liver injury.//Hepatology forum. – 2008. – № 2. – P. 2–8.
8. Kocharla L., Taylor J., Weiler T. Monitoring methotrexate toxicity in juvenile idiopathic arthritis.//J Rheumatol., – 2010. – № 36 (12). – P. 2813–8.
9. Laharie D., Seneschal J. Assessment of liver fibrosis with transient elastography and FibroTest in patients treated with methotrexate for chronic inflammatory diseases: A case-control study.//Journal of Hepatology. – 2010. – Vol. 53 – P. 1035–1040.
10. Lopatkina T. N., Burievich E. Z. Drug-induced liver injury. Edited by N. A. Mukhin. Practical hepatology. – Moscow, 2004. – P. 133–136.
11. Mukhin N. A., Moiseev S. V. Drug-induced hepatotoxicity.//Clin. hepatology. – Moscow, 2010. – № 6. – P. 3–7.
12. Polunina T. E. Drug-induced liver injuries.//Curing doctor. – Moscow, 2005. – P. 8–13.
13. Pirogova I. Yu., Pyshkin S. A. Diagnostic opportunities of the methods of non-invasive assessment of fibrosis in diffuse liver diseases.//RZHGG. – 2009. – № 4. – P.48–53.
14. Eugene R. Schiff, Michael F. Sorrell, Willis C. Maddrey. Drug-induced liver injury. Translation from English, edited by N. A. Mukhin. Schiff's liver diseases. – Moscow, 2011. – P. 95–243.

## **Ultrasound diagnosis of the lower extremity deep vein thrombosis in the patients with multiple fractures of the bones of the lower extremities**

**Abstract:** There has been developed algorithm of diagnosis, choice of the technique of treatment (NDGU 2011 0174.28.07.11) and program (N DGU 2011 0188. 04. 08. 11) for prognosis of the complications of multiple fractures of the bones of lower extremities which were proved by patents. There has been performed analysis of treatment of 120 patients with bone fractures of lower extremities who were examined with ultrasound dopplerography of the lower extremities during the period from 2010 to 2014. The algorithms proposed for diagnosis and treatment of the bone fractures of lower extremities with associated trauma allow timely identification of developing complications (syndrome of fatty embolism, deep vein thrombosis and thrombembolia of the pulmonary artery (PATE) and their modern treatment provided for preserving the life of the suffering.

**Keywords:** multiple fractures, lower extremities, diagnosis, prevention, thrombembolia, ultrasound dopplerography.

### **Introduction**

Traumatic injuries of the soft tissues and vessels, compelled extremity immobilization and a bed rest provide the most favorable conditions for occurrence of deep vein thrombosis and thrombembolic complications [2]. The statistical data testify to the frequency of deep vein thrombosis of the lower extremities accounts for about 160 on 100000 of population. The fractures of the long tube bones of the lower extremities are accompanied by the deep vein thrombosis of the lower extremities in 7,4% of cases [3].

The timely diagnosis of the deep vein thrombosis of the lower extremities is one of the leading tactics of the treatment of patients with multiple fractures of the bones of the lower extremities [4; 5].

The use of method of color Doppler mapping (CDM) provides possibility to differ quickly occlusive thrombosis from non-occlusive, to reveal the initial stage of thrombi recanalization, as well as to determine place of localization and size of venous collaterals [1; 6].

**The purpose** of the this stage of work was to study incidence rate of the deep vein thrombosis of the lower extremity in the patients with fractures of the long bones of the lower extremities with use of ultrasound duplex scanning (USDS).

**Material and methods.** We carried out the analysis of treatment of 120 patients bone fractures of the lower extremities who was performed ultrasound dopplerography of the lower extremities during the period from 2010 to 2014. Among the suffering patients there were prevailed males (91 – 75,8%). The majority of patients (87,9%) were at the age of 31 to 60 years. The leading cause of the polytrauma were traffic accidents (89–74,2%).

The open fractures were found in 82 injured patients (totally 112 fractures). According to classification of Caplan-Markova the fractures were distributed as follows: 27 fractures were related to the type IIB, 32 ones — to type IIV, 53 — to type IIIB. The closed fractures were in 38 patients.

The method of dopplerography was used in the hospital before and after surgery. The method of ultrasound dopplerography of the vessels of the lower extremities was performed at the mode of color mapping of the studied veins of lower extremities and dopplerographic mapping of deep and superficial veins of the hip.

There were studied blood flow of the iliac vein (IVB), of the common femoral vein (CFV), big superficial vein (BSV), superficial femoral vein (SFV), popliteal vein (PV) and deep vena cava (DVC).

**Results and discussion.** According to the results of duplex scanning in the patients thrombosis of the vein before operation

was revealed in 33 (27,5%) patients. The signs of the postthrombotic disease were identified in 8 (6,7%) of patients.

At the analysis of the vein thrombosis during studied period there was noted twofold increase in occurrence from 12,1% in 2010 up to 24,2% in 2013 and 2014 (Fig. 1).

The carried out researches show the tendency to rising of identification of the patients with deep vein thrombosis (DVT) that, probably, may be connected with increase of quantity of performed ultrasound investigations of the deep vein of lower extremities.

In relation to a patency of the vessel the thrombi were differed as parietal, occlusive and floating. The signs of parietal thrombosis were visualization of the thrombus with presence of free blood flow in the vein patency, absence of complete wall adhesions in compression of vein with transducer, presence of defect of filling at CDM, presence of spontaneous blood flow in ultrasound Doppler scanning.

At definition of a place of thrombus localization there was found, that more than at half (19–57,6%) of patients the thrombosis was limited by the common femoral vein, in 7 (21,2%) patients there was defined in the iliac vein, in 3 (9,1%) the thrombosis was extended to the superficial femoral vein, in 2 (6,1%) thrombosis was in the area of great saphenous vein. The thrombosis of the popliteal (1–3,0%) vein and of the deep vein cava was found less often (1–3,0%).

With regard to character of the echogenic structures in the patency of vessels there were identified occlusive (48,5%), floating (33,3%) and parietal (18,2%) thrombi. Emboli dangerous thrombi with floating proximal part present threat for thrombembolia of the pulmonary artery (Table 1.).

The investigations were performed on the iliac vein, common femoral vein (FV), posterior and anterior tibial vein (PTV) (ATV). The results of ultrasound investigations were registered as photo-material.

The diagnosis of thrombosis of the deep veins was confirmed in 22 patients. The thrombosis of the deep vein segments was revealed in 14 patients including ileofemoral segment — 4, femoro-popliteal-tibial segment — 4, cerebral vein segment — 6.

At revealing of DVT interfering to surgical treatment the conservative treatment was performed. Specific prevention was prescribed with direct anticoagulants. Administration of heparin in a doze 5000 UN every 8 hours (subcutaneously in the abdominal cavity) for 7–10 days (first injection 2 hours before operation), that reduces probability of the development of DVT and PATE approximately in 2 times.

Table 1. – The characteristic of the thromboses in relation to form and localization

Localization	Thrombosis form						Totally	
	Occlusive		Non-occlusive					
			Floating		Parietal			
n	%	n	%	n	%	n	%	
Common femoral vein	10	30,3	7	21,2	2	6,1	19	57,6
Iliac vein	3	9,1	3	9,1	1	3,0	7	21,2
Superficial femoral vein	1	3,0	1	3,0	1	3,0	3	9,1
Great saphenous vein	–	–	–	–	2	6,1	2	6,1
Popliteal vein	1	3,0	–	–	–	–	1	3,0
Deep vena cava	1	3,0	–	–	–	–	1	3,0
Totally	16	48,5	11	33,3	6	18,2	33	100

It was more rationally to prescribe low-molecular heparins (LMH) fraxiparin, clexan which increased opportunities for prevention of TEO. Low molecular heparins are as effective as non-fractionated heparin, and as well as they have a number of significant advantages. LMH are differed by more prolonged effect, they may be injected 1 (2) times a day. Thus there is no necessity for the daily laboratory control, and the adverse effects and complications (including influence on functions of thrombocytes and hemorrhage) develop less often. The conservative treatment including application of anticoagulants, disaggregants, phlebotonics, elastic compression, bed rest and others were performed in 22 patients. The women suffer from this disease approximately 2 times more often than men.

At massive embolism of the vein from the system of low vena cava in the ileocaval segment taking into account of the big risk of the development of the PATE there was used Streptokinase 250 000–300 000 MUN in the first 3–4 hours with use of doser with following administration of 100 000 ME with use of doser under the control of INR (international norm ratio) in norm from 0,85 to 1,15.

In 8 patients there were identified thrombi in relation to the patency of vessel. They were differed as parietal, occlusive and floating thrombi.

The complete occlusion of the patency was revealed in 2 patients, parietal thrombi were visualized with presence of free blood flow in the vein patency, absence of complete adhesion of the walls in 4, floating thrombi in the common femoral vein in 2 patients. Not fixed (floating) part of the thrombus, according to the ultrasound data, varied from 2 to 8 cm. The moderate mobility of the thrombotic masses was found more often. The patients with thrombotic complications were performed the following surgeries:

- plication of the left common femoral vein with thromboectomy — 3;
- thrombectomy — 3;
- ligation of the major veins — 2.

The patient after the surgery was prescribed low molecular heparins (fraxiparin) subcutaneously instead of the traditional heparin. Then the patient was transferred to the receiving of the peroral anticoagulants.

Then the patient was transferred for receiving of peroral anticoagulants. Xarelto-rivoroxaban ZAO company “BAIER” was used in 10–12 hours after operation in dose 1 tablets (10 mg) 1 time a day after operation. Preparations were received during 2–3 months and more.

In dynamics for estimation of progress of the thrombotic process there were studied 20 patients, of them in 8 patients the partial recanalization of the thrombotic masses were noted. The restoration of the vein patency was registered in 12 cases.

#### Conclusion

1. The early diagnostic measures and complex persevering prevention of the thrombotic complications, active timely revealing

of developing complications and their modern treatment are capable to save life of the injured victims.

2. Ultrasonic angio-scanning of the veins of lower extremities before and after operation and before discharge from hospital allowed timely to reveal developing without symptoms thrombosis of the deep veins in 91,5% of cases.

3. The transition at treatment and prevention of deep vein thrombosis from injection of low molecular anticoagulants (Fraxiparin, Clexan) to peroral tablets xarelto (rivoroxaban) is not less effective, more simple, safe and rational, than not fractionated heparin.

#### Clinical example

The patient Abduraimova O, woman of 52 year-old, received trauma due to traffic-incident. She admitted to the department with diagnosis: associated trauma. Brain injury, contusion of the soft tissues and bruise in the upper third of the left hip, bruise of soft tissues of the left knee joint, closed fracture of the middle third of the right humerus with displacement of the bone fragments. On the 7<sup>th</sup> day after trauma there were appeared edema of the legs, particularly in the area of the hip, ankle joint, increase in figures of the subcutaneous veins, light cyanosis of the skin integuments, tenderness along the vascular bundle. Ultrasound duplex angioscanning with color Doppler mapping allowed reliable diagnosis of the presence or absence of the thrombosis of lower extremities. At the dopplerography of the left lower extremity in the femoral vein there is determined thrombus with single point of the fixation in the distal part. The main its part is distributed freely along all the length and not connected with walls of the vein. The length of the floating part of the thrombus accounted more than 2 cm. In the are of the fixing site of the thrombus the occlusion was insignificant, floating part of the thrombus occupied almost all patency of the vein, blood flow is sharply reduced, the retrograde blood flow is determined. After consultation of angiurgeon the patient was performed plication of the left common femoral vein with thromboectomy. The patient was performed complex medicamentous therapy, strong bed rest, rising position and elastic dressing of the extremity, including low molecular heparins (LMH), clexan and fraxiparin. Heparin was injected in dose 5000UN intravenously by bolus with further infusion with velocity 1000 UN in hour. The velocity of the administration was controlled in 6 hours after onset of infusion with purpose to rise it 1.5–2 times from the initial level. Reosorbilact 400.0 was injected intravenously, venotonics — detrolex, flebodin 600 1 tablet. There was made diagnosis: Acute thrombosis of the left common femoral vein, floating thrombus of the left common femoral vein.

The patient after operation instead of traditional heparin was prescribed low molecular heparins (fraxiparin), subcutaneously. In this case there is no necessity for the daily laboratory control, and the adverse effects and complications (including effect on the functions of thrombocytes and hemorrhages) developed less often.

The patient in dynamics for estimation of the development of thrombotic process there was performed dopplerography of the veins of lower extremities.

#### References:

1. Aseeva I. A. Ultrasound diagnosis and prognosis of the thrombosis of the veins of the lower extremities in the traumatological patients: Synopsis of thesis ... cand.med.sci. – Moscow, – 2003: 17 p.
2. Boriskin A. A. Prevention and treatment of the thrombosis of the deep vein in the patients with fractures of long tube bones of the lower extremities: Synopsis of the thesis ... cand. med. sci., – Moscow, – 2010, 26 p.
3. Vlasov S. V. Mechanisms of the development, prognosis and prevention of the thrombus formation in traumas and orthopedic operations with high risk of thrombembolic complications: Synopsis of the thesis ... d.med.sci. – Kemerovo, – 2014, 46 p.
4. Epanchintsev P. M. Early diagnosis and prevention of the acute thrombosis of the deep vein of the ankle in the suffered with closed comminuted fractures of the tibial bones: Synopsis of the thesis.. cand.med.sci. – Omsk, – 2007, 20 p.
5. Kopenkin S. S. Prevention of the venous thrombosis and pulmonary embolism in the orthopedics. Klinicheskaya farmakologiya I terapiya, – Moscow, – 2006, – N2: – P.38–42.
6. Raptanova L. O. Ultrasound diagnosis of the venous thrombosis under the ambulatory conditions. Medicinskiy jurnal “SonoAce-Ultrasound” – Moscow, – N 17..

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## The method of determination of intracranial pressure in patients with crania bifida associated with hydrocephalus

**Abstract:** here have been analyzed 35 children in Republican Scientific Center of Neurosurgery with encephalocele associated hydrocephalus. Patients were divided into 2 groups: Basic and control group. For the first group to choose correct parameters used program — “Ликвородинамический тест” (so called “CSF dynamics test”). This method enhanced to choose parameters accurately there by helping deal with postoperative shunting procedures complications.

**Keywords:** encephalocele, hydrocephalus, intracranial pressure.

**Introduction.** Cranio-cerebral herniations (cranium bifidum) — congenital malformation occurs from 1: 4000–6000 to 1: 35,000 newborns and often has a poor prognosis for recovery [3, 22–25; 7, 39–42], especially at the location of craniocervical junction. Meningocele has better forecasts. Encephalocele can result in serious complications such as hydrocephalus. Encephalocele — frontal or occipital is the worst case of brain-skull herniation [9, 224]. The combination of encephalocele with hydrocephalus can be up to 30% of cases. This group of patients requires a landmark of surgical procedures [2, 40].

In modern literature research in hydrocephalus and other problems of intracranial pressure are used the concept of elasticity of the cranial system and its capacity [6, 25]. Carrying intracranial pressure correction from this position will also be considered to be justified also in cranial hernias. In addition, delayed primary operation — removing encephalocele in some cases may also be dictated by the somatic burdened child, poor physical development, early age [1, 40].

Surgical treatment of hydrocephalic syndrome carries out shunting operations using valve systems that are configured on dif-

ferent pressure [4, 29–32; 5, 153; 8, 15–26].

In our clinic, hydrocephalus shunt surgery demonstrations are held as the first stage of the treatment of these patients. Postoperatively, in some cases, there may be signs of inadequate correction of hydrocephalic syndrome that can be judged by the covers of encephalocele: maintaining its voltage and increase until its rupture, worsening of the neurological deficit, no increase of the surface epithelium in the hernial sac, as well as the progressive growth of the skull circumference.

With this in mind, we have begun a study on the selection of adequate parameters of the shunt systems for patients with encephalocele, combined with hydrocephalus.

Stress tests which are used to determine the production of liquor rate in hydrocephalus patients are unacceptable in encephalocele since there is an increased risk of the hernia sac rupture [6, 25].

Additionally, elastic and capacitive characteristics of the ventricular system in these patients are radically different compared to patients with isolated hydrocephalus because of the presence of an additional capacitance — encephalocele sac, the dimensions of which may vary within wide limits and elasticity of an encephalocele

walls, which depends on its walls — thickness, elongation, etc.

So we had to develop a method for determining the parameters of the shunt system for adequate correction of hydrocephalus combined with encephalocele and explore the results of the treatment.

**Material and Methods.** It were analyzed 35 children treated at the RNSC with encephalocele, combined with hydrocephalus at the primary (n = 18) and control groups (n = 17). From the total number of children in 22 observed had a thread of a cranio-cerebral hernia sac rupture due to the tension and thinning of its walls. This includes children with “weeping” of the surface of cranio-cerebral herniations, as manifestations of the extreme threat of rupture. 17 patients of the control group were operated according to standard procedures in our clinic until 2008.

We used the technique of fractional excretion of CSF from the ventricular system with constant pressure monitoring. On this basis is developed the liquor dynamic test with the definition of the “critical point of deformation of the ventricular system” as a sign of decompensation craniospinal compliance — the level of the ultimate strain of the cranial system.

With a view to the objective finding the critical level of the liquor system, we used the computer program named” liquor dynamic test “ DGU 20100102. The program works on the basis of the algorithm exceeded the arithmetic mean between the indicators change liquor pressure during the fractional excretion of CSF. The “liquor dynamic test” has a comfortable interface and the ability to conduct the archive and save the database. (Figure 1).

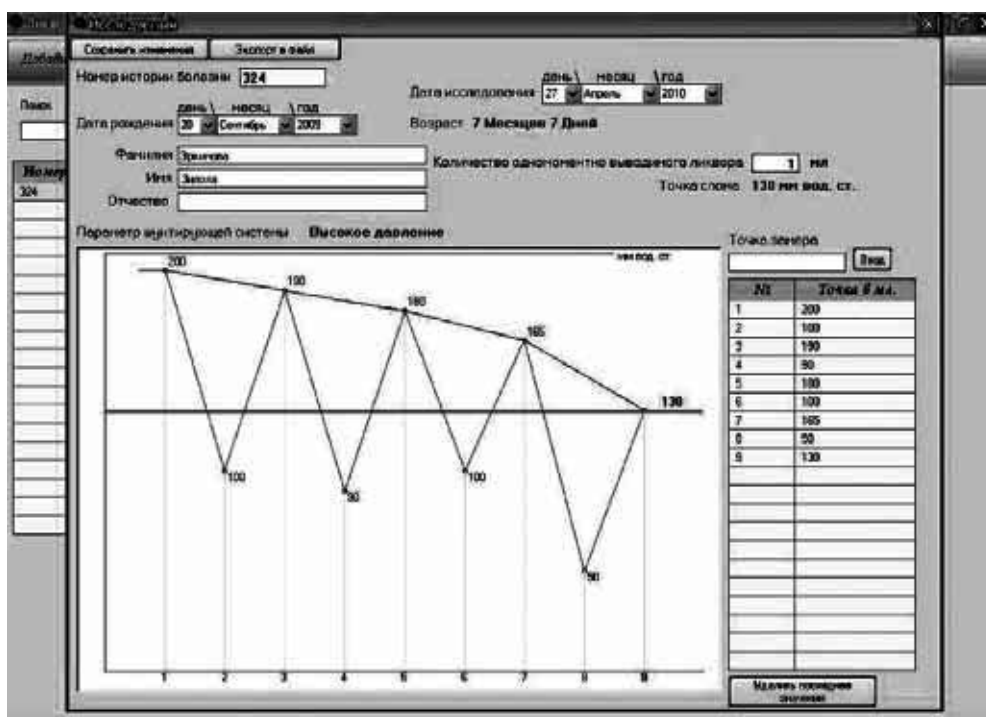


Fig. 1. The active window of the program named “ liquor dynamic test”

The result of the “ liquor dynamic test” program was to define the parameters of the setting shunt systems.

The positive effect of shunting operations assessed on the estimated regression of the clinical manifestations of hypertension — hydrocephalic syndrome, decrease of a cranio — cerebral sac tension, rise of the surface epithelium, improving the neurological status.

**Results and discussion.** Conducted surgeries were successful in these patients as far as the right was picked up the parameters of a shunt system. This led not only to the regression of hydrocephalic symptoms, but also created conditions for the improvement of the walls of the cranial hernia sac — build-up of a skin, prevented growth and rupture of a sac. Later it created favorable conditions for the second stage of the operation — the removal of encephalocele with plastics of the hernial gates.

The methodology was used in the study group of 18 patients with encephalocele, combining with hydrocephalus. In 10 of them there was a threat of rupture.

The use of this technique significantly improved the results of treatment when compared to the control group — 17 patients with similar pathology. In addition to this, the main group had the regress of hydrocephalic syndrome and elimination of the encephalocele sac rupture threat, also reduced the size of the hernia and this state remains stable until the 2 — nd stage of surgery — hernia repair. An indicator of the positive dynamics also showed

the epithelial growth in a thin wall of cranio-cerebral hernias that facilitates the subsequent surgery of the hernia sac plastics.

In 8 (47%) patients from the 17 patients in the control group the decrease in size and voltage of the hernia sac and its softening effects were temporary, despite the regression of hypertension — hydrocephalic syndrome. In 3 (17,6%) patients after shunt surgeries, in spite of the expected effect, there was a rupture of the hernia sac for the period of 3 to 30 days.

Patients of the main group, in accordance with the proportion of test of liquor dynamic implantable shunt systems at low pressure was 6 patients, which accounted for — 33,3% of the number of the main group, and set the system to a high pressure in 3 patients. The use of these systems has been dictated by our method of determining craniospinal compliance (Table 1).

Table 1. – Distribution of patients by the level of pressure correction

Pressure	Groups		In all n=35
	Main; n=18	Control; n=17	
High	3 (16,6%)	1	3 (8,6%)
Middle	9 (50%)	14 (82,3%)	23 (65,7%)
Low	6 (33,3%)	3 (17,6%)	9 (25,7%)

From this table it is also seen that a control group shunt system extreme pressure parameters have been set in all 4 patients, which was 23,5%.

We analyzed complications observed in the two groups of patients. The results are shown in table 2.

Table 2. – Complications after shunt surgeries compared in 2 groups of patients

Complications	1 – group; n=18	2 – group; n=17
Infection	–	5 (29,4%)
Epileptic seizures	2 (11,1%)	4 (23,5%)
Dysfunction in a year	3 (8,6%)	5 (29,4%)
Hypo drainage	2 (11,1%)	4 (23,5%)
Hyper drainage	–	17,6 (8%)

The data in table 2 allows to judge the reduction of the number of complications after shunt surgeries in patients of the main group as evidenced by the decrease in the number of dysfunctions in the study group (8.6%) compared with the control group — 29,4% and the number of hypo drainage states 11,1% and 23,5% respectively. Statistical significance was confirmed by Spearman rank correlation ( $r = 0,82$ ).

It should be noted that initially poorly chosen option implantable shunt system creates unfavorable conditions for wound healing, and to a violation of its functionality.

#### Conclusions.

1) Established a direct link between the outcomes of operational activities and the accuracy of the determination craniospinal pressure in patients with encephalocele combines with hydrocephalus.

2) Application of methods for determining craniospinal pressure using “liquor dynamic test” program has reduced the violations of a shunt systems drainage dysfunctions in more than 2 times.

#### References:

1. Асадов Р.Н., Бельченко В.А., Притыко А.Г. Опыт хирургического лечения гигантских энцефалоцеле. // Сборник статей 3-й всероссийской конференции по детской нейрохирургии. – Казань, 8–10 июня 2011.
2. Асадов Р.Н. Одноэтапное комплексное лечение детей с врождёнными передними черепно-мозговыми грыжами // Сборник статей 3 –й всероссийской конференции по детской нейрохирургии. – Казань, 8–10 июня 2011.
3. Асадов Р.Н., Бельченко В.А., Притыко А.Г., Петров Ю.А. Хирургическое лечение передних черепно-мозговых грыж. Вопросы нейрохирургии. 2007.
4. Арутюнов Н.В., Петряйкин А.В., Корниенко В.Н. Изучение ликворотока на основе магнитно-резонансной томографии // Вопр. нейрохир. – 2000. – № 3.
5. Доманский Д.С., Белкин А.А. Влияние ликвородинамических нарушений на реализацию системы церебральной защиты // Мат-лы II Всероссийской конф. «Детская нейрохирургия». Екатеринбург. 27–29 июня 2007 г. – М., 2007.
6. Коммунар В.В. Выбор параметров имплантируемой дренажной системы в лечении гидроцефалии: Автореф. дис.. канд. мед. наук. – СПб., 2003. – 25 с.
7. Субботина М.В., Ларионов С.Н., Антошкина Е.П. Диагностика назозтмоидальной мозговой грыжи у ребенка // Российская ринология. 2015;23 (2): 39–42.
8. Pudenz R.H. The surgical treatment of hydrocephalus // Surg. Neurol. – 1981.
9. Villarejo F.J. Atlas of pediatric Neurosurgical techniques // Basel; – New York: Karger. – 1985.

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## Immediate and medium-long-term clinical and angiographic results of the use of bioresorbable vascular scaffold ABSORB

**Abstract:** To study the safety and efficacy of the use of the second generation everolimus-releasing bioresorbable vascular scaffold Absorb in our real practice and the average long-term clinical results. The study involved 53 patients with various forms of ischemic heart disease who was undergone percutaneous coronary intervention with implantation of bioresorbable vascular scaffold Absorb. The use of the Absorb BVS in clinical practice is associated with good immediate clinical and angiographic success rate and acceptable midterm clinical outcomes.

**Keywords:** bioresorbable vascular scaffold, ischemic heart disease.

Since the discovery of coronary balloon angioplasty in 1977, despite the large number of achievements in the field of interventional cardiology biggest challenge remains the development of neointimal hyperplasia inside the stent, in-stent thrombosis and neoathrosclerosis with the subsequent development of late and very late thrombosis [1; 2]. The constant presence of a metal prosthesis in the vessel wall causes a continual overlapping of lateral branches at the level of branching vessels, prevents promising surgical re-

vascularization, worsens vasomotor function and vascular imaging stented segment during computed tomography [3]. In this connection, established bioresorbable vascular scaffold (BVS) Absorb (Abbott Vascular, Santa Clara, CA, USA) which is fully absorbable device for the temporary maintenance of the vascular wall and delivery of antiproliferative drugs Everolimus, which allows the vessel wall to recover without permanent presence of a metal stent [4]. In this study was to evaluate the success of the procedure, angiographic

results and clinical outcomes in the medium to long-term period in patients with various forms of ischemic heart disease.

**Material and Methods.** The study included 53 patients undergoing percutaneous coronary intervention with BVS implantation. Baseline characteristics of patients and lesions are shown in Table № 1. Mean age was 51 ± 10 years, patients were predominantly male (90.5%) and in 20.7% of cases there were a diabetes mellitus. Stable angina was the indication for PCI in 37.7% of cases, and myocardial infarction (prescription > 1 week) in 50.9% and 11.4% unstable angina.

Table 1. – Baseline patient and lesion characteristics

Patients, n (%)		53
Age, yrs		51 (±11)
Male sex		48 (90.5)
Hypertension		43 (81.2)
Hyperlipidaemia		36 (67.9)
Diabetes mellitus		11 (20.7)
Previous myocardial infarction		6 (11.3)
EF LV		54.1 (±9.8)
Multivessel disease		6 (11.4)
Indication for PCI	AMI (prescription > 1 week)	27 (50.9)
	Stable angina	20 (37.7)
	Unstable angina	6 (11.4)
Lesion, n (%)		54
Target lesion	LAD	47 (87.0)
	RCA	4 (7.4)
	Cx	3 (5.6)
Lesion severity according to ACC/AHA	A	7 (12.9)
	B1	9 (16.7)
	B2	12 (22.3)
	C	26 (48.1)
Bifurcation		5 (9.3)
Calcification		6 (11.2)
Occlusion (<1 month)		8 (14.8)

Numbers are % or mean ±SD; EFLV: ejection fraction of left ventricle; PCI: percutaneous coronary intervention; AMI: acute myocardial infarction; LAD: left anterior descending; RCA: right coronary artery; Cx: circumflex; ACC/AHA: American college of cardiology/American heart association.

Six patients (11.4%) had multivessel disease. Most lesions (48.1%) were type C classification AHA/ACC cases with occlusion of the aged not more than 1 month and 8 bifurcation lesions was 5. General characteristics of treatments are given in table 2.

The PCI was performed as an elective procedure. Patients were pre-treated with dual antiplatelet therapy. Pre-dilation performed in 52 (96.2%) lesions. According to the instructions for pre-dilation balloon catheters used in short length than planned scaffold and 0.5 mm less than or equal to its diameter (ratio balloon/artery 0.7–1:1). After nitroglycerine (200 mcg), vessel size and lesion length were determined by quantitative coronary angiography (QCA). BVS implanted following the instructions for use: increasing pressure by 2 atm every five seconds up-to 12–14 atm, and post-dilatation with a shorter, non-compliant balloon at nominal pressure with a maximal increase of the balloon above scaffold size of 0.5 mm.

PCI for bifurcation lesions was performed as described in provisional-T with a single BVS and subsequent balloon dilatation of the lateral branches using compliance balloon catheter through the mesh at a low pressure CVD (≤8 atm.) with the final optimization

of the BVS. In two cases due to the extent of lesions sequentially implanted two BVS by «marker to marker» technique.

Patients prescribed dual antiplatelet therapy for at least 12 months. Study population consisted of all patients undergoing PCI with implantation of BVS «Absorb» in the period from August 2014 to December 2015. The decision to implant BVS depended on the discretion of the operator, the presence of an appropriate frame size and the patient’s consent. The study included patients with a wide spectrum of indications ranging from stable angina to acute myocardial infarction, and the diverse nature of *de novo* lesions.

Table 2. – Procedure characteristics

Variability	54
Total number of lesions	54
Lesions >20mm	23 (42.5)
One more scaffold implantation	6 (11.2)
Pre-dilation	52 (96.2)
Average diameter of balloon, mm	2.54±0.3
Average pressure of inflation, mm	12.8±1.6
Average time of exposition, sec	50.8±1.7
Post-dilation	54 (100)
Total number of scaffolds	61
Average length of scaffold, mm	24.4±8.3
Average diameter of scaffold, mm	3.3±0.2
Type of post-dilation balloons	54
Non-compliance balloon	45 (83.4)
Compliance balloon	9 (16.6)
Average diameter of balloon, mm	3.17±0.5
Average pressure of inflation, mm	14.3±4.4

Numbers are% or mean±SD.

Angiographic films were analyzed with appropriate software (QCA analysis, Philips, The Netherlands) by two of the researchers. The reference vessel diameter, the minimum diameter of the lumen (MDL) and percent diameter stenosis (% DS) were prepared for the target vessel before and after implantation of the scaffold. The «acute gain» was defined as the difference between the MDL before and after the procedure inside the scaffold. Angiographic success was defined in the presence final in-scaffold residual stenosis of <20% (by QCA) and TIMI-3 flow, without any complication. Success of the procedure was determined in the absence of significant clinical complications in the target vessel during hospitalization (cardiac death, myocardial infarction associated with the target artery, or the need for repeat revascularization of the target vessel, thrombosis of the scaffold). Under the immediate clinical success meant: the complete absence of symptoms of angina or decrease its symptoms for 2 or more functional classes of angina pectoris. Statistical data processing was carried out using MS Excel 2010 program.

Results and Discussion. Immediate angiographic and procedural success were achieved in 96.2% and 100% respectively. The immediate clinical success in 51 (96.2%) case had taken place. In 2 patients (3.8%) showed a reduction in angina class 1, which was due to the presence of atherosclerotic lesions in other segments of the coronary arteries. The immediate result is shown in table 3.

Basic analysis of the QCA was available for all lesions (table 4). Before the procedure, the average MDL was 0.35 mm, with an average 90.8% stenosis (DS). After the procedure average MDL was 3.1 mm, resulting in acute gain rate was 2,75mm.

Table 3. – Immediate and 30-day clinical and angiographic outcomes

	<b>53</b>
Death and Myocardial infarction,%	0
Thrombosis,%	0
Residual stenosis >20%,%	0
Angiographic success,%	96,2
Clinical success,%	100
Procedural success,%	96,2

Table 4. – QCA outcomes before and after procedure

	<b>Before procedure</b>	<b>After implantation under nominal pressure</b>	<b>After post-dilatation</b>	<b>P</b>
Reference diameter of vessel	3.2±0.62	–	3.5±0.8	0.06
Minimal diameter of lumen	0.35±0.46	2.7±0.35	3.1±0.42	0.05
Diameter of stenosis,%	90.8±8.7	17.2±6.7	8.6±3.2	0.01
Acute gain			2.75±0.51	

Numbers are % or mean ±SD

Average long-term results of BVS implantation showed the following data (table 5): Median follow-up was 196 days (180–214). By the sixth month of observation were available to 100% of patients. It has been no cases of cardiac death. In one case (1.8%) due to self-canceling patient clopidogrel occurred later (three months after implantation) thrombosis of the BVS which subsequently led to the development of non-fatal myocardial infarction. Clinical success was observed in 49 of 53 patients (92.4%,  $p=0.0005$ ). This was to maintain the achieved results and the clinical results of stress tests (bicycle exercise test) and also well dynamics of echocardiography. An increasing average left ventricular ejection fraction from 54.1±9.8 to 55.8±8.5% ( $p=0.1$ ). In 4 (7.6%) patients revealed a refund clinics angina, Q positive myocardial infarction occurred in 1 patient (1.8%). All patients with worsening clinical status in the long term repeat coronary angiography was performed, the results of which revealed the progression of atherosclerosis in other segments of the coronary arteries, restenosis signs of BVS have not been identified.

Table 5. – Medium-long-term clinical outcomes

	<b>53</b>
Death, %	0
Thrombosis, %	1.8
Recurrent angina pectoris, %	7.4
Myocardial infarction, %	1.8
Clinical success, %	92.4

In the current study after implantation of BVS in population of CHD patients, including patients with a high risk and complex lesions, it has been received good angiographic (96.2%) and clinical (96.2%) success and acceptable intermediate clinical outcomes (the aggregate rate target vessel complication 1.8%). Our results showed that the percentage of angiographic success (96.2%) and

the results of the QCA is slightly lower than in cohort B ABSORB study [5]. This small difference is mainly due to the composition of our population, which included more complex lesions and patients with myocardial infarction, as well as the absence of intravascular imaging devices. General 30-day outcomes of our study were similar to published data on BVS Absorb [6; 7] where researchers found no cases of large cardiovascular events over the period of observation in the combined cohort of patients in relatively simple lesions in a cohort A. Large cardiovascular event rate for the six-month period was also comparable with the results Absorb study (3.6 vs. 3.0%). It noted one case of definite thrombosis of BVS. Thrombosis developed in three months after stop taking of clopidogrel. The incidence of target vessel complication was higher in our study compared with the cohort Absorb studies (1.8 vs 0%). This is due to the premature cancellation of antiplatelet therapy, which has led to the development of non-fatal myocardial infarction and scaffold thrombosis. Due to limited experience, the treatment of BVS thrombosis in our centre are not standardized, and in typical cases, the choice of strategy is at the discretion of the operator. According to the literature the treatment of thrombosis after implantation of scaffolds, especially the implantation of drug-eluting stents is also controversial. According to the literature in the short time period BVS may more prone to thrombosis compared to conventional metal stents, which is due to the thickness of beams (150µm) with a greater surface area, which may take longer to cover the endothelial tissue [3]. Although in our experience small, cases of thrombosis associated with the procedure and the BVS was not observed. More research is needed to confirm the frequency greater thrombogenicity of BVS compared to conventional metal stents. Also, do not complete BVS apposition may also contribute to thrombosis. Incomplete BVS apposition can be avoided by improper preparation of lesion before scaffold implantation, adequate choice of scaffold's size, post-dilatation with high pressure balloon. According to the recommendations [8] for adequate lesion pre-dilatation must be used for balloon diameter is less than 0.5 mm on the proposed scaffold, as well as the need to use cutting balloons, rotational atherectomy and thrombectomy, which can support and improve the lesion preparing. We are also have found that delivery for platform sizes more difficult for complex lesions compared to the latest generation of stents in our experience. In calcified lesions and tortuosity of vessels for delivery to BVS required the use of additional support techniques.

### Conclusions

1. Using the Absorb BVS in patients with various forms of ischemic heart disease are highly effective and safe method of treatment is accompanied by good immediate and medium to long-term results.

2. Delivery of the Absorb BVS is satisfactory, but still need to use the appropriate guide catheter, adequate pre-dilatation and if necessary a technique of soft hydrophilic wire deep intubation.

3. Implantation technique and receiving dual antiplatelet therapy is the key to achieve positive results in real practice. The case of the BVS thrombosis occurred after 3 months is associated with self-stopping of dual antiplatelet therapy.

4. Medium-long-term results of the study show that the BVS can be used in compliance with the basic principles of optimal implantation the Absorb BVS, despite the lack of imaging control during scaffold implantation.

### References:

1. Garg S., Serruys P.W. Coronary stents: current status//J Am Coll Cardiol. – 2010. – Vol.56. – P. 1–42.



2. Nakazawa G., Otsuka F., Nakano M. et al. The pathology of neoatherosclerosis in human coronary implants bare-metal and drug-eluting stents//J Am Coll Cardiol. – 2011. – Vol. 57. – P. 1314–22.
3. Sousa J. E., Costa M. A., Abizaid A. et al. Lack of neointimal proliferation after implantation of sirolimus-coated stents in human coronary arteries: a quantitative coronary angiography and three-dimensional intravascular ultrasound study//Circulation. – 2001. – Vol. 103. – P. 192–195.
4. Wykrzykowska J.J., Onuma Y., Serruys P.W. Advances in stent drug delivery: the future is in bioabsorbable stents//Expert Opin Drug Deliv. – 2009. – Vol. 6. – P. 113–126.
5. Serruys P.W., Onuma Y., Dudek D. et al. Evaluation of the second generation of a bioresorbable everolimus-eluting vascular scaffold for the treatment of de novo coronary artery stenosis: 12-month clinical and imaging outcomes//J Am Coll Cardiol. – 2011. – Vol. 58. – P. 1578–1588.
6. Diletti R., Karanasos A., Muramatsu T. et al. Everolimus-eluting bioresorbable vascular scaffolds for treatment of patients presenting with ST-segment elevation myocardial infarction: BVS STEMI first study//Eur Heart J. – 2014. – Vol. 35. – P. 777–86.
7. Simsek C., Magro M., Onuma Y. et al. Procedural and clinical outcomes of the Absorb everolimus-eluting bioresorbable vascular scaffold: one-month results of the Bioresorbable vascular Scaffold Evaluated At Rotterdam Cardiology Hospitals (B-SEARCH)//Euro-Intervention. – 2014. – Vol. 10. – P. 236–240.
8. Serruys P.W., Onuma Y., Ormiston J.A. et al. Evaluation of the second generation of a bioresorbable everolimus drug-eluting vascular scaffold for treatment of de novo coronary artery stenosis: six-month clinical and imaging outcomes//Circulation. – 2010. – Vol. 122. – P. 2301–2312.

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## Open Vertebroplasty in surgical treatment of metastatic tumors of the spine

**Abstract:** The treatment analysis of patients with pathological fractures of metastatic tumors of the spine in the thoracic and lumbar spine was performed. The results of surgical treatment were studied by using the method of internal stabilization and open vertebroplasty. The following benefits were highlighted: increased support ability of the vertebral height and preservation of his body, and improve the reliability of internal stabilization.

**Keywords:** tumor metastasis, spine, vertebroplasty, transpedicular stabilization, surgery.

The method of percutaneous (closed) vertebroplasty in treatment of patients with aggressive vertebral haemangiomas and spinal metastasis has proved its necessity and is widely used in treatment of the pathology. However, in surgical practice we often come across the situation, when neurological disorders and destruction of posterior wall of vertebral body do not let apply this method. In such situations, we have to make decompression of spinal canal and its content with removal of a part of metastatic tumor. But, while making posterior wall decompression and transpedicular stabilization, we do not always manage to fix damaged vertebral motion segment, to improve support ability of vertebral column.

Purpose of the research — to conduct analysis of treatment of patients with pathological ruptures in haemangiomas and metastatic tumors in thoracic and lumbar spine, as well as to learn results of surgical treatment with use of intrinsic stabilization and open vertebroplasty method.

Materials and methods. Results of research and treatment of 12 patients with metastatic tumors and haemangiomas of thoracic and lumbar spine (4 patients with haemangiomas and 8 patients with metastasis) conducted within the period from 2009 to 2015 years at RUz MH RRCN. Age of the patients is between 36 to 55; 4 men and 8 women. Average age of the patients is 40. Clinical and neurological examination of all patients were made, the diagnosis is confirmed on the basis of instrumental examination (MRT, MSCT, Ultrasound investigation of abdominal cavity

and pelvic organs, pneumonography and others) of oncologist's decision. Careful selection of patients have been made — decompressive-stabilizing surgery and open vertebroplasty were made only in situations, when it was impossible to confine to percutaneous vertebroplasty, due to availability of long tract disorders as a result of partial compression of spinal cord, but hard destruction of vertebral body was not reported at that (K. Tomita's classification, type 2,3, 2001y.). Results of the treatment were assessed based on the scale, assessing the dynamics of neurological disorders (ASIA) and dynamics of spinal axis recovery according to radiographic data.

**Results.** Localization of blastomas in region of vertebral column was as following: In thoracic spine — 4 (67%); in lumbar spine — 8 (33%).

Neurological signs, measured according to ASIA grading scale, are presented as follows. Patients of group B — 7 (58%), group C — 2 (17%), group D — 3 (25%). There are no patients of group A and E.

According to pain syndrome intensity (VAS scale) patients are divided as follows. 3 (25%) patients complained of inconsiderable pains (3–4 scores). 8 (67%) patients complained of moderate pain (5–7 scores). 1 (8%) patient with tumors of lumbar spine complained of severe pains (score 8 and over).

Table 1 presents assessment of spinal injury based on radiology examination.

Table 1. – Assessment of spinal injury on the basis of radiographic surveys

Parameters	Value
VWSDP (n=12) interval from 0% to 55%	19,07%±16,79%
SCP (n=12) interval from 0% to 80%	26,87%±17,06%
Stricture of spinal canal (n=12) interval from 12% to 80%	30,22%±15,73%
Angle of local anterior curvature (n=12) interval from 14° to 39°	13,38°±12,14°
<i>Number of injured axis (level)</i>	<i>(n=12)</i>
I	3 (25%)
II	9 (75%)
<i>Spinal deformity scale (level)</i>	<i>(n=12)</i>
1 — compression fracture	5 (42%)
2 — fracture with compression prevalence	5 (42%)
3 — fracture with sphenic deformity prevalence	2 (16%)
<i>Tomita classification (level)</i>	<i>Number of cases (n=12)</i>
T <sub>1</sub>	3 (4%)
T <sub>2</sub>	5 (7%)
T <sub>3</sub>	2 (4%)
T <sub>4</sub>	2 (4%)

Average value is equal to: VWSDP (Vertebra wedge-shaped deformation parameter) — 19,07%±16,79%, SCP (Spine compression parameter) — 26,87%±17,06%, stricture of spinal canal — 30,22%±15,73%. Average value of angle of local anterior curvature is equal to — 13,38°±12,14°. While assessment of dorsal spine injury, grade II prevailed (75% of patients). 25% patients had lesions, referring to grade II. While scale assessment of spinal deformity, lesions of grade 1 and grade 2 were revealed in equal frequency. There were 5 (42%) patients in each group. 2 (16%) patients referred to grade 3. In grades T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> of Tomita's classification, all 12 (100%) patients had blastomas limited to bony structure and spinal canal.

Type of posterolateral surgical approach is presented in table 2.

Table 2. – Type of surgical approach

Type of surgical approach	Number of cases (n=12)
1. Arch resection, removal of vertebral arch root and upper intervertebralis	2 (14%)
2. Arch resection, removal of vertebral arch root, upper and lower intervertebralis	3 (19%)
3. Hemilaminectomy, laminectomy, removal of vertebral arch root, articular process, and neural spine — in lumbar spine	4 (48%)
4. Item 3 + removal of costotransverse joint, head of rib and a part of rib — in thoracic spine	3 (19%)

1<sup>st</sup> and 2<sup>nd</sup> economic approaches were applied in 5 (42%) cases. 3<sup>rd</sup> and 4<sup>th</sup> extensible surgical approaches were made in 7 (58%) cases. Surgical intervention of bilateral decompression of spinal canal elements was made for 8 (67%) patients, and unilateral decompression for 4 (33%) patients.

Table 3 represents spinal stabilization from position of vertebral body injury level. Transpedicular stabilization was made to all 12 (100%) patients. Acrylic cement, which was used for filling vertebral body defects, was applied for spondylosyndesis.

Table 3. – Spinal stabilization

Stabilization	Number of cases, n=12	Spinal injury level	
		Th <sub>3</sub> -Th <sub>12</sub>	L <sub>1</sub> -L <sub>4</sub>
<i>Type</i>			
Transpedicular	11 (92%)	3	8
Lamina hooks	1 (8%)	1	
<i>Spondylosyndesis</i>			
Acrylic cement	12 (100%)	4	8

Perfect early result of treatment (group A) was reported with 3 (25%) patients. Good (group B) and satisfactory (group C) results were reported, correspondingly, with 6 (50%) and 3 (25%) patients.

Analysis of neurological disorders in group B on lower limbs function revealed improvement (in average) in levels 1,04±0,56 according to ASIA/IMSOP scale. All 7 patients with blastoma had regression of neurological disorders. Reduction of pain syndrome is reported (in average) in levels 3,17±1,07 according to VAS scale. Reduction of angle of local anterior curvature in group C was equal to (in average) 10,91°±6,44°. Better results were reported with SCP (9,45%±8,50%), rather than with VWSDP (6,55%±9,86%).

Table 4. – Early results of treatment

Results	Number of cases (n=12)
A — perfect	3 (25%)
B — good	6 (50%)
C — satisfactory	3 (25%)
D — bad	—
<i>Improvement</i>	
According to ASIA/IMSOP scale (level)*	1,04±0,56
According to VAS scale (score)*	3,17±1,07
Angle of local anterior curvature**	10,91°±6,44°
VWSDP**	6,55%±9,86%
SCP**	9,45%±8,50%

\* concerning results in groups A and B

\*\* concerning results in groups A and C

\*\*\* death

Control investigations were made with 8 (67%) patients (table 5). 4 patients did not agree to get control investigation. Long-term good result of treatment was reported in 6 (50%) cases, bad result — in 2 (16%) cases. Improvement according to ASIA/IMSOP scale, in average, was equal to 0,21±0,43 level, and according to VAS scale — 34±0,52 level. Deterioration of neurological condition according to ASIA/IMSOP scale, in average, was equal to 0,25±1,71 level and according to VAS scale — 0,43±0,57 level. Besides, deterioration of average value of local anterior curvature angle in this group began for 2,45°±1,89°. Complications in the form of acrylic cement epidural insertion with spinal cord compression are not revealed.

Discussion. In availability of blastoma, injuring anterior and posterior columns of spinal bone, it is recommended to make two-stage surgical treatment (posterior approach and then anterior approach) [6, 1243–1266; 7, 145–154; 8, 438–446]. But we can reduce period of treatment in some cases, by using bilateral posterolateral approach, which enables full vertebrectomy and decompression of spinal cord [9, 211–220; 10, 2240–2250; 11, 236–264; 12, 36–46]. After tumor removal and spinal cord decompression, it is required to make spine stability, which can be done by using posterior and

anterior approach. Metal implants and bone transplants, which enable to make reconstruction of vertebral body, are used for stabilization of vertebra.

Table 5. – Results of control investigation

Results	Number of cases (n=8)
Good	6 (50%)
Bad	2 (16%)
No data	4 (34%)
<i>Change in group of patients with good result</i>	<i>n=6</i>
According to ASIA/IMSOP scale	0,21±0,43
According to VAS scale	0,34±0,52
<i>Change in group of patients with bad result</i>	<i>n=2</i>
According to ASIA/IMSOP scale	0,25±1,71
According to VAS scale	0,43±0,57
Angle of local anterior curvature	2,45° ±1,89°

In malignant tumor, it is not recommended to replace bone flap, as it will be destructed. Bilski et al. [10, 2240–2250] states that reconstruction of vertebral body is not required, when posterior stabilization is made with saved major part of vertebral body. Bridwell et al. [13, 1383–1394] made posterior stabilization for 25 patients, without reconstruction of vertebral body. Only 1 patient had complications after this way stabilization. Besides, in opinion of Bauer

[14, 514–522], posterior stabilization is sufficient consolidation of unstable vertebra, in availability of blastoma, injuring vertebral body.

29 (73%) patients of 40 with metastatic tumors and tumors coming from hematopoietic system made filling of body with bone cement after decompression of neuroblastomas, partial removal of vertebral body tumor. Tumor removal method was limited only with transformed cells, unaffected bone and hyaline plate were not removed. After tumor removal, the cavern was filled with acryl cement. In all these cases, stabilization of vertebra was made by systems of transpedicular implants. Scoville et al. [15, 274–279] presented results of surgical treatment of vertebral tumors with using of acryl cement. Necessity of strengthening of support ability of normal skeletal elements of vertebra by means of acrylic cement prostheses was proved. Akeyson et McCutcheon [9, 211–220] learned complications after using of acrylic cement in 16% cases. In our material, use of acrylic prostheses did not provide additional strengthening and there was no complication. Bilsky et al. [10, 2240–2250] noted that failure in using of bone cement is connected with the method of vertebral body removal and type of posterior stabilization. Saving of those parts of vertebral body, which are not affected by tumor, influence over spine stability and prevents shifting of acrylic prostheses.

So, the method of open vertebroplasty has many advantages. They are: improvement of vertebra support ability, saving the height of its body, improvement of reliability of internal stabilization. Also, several authors report about chemotherapeutic and thermal influence of methylmethacrylate on residual tumor.

#### References:

1. Abdullaev D. D. Selection of treatment method for patients with metastatic tumors of vertebral column and spinal cord//Current problems of neurosurgery: Materials of 3<sup>rd</sup> research and practice conference – Tashkent, 2008. – 128–129.
2. Ardashev I. P., Rerikh V. V., Total spondylectomy in treatment of spine tumors//Spine surgery, 2009. – № 1. P. 49–56.
3. Babkin A. V. Spondylectomy in spine blastomas//Magazine of the State Medical University of Grodno – Moscow, 2010. – № 2. P. 129–130.
4. Vertebroplasty in treatment of patients with spine tumor injuries: Diss. ... Candidate of Medicine – Moscow: SI RAMS “N. N. Blokhin Russian Cancer Research Center», 2005. P. 129.
5. Djinjikhadze R. S., Dreval O. N., Lazarev V. A., Vetrile S. T., Shevelev I. N., Musaev E. R. Surgical treatment approach in myelogenic injury of vertebral column and spinal cord//Spine surgery, 2006. – № 4. P. 55–60.
6. Kostuik J. P.: Surgical approaches to the thoracic and thoracolumbar spine. W: The Adult Spine Principles and Practice. Red.: J. W. Frymoyer, Raven Press Ltd., – New York 1991, P. 1243–1266.
7. McAfee P. C., Zdeblick T. A.: Tumors of the thoracic and lumbar spine: Surgical treatment via the anterior approach. J. Spine Disord. 1989, P. 2, 145–154.
8. Sundaresan N, Steinberger A. A., Moore F., Sachedv V. P., Krol G., Hough L., Kelliher K: Indications and results of combined anterior-posterior approaches for spine tumor surgery. J. Neurosurg. 1996, P. 85, 438–446.
9. Akeyson E. W., McCutcheon I. E.: Single-stage posterior vertebrectomy and replacement combined with posterior instrumentation for spinal metastasis. J. Neurosurg. 1996, P. 85, 211–220.
10. Bilsky M. H., P. Boland, E. Lis., Raizer J. J., Healey J. H.: Single stage posterolateral approach for spondylectomy, epidural decompression, and circumferential fusion of spinal metastases. Spine – 2000, 25, 2240–2250.
11. Hasegawa K., Ogose A., Kobayashi H., Morita T., Yasuharu H.: Simultaneous anterior-posterior approach for excision of malignant paraspinous tumor and subsequent reconstruction. Technical note. J. Neurosurg. (Spine 2) 1999, P. 91, 236–264.
12. Tomita T., Toribatake Y., Kawanara N., Ohnari H., Kobe H.: Total en bloc spondylectomy and circumspinal decompression for solitary spinal metastasis. Paraplegia 1994, P. 32, 36–46.
13. Bridwell K. H., Jenny A. B., Saul T., Rich K. M., Grubb R. L.: Posterior segmental spinal instrumentation (PSSI) with posterolateral decompression and debulking for metastatic thoracic and lumbar spine disease. Limitations of the technique. Spine 1988, P. 13, 1383–1394.
14. Bauer H. C. F.: Posterior decompression and stabilization for spinal metastases. J. Bone and Joint Surg., – 1997, 79 (A), P. 514–522.
15. Scoville W. B.: Palmer A. H., Samra K., Chong G.: The use of acrylic plastic for vertebral replacement and fixation in metastatic disease of the spine. J. Neurosurg. – 1978, P. 27, 274–279.

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## **Mistakes, dangers and complications in surgery of the cysts of biliary ducts in children**

**Abstract:** From 74 children operated in our institution due to cyst anomalies of the biliary ducts of them in 12 children there were performed erroneous operations in the other clinics. This is explained by diagnostic and tactic mistakes by physicians of the medical institutions without experience in treatment of children with anomalies of the biliary ducts. In two patients there were observed complications of the iatrogenic character in the complex anatomic-topographic variants of anomalies. In 33 children there were found various complications in the postoperative period. In the article there were presented the most frequent complications, their causes and characteristic features of the therapeutic tactics.

**Keywords:** cysts biliary ducts, treatment, complications, children.

### **Introduction**

The diagnostic and tactical mistakes and complications, connected to them, at the cystic anomalies of the biliary ducts (CABD) are observed rather frequent. The abnormal introduction of the segmental ducts into the common biliary duct (CBD) and anatomic variations of the formation of the gallbladder and biliary tract complicate performance of the open and laparoscopic surgeries may be cause of iatrogenic injuries or technical mistakes. The danger sharply occurs under the conditions of marked adhesive process due to developed biliary peritonitis at the rupture of the cyst or complications of the inadequate primary surgery [2; 3]. In the literature there is described a case of iatrogenic injury of the portal vein at the removal of the cyst of the common biliary duct [1].

**The purpose** of research was to analyze errors, dangers and complications at the stage of diagnosis and operative introduction and to develop adequate surgical tactics in the cystic anomalies of the biliary ducts on the basis of the material of our clinic.

### **Material and methods of research**

On the clinical bases at the chair of hospital children surgery, children oncology of Tashkent Pediatric Medical Institute in 1979–2016 there were observed and treated 76 patients with CABD (60 girls and 16 boys) at the age of the neonatal period to 16 years old. Of them 74 children underwent operative interventions.

### **Results and discussion**

The primary and repeated surgeries were performed in our clinic in 62 (83.8%) from 74 children; 12 (16.2%) children the primary palliative surgeries were carried out in the other hospitals. Two out of 12 patients admitted from the other hospitals were operated with wrong diagnosis of anomaly of the gallbladder development. The cyst of the common biliary duct remained to be unrecognized. In one case the cholecystectomy was made wrongly without intervention into the cystic-changed common biliary duct; in the secondary case the surgery consisted in "elimination of the adhesion of the gallbladder". Some times ago in these children the former clinical attributes of disease have renewed. At repeated inspection the correct diagnosis was established: the cyst of the common biliary duct. The patients were performed repeated surgical correction. One girl underwent erroneous appendectomy at admission to the hospital with pains in the abdominal cavity at the place of residence. Two years later at hospitalization with suggestion of hepatic echinococcosis the diagnosis was not confirmed, and in this case the cyst of

the common biliary duct remained also to be unrecognized. In the further in our clinic the child was studied and operated with real diagnosis — the cyst of the CBD. The similar tactic mistake was observed in the girl in the age of 1 year and 1 month with the diagnosis of primary peritonitis. The operation was completed by drainage of the peritoneal cavity. In 6 days with continuous peritonitis the patient was repeatedly operated. There was found perforation of the cyst of CBD, and the drainage cystostoma was applied. In the girl of 2,5 month old operated with suspicion on intestinal invagination, there was revealed rupture of the common biliary duct; there was performed suture of the rupture without drainage of the common biliary duct. The child has died. The autopsy showed that the cause of the biliary peritonitis was the tear of the cyst of the CBD. In the lumen of the gallbladder there were found concretions. The histological investigation showed presence of the ectopic tissue of the pancreatic gland in the wall of the CBD. The rest 7 patients of this group, being underwent surgery with wrong diagnosis the liver echinococcosis (6) and intestinal invagination (1), due to confusion and absence of experience in the surgeon in relation to radical treatment of the cysts of the common biliary duct, the operation was finished by external bile deviation. In 3 of them there were occurred complications, required repeated operation at the early postoperative period. The child being operated because of suspicion on intestinal invagination required relaparotomy on the 5<sup>th</sup> day due to adhesive intestinal obstruction. In two patients in the postoperative period there were noted signs of the continuing biliary peritonitis connected with incomplete hermetization of the drainage tube in the cyst (1) and it's falling down from the cyst cavity because of insufficient fixation (1). In two patients there were observed complications of the iatrogenic character. In one of them there had happened injury of the portal vein wall during surgery under the conditions of the massive adhesive process in the hepatoduodenal zone and inflammatory signs around the cyst at the stage of mobilization. The wound was sutured and hemorrhage stopped. The surgery was finished by cholecystectomy, partial dissection with reconstruction of the cyst of the common biliary duct and formation of the hepaticoduodenal anastomosis. In the postoperative period there were developed clinical-laboratory indicators of the portal hypertension, stopping with intensive conservative measures on the 7<sup>th</sup> day after surgery. The second child required repeated operative intervention in the nearest postoperative period

after cholecystectomy, partial resection of the cyst with application of the hepaticoduodenostomy in connection with increasing signs of mechanic jaundice. The development of this complication was connected with ligation of the segmental duct independently running into the cystic dilated common biliary duct at application of hepaticoduodenostomy. It was confirmed by the retrospective analysis of intraoperative cholangiography. At the relaparotomy on the 3d day after operation there was loosened the second layer of sutures along the right edge of the created anastomosis. In the postoperative period the signs of mechanical jaundice were quickly stopped, its intensity attenuated. The biliary drainage tube stopped on the 7 day. The patient was discharged at the satisfactory state.

Out of 74 primary and repeated operations which have been carried out in clinic, in 41 (55,4%) patients the postoperative period proceeded smoothly, in 33 (44,6%) there were observed 63 complications; in 20 cases they were more than two in one patients. The lethal outcomes in the early postoperative period there were observed in 4 (5,4%) cases. The patients with the lethal outcomes were from group of these 33 patients with postoperative complication.

Early postoperative complications were divided into general surgical (paralysis of the intestine, adhesive intestinal obstruction, suppurative-inflammatory complications, intestinal eventration, hemorrhage (in the gastric-intestinal tract or in the abdominal cavity) — 11; specific (bile secretion, progressing or addition of the pancreatitis, mechanic jaundice, progressing of the damaged liver function, DBC) — 49; somatic (acute respiratory and renal insufficiency, sepsis, polyorgan failure, generalization of the intrauterine infection) — 3.

Clinical signs of acute pancreatitis with characteristic pain attack and dyspeptic expressions increase in amylase level in the analysis of blood and urine appeared on the 2–3 days after application of the hepaticoenterostomy (9) hepaticoduodenostomy (1) and external cyst drainage (1). The development of this complication, probably, is caused by reactive pancreatitis due to traumatization of the head of pancreatic gland in the cyst mobilization. In 2 patients the shown factors promoted an aggravation of the available before operation pancreatitis. On a background of complex conservative treatment with inclusion of contralateral the signs of pancreatitis were stopped, amylase indicators normalized.

The bile secretion in the postoperative period was noted in 14 (20%) patients. The volume of bile secreted through drainage tube inserted into the abdominal cavity accounted for 50–400 ml a day. This hermetic external drainage of the cyst (3) and drawing (erroneous removal) of the cystic tube in 3 patients. This became the cause of peritonitis development, eventration of the intestine required of repeated surgeries. In 8 cases after operation of the internal drainage independently on their type the excretion of bile, evidently, was connected with non hermetic biliodigestive anastomosis. Absences of the signs of peritonitis and gradual decrease in volume of the bile excreted have become the indicators for waiting tactics. On the 5–12 day the bile excretion has stopped independently.

Progressing of liver insufficiency was in 5 children at the age to 6 months who had external cyst drainage with liver biopsy. In all these patients prognosis at discharge was determined as unfavorable. They died during 30–40 days after discharge from hospital due to increasing liver insufficiency induced by progress of biliary liver cirrhosis.

In one patient on the 3d day after operation cholecystectomy, the cystectomy with application of hepaticoduodenostomy there was noted intestinal hemorrhage, worsening of the state, vomiting with blood trace, tarry stool, increase in anemia expressions (anemia, paleness, reduction of the erythrocyte quantity and hemoglobin features). In the fibrogastroduodenoscopy the source of hemorrhage was not defined. The hemostatic therapy appeared to be effective, on the 6 day the hemorrhage stopped. In the other patient on the 2 day after operation of cholecystectomy, cystectomy with application of the hepaticoenterostomy by Roux there was noted worsening of the health state, increase in abdomen cavity volume, reduction in hemoglobin level. The child was performed repeated surgery with hemoperitonitis. The cause of hemorrhage was removal of ligature from one branch a. cystica.

The analysis of intraoperative and postoperative complications showed that the main causes of their occurrence appeared to be severe initial state of the patients, complex anatomic-topographic variants of anomalies, inflammatory processes in the hepatoduodenal zone, tactic and technique mistakes at the stages of diagnosis and operative treatment. The optimization of the diagnosis and surgical treatment of CABD on the basis of differential approach taking into account anatomic peculiarities of the cysts, established by preoperative studies and intraoperative cholangiography, allowed decrease in number of diagnostic mistakes, complications and lethal outcomes during the last years. From 25 operated children in the period 1979–2004 the complications and lethal outcomes were 16 (64%) and 2 (8%) cases. Among 49 operated children in 2005–2016 years the complications and lethal outcomes accounted for 17 (34,7%) and 2 (4%) cases.

### Conclusions

The mistakes at the preoperative period were caused by absence of clear symptomatic, characterized by dynamic clinical signs, low awareness and alertness of the physicians of various specialties in relation to cystic anomalies of the biliary ducts that in total appeared to be main cause of the delayed diagnosis and occurrence of various complications.

The tactical and technical mistakes of the doctors at the peripheral level during surgery complicate realization of repeated interventions, increase risk of occurrence of intraoperative complications and confirm expediency of realization of operative treatment under conditions of the specialized departments.

In newborns and young children of early breast age CABD mainly proceed on a background of decompensated disorders of the liver function, induced by congenital causes, negatively influencing on the results of treatment, outcome of disease, that requires differential surgical approach.

### References:

1. Аюпян В. Г. Хирургическая гепатология детского возраста. – М., Медицина. – 1982. – С. 176.
2. Dong Q, Jiang BX, Jiang Z, et al. Management of congenital choledochal cyst complicated by biliary anomalies and aberrant bile duct // *World J Pediatr*. 2006 May; 2 (2): 133–138.
3. Liuming H., Hongwu Z, Gang L, et al. The effect of laparoscopic excision in children with choledochal cyst: a midterm follow-up study // *Journal of Pediatric Surgery* – 2011; 46: 662–665.

## Section 8. Mechanics

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### Actual prospects of application of metal layered composition of type “FSS-an intermediate alloy-solid working element” in manufacture of drill tools

**Abstract:** The basic directions of development of Uzbekistan are conditioned by acceleration of scientific and technical progress at advancing rates of development of mechanical engineering and oil and gas complex. Implementation of these plans assumes strengthening and an intensification of tool manufacture, demands increase in the nomenclature and complexity of applied tools for realization of the newest technological processes at simultaneous increase of their reliability, durability and decrease in labor input, power intensity and material capacity of their manufacturing.

**Keywords:** technological processes, drilling of blast, metal layered composition, mechanically-by press fitting, steel melt, Materials science and materials technology.

In this aspect, undoubtedly, working out and introduction of the new technological processes directed on creation of new materials, possessing a complex of set valuable properties is perspective. Thereupon working out scientific basis of creation and research of metal layered composition (MLC) of type “FSS—an intermediate alloy–solid working element” possessing high ruggedness is actual. Application of investigated MLC is perspective in manufacture of the tools of exploited under conditions of percussive perforating drilling of blast holes in medium-abrasive rocks with strength factor  $f \geq 10$  and other tools, applied at carrying out of drilling works, including in oil and gas complex.

The purpose of the present researches is studying of composition, structure and properties of the forming bimetallic compound and its behavior under operating conditions as the drill tool depending on technological parameters of its manufacture.

The method essence consists in placing in polystyrene foam models of inserts from the tool materials forming a working surface tool by melting or formation of connection at contact with melt. Formation of bimetallic connection allows raising working capacity and longevity of the tool, cutting down thus expenses of materials, work and energy expenses. Depending on modular inserts can be carried out from powder green compositions or compact materials.

Various tools applied recently not meet completely the requirements of technological processes, in particular –low ruggedness, high prices, etc. [1; 2]. Now the bimetallic structure of the tool is reached by connection with the body by welding, the soldering of working elements [1], mechanically-by press fitting or by means of the special device [2]. Constructively such tool demands separate manufacturing and the body, and working elements with their subsequent connection. Besides complication at the expense of introduction of additional operations, technological processes is distinguished in this case by high labor input and low use factor of metal, and also, high cost product. For elimination of these lacks in practice the “know-how” of the tool was used by molding [3], but it conditions low accuracy of received castings, great volumes of the

subsequent machining and low durability of formed connection. Last years it is offered to apply a method of precision to the decision of these problems in metal forms. However for reception of reliable and strong connection in this case the preliminary warming up of the die-casting tool and creation of regenerative atmosphere in it is required. All this complicates and raises the price of the process of tool manufacturing.

Considering all listed lacks, the “know-how” of the cast bimetallic tool of various special-purpose designations by molding method on lost models [4] is developed. The essence of the method consists in formation of polystyrene foam models in specially made mold, with model dressing, model assemblage on a collector, installation of collectors on a post in cast, sanding-up, its vibrato compaction, filling-in with steel melt. At contact with melt polystyrene is gasified, the formed cavity is filled with melt which after crystallization completely and with high accuracy reproduces the form and the sizes of the initial foam model.

Distinctive features of the method are:

- Possibility of reception of complex one-piece models;
- Reception of casts on II class of accuracy;
- Creation in the course of filling-in of the melt in a form of regenerative atmosphere during all period of its crystallization.

These features defined a choice of way as basis for working out the “know-how” of the drill tool from bimetallic systems. Specification and grounding for of technological process of reception of the cast bimetallic tool needed the decision of variety of problems:

- An establishment of formation conditions of cast bimetallic compound depending on modular state of inserts;
- Studying of influence of formation conditions on composition, structure and properties of bimetallic compounds;
- Reliability estimation, working capacity and durability of bimetallic connections;
- Grounding for and a choice of ways and directions of perfection of technological process of reception of the cast bimetallic tool with a view of increase of its technical and economic indexes.

It is established, that for a class tools, with corresponding geometrical parity of an insert and a bearing base, the crust in a contact zone remains prior to the beginning of volumetric crystallization.

In this situation for reception of solid tie formation of liquid phase at the expense of fusion of the intermediate layer material put on an insert, or fusion of the insert is necessary.

The variant with intermediate layer practically unique for compositions hitch components essentially differ under physical characteristics. Solid alloys-steel concern these compositions, molybdenum alloys-steel. Practical realization of similar compositions has found the embodiment at the manufacturing of the drill tool applied in oil and complex (Fig. 1, 2).

For the drill tool inserts from the solid alloys, intended for soldered tool were used. Transitive layer was put by a method of plasma spraying. Structures of sprayed alloys are presented in table, the thickness of coverings is in limits of 0,1–0,5 mm. MLC with solid working element from solid alloys of group VK and TK differ by presence of fusible intermediate layer between composition components. As intermediate layers various fusible alloys were approved:

- Alloys for soldering of solid alloys P-100, P-102, brass L60;
- Self fluxing alloys of the system Cu-Ni-Mn Vpr-2, Vpr-4.

As well as in the previous cases, as criterion of quality served a continuity of connection. To this criterion the group of alloys not concerns such as: P-100, P-102, which is conditioned by occurrence of cracks in formation of compositions. Therefore all researches have been spent on compositions with use of self fluxing alloys of system Cu-Ni-Mn (VPr-2 and VPr-4) where has been reached continuity of ties. For revealing of parity of content Cu and Ni (% weight) on quality of formation of a compound, compositions with transitive layer from alloy PR-N55P on Ni-Mn- base and brass L62 (Table 1) were in addition investigated.



Fig. 1. Polystyrene foam models

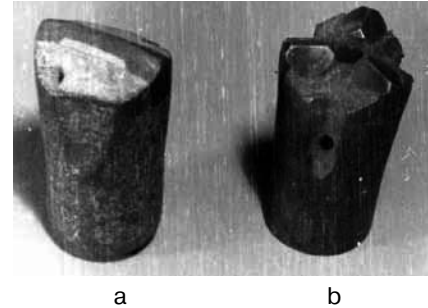


Fig. 2. Casts MLC type casting bore bits. a – one arrow; b – three arrow

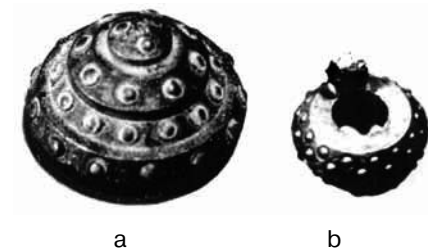


Fig. 3. Cast mills of type MLC for drilling bits. a – for three cone bit; b – for one cone bit

Table 1. – Chemical composition of self-fluxing alloys system Cu-Ni-Mn used as intermediate alloys at creation MLC

Alloy grade	Chemical composition, weight %					
	Cu	Ni	Mn	Si	Mo	Others
VPr-2	base	5,2	25,7	2,5	–	–
VPr-4	base	29,5	28,4	1,1	–	–
VPr-33	4,1	base	19,5	7,7	10,4	10,6% Cr
VP-N55R		55				

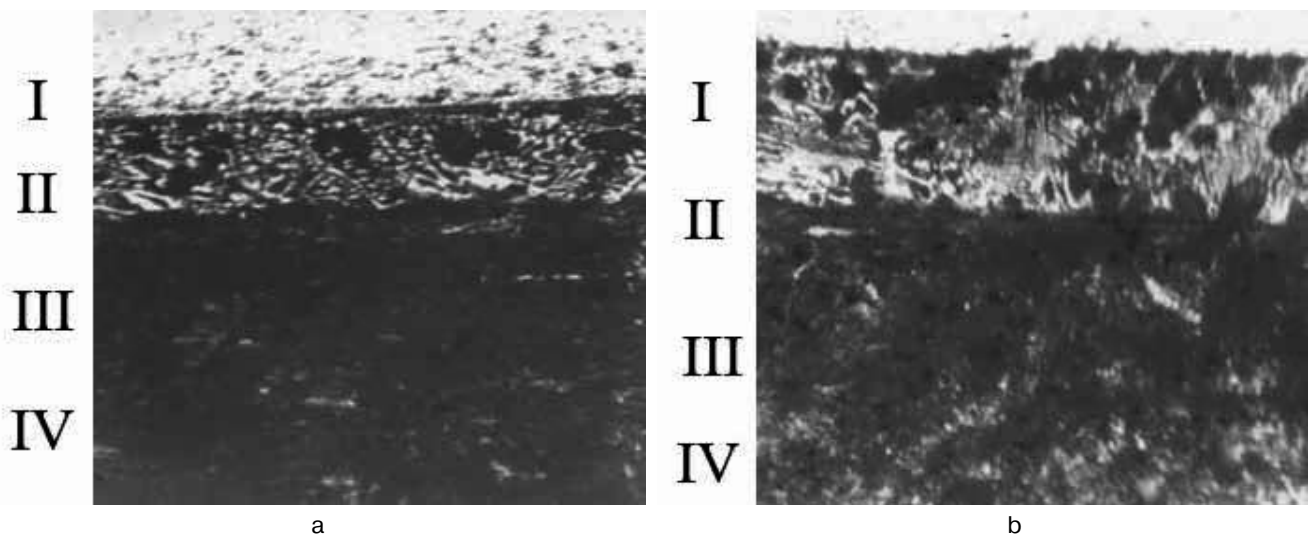


Fig. 4. A microstructure of transitive zone MLC solid alloy T5K10-LKC 40HL with transitive layer from alloy Vpr-4. I–Migration zone; II- a zone on the base of transitive layer material  $\delta=0,2\text{mm}$  (a),  $\delta=0,3\text{mm}$  (b), III- a crust; IV- a zone of carburizing increase  $\times 100$

Metallographic researches of compositions have elicited following facts:

– Presence of well distinguishable border on solid alloy (edging) on all interface with steel (Fig. 3) with characteristic thickness of 0,5–1,0 mm.

– Complexity of microstructure of the transitive zone including four subbands (Fig. 4):

I subband-from the side of solid alloy differs in the increased distance between carbide particles. A thickness is to 0,1mm.

II subband- is formed on the base of material of intermediate alloy. Characteristic signs-dendrite skeleton with fine-grained structure of inter dendrite zones. A thickness is 0,2–0,3 mm.

III subband — a crust with fine-grained structure. A thickness is from 0,02 to 0,05 mm.

IV subband — area of carburizing material of a bearing base by products of polystyrene gasification with paelite-cementite or parlite structure gradually turning into ferrite-pearlite structure of hypereutectoid steel. A thickness is 0,3–0,5 mm.

Prominent feature of composition with transitive layer is an influence of structure and a thickness of covering on the sizes of subbands.

Changes of Ni in transitive layer, depending on used material from 5% weights to 55% weights increases a thickness of I subband for group VK8 alloys approximately twice and for alloys TSK10 1,8 times (Fig. 5). Accurate correlation between thickness of coated covering and I subband is traced, namely to smaller thickness of covering, the smaller sizes of I subband correspond and on the contrary.

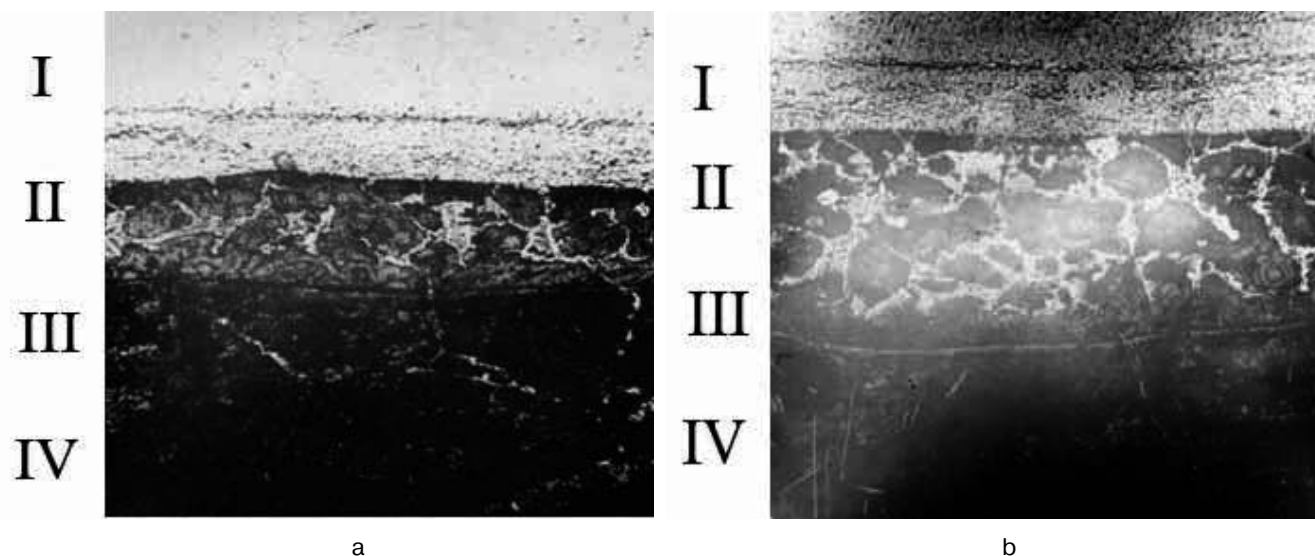


Fig.5. A microstructure of transitive zone MLC solid alloy VK8-FSS 40HL with transitive layer from alloy VPr-2. I – Migration zone; II – a zone on the base of transitive layer material;  $\delta=0,2\text{mm}$  (a),  $\delta=0,3\text{mm}$  (b), III – a crust IV – a zone of carburizing. Increase  $\times 100$

The sizes of II subband formed on a basis of material melt of a transitive zone are defined by the sizes of coated covering. The thickness of III subband (crust), and also subband of carburizing practically not depend on a thickness of transitive layer. The wavy relief of a crust testifies to its dissolution in a material of an intermediate layer and fusion in metal-of the base. Results of micro sounding of all zones on samples of composition VK-8-VPr-2-steel 40HL are resulted on Fig. 3, 4.

Attracts attention the fact of the great paths of diffusion of tungsten and cobalt from solid alloy in intermediate layer and further, reaching 400 microns, i. e. practically in all subbands there is a tungsten and cobalt content decreases. Penetration Ni into solid alloy and Cu in steel is characterized by diffusion-200 microns and 150–200 microns; Mn penetrates into solid alloy, more strongly than in a steel 40HL.

Thus, possibility of forecasting with high probability of creation MLC with higher level of set mechanical properties is established, purposefully to introduce corrective amendments in manufacturing techniques of tools on base of MLC, in particular-bits and mills, subjected while in service to a friction that allows to prolong accident-free operation of the drilling equipment.

Results of researches MLC are introduced in technology OJSC “Uzbek factory of refractory and heat resisting” materials. The received scientifically-practically results are entered into educational process on department “Materials science and materials technology” of Tashkent State Technical University named after Abu Rayhan Beruni for students of undergraduate and postgraduate students.

#### References:

1. Phillipov G. V., Cutting tool//Machine building, – 2001. P. 391 p.
2. Zubtsov M.E., Korsakov V.D. Firmness of stamps/Machine building, – 1991. P. 200 p.
3. Lenezemovsky A. V. Bimetallic casts/Machine building, – 2004. P. 180 p.
4. Stepanov U. A. Moulding on gasified models/Machine building, – 1996. P. 224 p.
5. Norhodjaev F. R. Cast bimetallic compositions of molybdenum alloys-steel for pressing tool. Thesis of candidate of technical sciences. – Tashkent. 1993. P. 168 p.



## Section 9. Pedagogy

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### Pedagogical support of competence formation: methodological bases and experimental context

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**Abstract:** The article considers the problem of competence approach methodological basis. It discusses the topical issues of organizing a holistic educational process. The article presents the original solutions created by the author and the results of experimental verification of the specified conditions of pedagogical maintenance of educational and training activities.

**Keywords:** educational environment, educational process, wholeness, subjectivity, interaction, attitude, result, individual educational potential.

#### Introduction

Competence approach initiates the search for the new patterns of educational process, revealing the specifics of its organization from the standpoint of active subjective interaction between the participants. Within the educational process there takes place the development of the content of basic educational programs (BEP). Baccalaureate programs should be released in the atmosphere of trust, mutual support and responsibility for the result, through the acquisition of personal sense and value importance of education, the development of communicative skills and ability to apply the knowledge in solving educational practice-oriented tasks.

#### Main part

The content change of higher education is determined by the new educational standards binding the process organisation with the achieved results which satisfy the quality criteria. First of all, it is important to mention the competence formation as it is ensured with the shift of the education system from the traditional teaching practices which use the knowledge determinants of success to the practice of competence development with the help of various tools and pedagogical support technologies, and to the organization of interpersonal and group interaction between the participants during the whole educational process [2; 3; 6].

Methodological bases of holistic educational process in a university should be considered using the example of undergraduate bachelors getting the teacher training education and in the context of experimental verification of the didactic and providing conditions of the educational activity, as well as the educational environment capabilities (the specially designed educational environment) and the expected results of education.

Common problems of competencies are marked in the researches of the following foreign authors (J. Raven, J. Coolman, R. Collins, E. de Bono, V. de Lanshere, J. Folger, A. Freley, J. o'Tool, S. Shneider, L. Spencer, etc.). Russian scientists explore the questions of competence formation in different subject areas, in communication and pay special attention to the knowledge and professional competences (V. S. Bibler, V. V. Davidov, I. A. Zimniaia,

S.Iu. Kurganov, A. M. Matushkin, N. F. Talyzina, M. A. Kholodnaia, A. V. Khutorskoi, D. B. Elkonin, P. M. Erdniev and etc.) [2].

Competencies reflect the requirements of general legal units of the federal state educational standard applied to the content of undergraduate bachelor educational programs. However, the aim of modern higher education is the competence. Competence (kompetentnost) is defined as the integral characteristics of the professional activity qualities or the degree of professional personal satisfaction. Competencies are revealed throughout the particular features of their owners and within their relation to the results of individual and collective activities.

The methodological basis for developing the professional pedagogical education is the vocational and educational environment, defined as the form of relationship of an individual with the world of professions and the methods of getting professional education [1].

It is believed that the educational environment of high school educational institution creates the necessary conditions for the holistic educational process. However, not always the educational goals are implemented successfully. Therefore, the attitude should be considered as a condition for the successful competence formation.

V. V. Serikov rightly observes that if the teacher is subjectively removed, and his "child" (holistic educational process) is not the author's self-expression or self-realization, the wholeness is destroyed on a subjective level, where it is born or designed: "... education loses its wholeness, when the subject is alienated from the process, when something he is doing, is not his own existence" [4, 16].

Studying a holistic education process for compliance with the criteria and indicators of successful/qualitative competence formation is related to the uncertain issues of theory and practice of higher pedagogical education:

- undeveloped methodological grounds of competence approach related to the goals, objectives and content of the educational activities;
- lack of practice-oriented mechanisms of substitution, transformation and adaptation of the knowledge and skills represented by descriptors and determinants of educational content of the competence format;

- unset grounds for adequate choice of criteria/indicators for evaluating the educational competencies, matching the components and the components of professional competence;
- uncertainty of federal state educational standard imposed on the results of educational and training activities of subjects of education.

It is obvious that the choice of bases for the competence formation should be considered comprehensively, throughout the interconnection of the conditions of the relevant areas of pedagogical maintenance of the educational activities: *predictive, motivational, communicative and technological* ones.

The targeted objects of pedagogical maintenance of competence formation in training future bachelors while preparing the experimental part of the study were the personally significant value orientations on achieving educational results, developing communicative skills and so on. Content and event fulfilment of educational activities of the school staff and interdependent educational relations of educational subjects were presented as the logical bases of active and interactive subjective relations. These are:

- emotionally positive willingness for joint creativity at the levels of subject-subject interaction (*collective, group, individual*);
- nature and extent of the communicative propensity of the participants (*interest, attention, understanding, acceptance, activity, responsibility*);
- *adaptability*, as a manifestation of abilities and skills of *orientation* in the surrounding educational environment of the university;
- ability to *mobilize* internal forces through self-assertion and personal formation in situations associated with overcoming the difficulties, solving the educational problems and challenges of the life plan.

According to V.V. Stolin [5], the change of consciousness as a natural result of education and self-identity is determined by the evaluation criteria, and through the awareness and the “feeling”/“attitude” parameters beginning with the level of reality perception (self-esteem change), up to the level of natural creativity and responsibility manifestations [2, 60]:

- desire and need to arouse the interest, to feel the complicity, care and support (health);
- awareness of personal success while implementing the actions, which are defined by the terms of educational and professional work, and comparing himself to “other”/“the others” (self-organization);

- presentation of himself as a phenomenon determined by the level of educational achievements and integrative character of the ability *manifestations* (self-esteem);
- feeling the needs for further professional development and personal development (self-actualization).

According to the research of the holistic educational process, we note the peculiarity of manifesting the communicative-activity relationship: attention, interest, understanding, acceptance, responsibility, activity and so on. Personal characteristics of the activity levels correlate with the position choice: *passive, regulatory, sub-situational, individual and creative* ones.

Thus, the success of the educational activities within a holistic educational process should be viewed throughout: being aware of personal significance of higher education, taking the responsibility for the profession choice; planning/realizing the goals and objectives of the nearest and further prospects for personal growth; personifying the educational values, developing communicative abilities and activities; applying knowledge and skills in solving the educational and practice-oriented tasks in an atmosphere of trust, mutual accountability for the results; expanding the educational experience and activities of communication, transferring a rough basis of the formation of skills and abilities in a variety of uncertain situations and professional outcomes.

### Conclusion

Results of experimental studies confirm the thesis that the holistic educational process at the methodological level is determined by the didactic conditions in the technological context of the requirements for pedagogical maintenance. The following ones include:

- goal setting, choice of teaching objectives and means of training and education;
- combination of traditional and innovative approaches, methods of training and education;
- variability of using forms of conducting classes;
- use of practice-oriented diagnostic techniques, the organization of control, evaluation of training and educational achievements of the students, including the assessment of subjective education of students-level indicators;
- approximation of the characteristics of the educational results to normative (standardized) quality indicators.

### References:

1. Zeer E. F. Development problems of vocational pedagogical education//Kazan pedagogical journal. 2014. – № 2 (103). P. 9–22.
2. Nabiev V. Sh. Didactic conditions of forming military special competence of cadets of military universities of Communications (examplified by special disciplines): dis. ... Cand. ped. sciences. Ulyanovsk, – 2008. 215 p.
3. Nabiev V. Sh. Diagnosing results of performing and forming the professionally significant qualities of future BE bachelors//Professional education in Russia and abroad. – 2016. – № 2 (22). P. 80–85.
4. Serikov V. V. Subjective foundation of holistic pedagogical process//Proceedings of the VSPU. – 2012. – № 4 (68). P. 12–18.
5. Stolin V. V. Self-consciousness of the individual. M.: Publishing house of the Moscow university, – 1983. 288 p.
6. Nabiev V. Sh., Diakonova O. O., Petukhov M. A. Holistic educational process in didactic unity of contradiction and connectedness within competence formation//International Journal of Experimental Education. – 2015. – № 12–6. P. 710–712.

## Section 10. Psychology

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### The culture and attitudes

**Abstract:** There are deep relations between the human mind and the environment. The surroundings of humans refilled with influences from past generations. Therefore, humans are shaped by the character of the world. The analysis of psychological literature concludes that children become the object of culture from birth. In the process of socialization, a child learns other scenarios from their culture. The state of mind interiorized all of these cultural scenarios. This process impacts a person's perception of the external world. Such influences impact the formation of conscious perception and the emotional system.

**Keywords:** Attitude, Culture, Intentional World, The Conventional World, Cultural Frame of Perception.

#### Introduction

The biological existence of humans coupled with their social existence is a fact accepted by main stream science. The social existence of humans is reflected by living amongst other persons with shared communications. Should an Infant be removed from human care, in some conditions; a child may have biological existence, but their social existence will accrue in the form of an outcast, one condemned in existence to death. Defined events described in the psychological literature of infants living among animals have proven this hypothesis. Given, the continuation of their biological existence, these infants remain defined as abnormal; proper character formations do not take place.

The seprocesses have been studied as per, the process of social experiences of previous generations involving infants. Children from childhood learn images, modes, schemes, samples of behaviors and scenarios from parents. Also, the child learns the elements of culture as per its impact. Children learn the differences between 'good', 'bad', 'can or cannot'. The elements of culture transfer from parents to the child are in essence learned patterns of behavior.

Analysis of the psychological literature [2; 4; 5; 6] show that, the problem was in fox since the beginning of the past century. Attitudes are learned from different aspects and the role of culture in its formation were also examined.

Investigations show that an infant from birth who is surrounded with elder people, as it was mentioned by the psychologists says, the child is affected by culture from birth.

One of the lead postulates of anthropologic psychology is that, there is a connection between people and this information which makes for possible multiple impacts. As it was notified by S. Lurie, "The seared relations between the special existing human surroundings and fundamental categories of his/her mind: The human environment is full with the material and ideal ways of the behaviors, left from the past generation." [1; 7]. When we say intentional world, it is considered the world created by the human and when we say conventional world, it is considered the world that is important for human. S. Lurie writes: "Each culture represents the "intentional" world, so "the created and build world". Then he writes: "The infinity numbers of different intentional world scould not be justified with conventional world (so, social strengthened world of importance)"

[1; 6]. So, the culture created by humans is the important world for humans. The infinite numbers of cultures have social importance.

The source of culture is not a world; it is the human having specific cultural systems and consequently it is the intentional person. There is a specific culture in the basis of the state of mind of the intentional person. The culture generates intentional persons. Apparently, it is the process of having mutual impacts: humans make culture, at the same time, culture forms humans and their internal worlds. S. Lurie writes: "The intentional world is factually and realistically will be existed while the people have the knowledge redirecting their trust, wishes, targets and mental images" [1; 7].

R. Shveder is also approving it: "The intentional events and things will exist only in the intentional worlds. Anything out of our reaction and interest will not exist. The intentional things are active because, we have their images, they do not exist in any "natural" reality out of the human's mind and activities, [5, 88]. The impact of the culture on humans for it to be understood as it impacts the human perception. In the psychological literature, it calls "cultural frame of perception". The anthropologic psychologists give high value to perception and they say that, the objects of the external world passing through perception take their mental meanings. The psychological anthropologists review perception as the process forming the base structure of the culture [1].

As the results of investigations, it was found that, the paradigms formed structure and context of the culture is not perceivable, otherwise, it would not be culture, it would be just the norms accepted by the small groups of people. S. Lurie writes: "It is possible to understand these paradigms as the general culture scenarios perceived and interiorized. Such scenario can identify the character of perception and activity" [1, 12]. The learned scenarios are realized in the mutual impact process and become significant for human. As it is defined in the psychological literature, we do not live in real world we live in the world of importance [1; 5].

The world of significances is also related to attitude itself. The culture learned by a person is a thoughtless attitude against the certain actions. In addition, the cultural scenario itself is defining by the components of attitude like, cognitive, emotional, and conative elements. Summarizing the above mentioned, we can see that the

scenarios are: 1) Realizing in the mutual impact process; 2) Related to the attitudes; 3) Significance; 4) Scenarios itself defining by the impact of attitude.

Indeed, initial public institutional make the basis of experiences which will be used in whole of his/her life. So, considering these facts, S. Lurie assessed the initial public institutional as a phenomenon defining their degree of excitation, character of neurosis, the ways of psychological defenses. In opinion of A. Kardiner, re-institutional is establishing by the folklore, mythology and religious. A. Kardiner gives explanation to all of them as “a projection of main structure of the person.”

As it was notified by the author himself, the first level is the thoughtless area and they could be presented only by transferring the thoughtless complexes to real objects. They are transformed little; their changes, the institutes created them to be transformed. The last level is the fully mindful and cognized level. Other levels state in the middle of them [3].

The American psychologists J. Whiting and I. Child approve also above mentioned hypothesis in their investigations. “... Person locates in between two systems: Experience of childhood education, magic, religious trust and practices” [6, 227]. J. Whiting and I. Child using the stimuli and reaction paradigms, they use “black box” notion: “Behaviour of elders is respond to childhood education. Person is the black box which is remained between them, and directly evaluation is impossible” [6, 190]. In my opinion, the black box is the internal world of human, his/her attitude — dispositions and plenty of dispositions. S. Lurie is also justifying that, there are a lot of black boxes.

Then, arguing the mutual impacts between the individual behavior and dispositions, R. Le Vine writes: “Such observed aspects of behavior are not the basis of the person, it reflects the person, to tell the truth, and it reflects the dispositions which affect to his/her behavior. Dispositions affect behaviours of the person, as well as cultural norms, but it is from inside. The psychologist, studying the person, does not stay in the level of behavior, rather he looks at his/her unobserved side and in his suppositions, this side is psychologically organized: “We have to recognize that, the disposition is organized, the organization has the functional importance” [4, 90].

R. Shweder notes that: “The principles of intentional world are like, subject and object-human and his/her surrounding is mutually absorbed to each other and they cannot be studied like, one is dependent from other one but the second does not depend on first. Neither this nor other could be defined considering each other specifications” [5, 379]. Concussively, the socio-cultural environment cannot exist without depending on human subjectivity and human mental reality cannot exist without depending on socio-environment. R. Shweder shows that, the socio-cultural environment is the intentional world because, it reality is only

possible when there is an existence of human communities which are impacted by and directed to trusts, wishes, targets and other mental images” [5]. R. Shweder has defined the six types of relations between culture and cultural human. Initially, he divides the relations in two big groups: 1). Positive relations; 2). Negative relations.

He shows that, the positive relation is appearing when the world intentionally is increasing or supporting people intentionally. The negative relation is appearing when world intentionally negatively affects to the intentionally of the state of mind. Then, R. Shweder divides these relations in to the groups like active, reactive and passive. He shows that, active relation appears when he/she makes his/her targets with his/her own choices. Reactive relations appear when the target for a person is defined by other people or the intentional world is created for him/her. The goal of the human in passive relations to the world is to be immortal in intentional world [5]. Thus, R. Shweder has demonstrated six types of relations: positive (active, reactive, passive); negative (active, reactive and passive).

### Conclusion

Thus, summarizing above mentioned, we conclude that, culture strongly affects the formation of the state of mind as well as biological and sociological process. The child becomes the object of the culture from the moment of birth. Received information is interiorized by his/her state of mind. This process is highly affects the child's perception, mental and emotional system.

In addition, the investigation demonstrated that, every culture is intentional, and therefore it is a created and build world. The source of the intentional world is the intentional person. At the same time, cultural systems are dependent on the intentional person and dependent on the culturally conditioned state of mind. Humans create the culture. The culture is forming the human. Thus, the culture is the unit of intentional world and intentional person having mutual impacts with each other.

It is clear that, impact of the culture on humans has to be understood as impact to the human perception. The way of forming perception by the impact of culture is by defining the formation of the attitude. Attitudes and perceptions are closely contacted and they have impacts upon each other. Culture learned by human is conditioning; it is thoughtful or thoughtless attitudes within certain actions.

Therefore, we have to note that, information transfer during childhood education takes place in the structure of the mind and emotional systems with behavioral mechanisms of a child and all is strengthened by attitude. The state of mind of all persons is formed by the impacts of bearer culture. Given, an attitude is positively formed; such dispositional optimism supports the individual to obtain their targets.

### References:

1. Lurie S. V. Psychological Anthropology: History, status and prospects. Moscow, Alma Mater, 2005, P. 624 p.
2. Shihirov PN Social Studies in the US system. \\Problems of Philosophy, 1971, N5, P. 168–175)
3. Kardiner A. Psychological Frontier of Society, New York: Columbia University Press, 1939.
4. Le Vine R. A. Culture, Behavior and Personality. An Introduction to the Comparative Study of Psychosocial Adaptation. Chicago, Aldine Publishing Company. 1974, P. 3–4.
5. Shweder R. A. Cultural psychology – What is it? NY, Cambridge University Press, 1990.
6. Whiting J. W. M., Child I. L., Children Training and Personality, New York: Wiley, 1953. P. 286 p.

## Section 11. Regional studies and socio-economic geography

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### Prospects of development of ecological tourism in Tuapse district of Krasnodar region

**Abstract:** Sustainable development of mountain territories should improve the quality of life of the local population, which is defined by such indicators as augmentation of the level of economic wellbeing, improvement of social conditions of living in the given area, increase of the culture of interrelations and importance of the uniqueness of lifestyle. Tuapse district is one of the most popular recreational places in Krasnodar region. Various kinds of economic activity are realized in Tuapse district. Their combined impact has led to a significant depletion of natural resources. Further uncontrolled recreational use of the territory may lead to gradual degradation of landscapes and loss of their attractiveness to the tourists.

**Keywords:** tourism, Krasnodar region, ecological tourism, Black sea coast, sustainable development.

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Socio-economic role of tourism in the mountain territories is performed through the carried-out functions, among which, the most important functions are: economic, social, cultural-cognitive, therapeutic, integrative, ecological, international, political. The idea of sustainable development of mountain territories is based on conceptual restrictions leading to the fact that the process of satisfaction of the current needs should be performed without damage to the future: without depletion of natural, cultural resources and without harm to the environment. Understanding of the concept of sustainability ensures the opportunity to plan effective long-term development of tourism and implies the system of rational nature use in the mountain tourist center [4; 9].

Sustainable development of mountain territories should improve the quality of life of the local population, which is defined by such indicators as augmentation of the level of economic wellbeing, improvement of social conditions of living in the given area, increase of the culture of interrelations and importance of the uniqueness of lifestyle. The improvement of the quality of tourist services for proper recovery of psycho-physical strengths of the man and his socio-cultural development are related to the sustainable develop-

ment of mountain territories. Preservation and reproduction of natural resources is one of the conditions of performance of numerous functional kinds of activity in mountain territories.

Tuapse district is one of the most popular recreational places in Krasnodar region. High demand from the point of recreation and tourism is determined by convenient transport links, unique combination of relief and natural conditions. Tourist practice is notable for high activity and, mainly, spontaneous nature. Various kinds of recreational activity were developed in the considered territory.

Primarily, they include *trekking*, the objects of which are the massif of the mount Indyuk as well as the peaks of Semashkho and Dva Brata. Like trekking paths, *cycling paths and jeeping tours* are mainly associated with low and medium mountain areas. For *mountain-climbing*, the peaks of Indyuk, Indyushka, Sobor-skala, Khozhash rock are used. A big number of rapids and obstacles, high flow rate in the upper reaches of the rivers Pshish and Pshekhha allow their use as the objects of *sport water tourism*. Another kind of recreational activity, less popular due to the spread of karstic processes, is *caving*. Karst forms represented by wells and small caves are associated with Skalisty khrebet and a small part of Yuzhny Bokovoi

khrebet in the districts of the peak of Boz-Depe and khrebet Pseushko. Narrow sites with steep slopes of the valley of the upper reach of the rivers Pkhesha and Kuapse are suitable for *canyoning*. From the point of aesthetic of relief, there is a big number of *observation points* overlooking eccentric mountain landscapes. There are a few *therapeutic institutions* on the coast, and in the low and medium mountain area, there are several tourist bases for *trekking-lovers* (walking for therapeutic and cognitive purposes). Thus, a wide range of recreational activities is developed within the considered district due to a unique combination of natural recreational resources.

Various kinds of economic activity are realized in Tuapse district. Their combined impact has led to a significant depletion of natural resources. Recreation, compared to other activities, is most permissive kind of activity, especially within mountain territories. In the mountain part of the studied district, it is most obvious due to wide spread of timber-harvesting and extraction of mineral resources. Also, as a result of development of tourism, there is additional load on coastal zone, where recreational-hotel complex is combined with residential, port and other kinds of economic activity [8].

As mentioned above, tourism is characterized with expressed spontaneity, which eventually leads to noticeable changes in the appearance of landscapes. For instance, mass weekend recreation in the area of the massif of the mount Indyuk has led to the appearance of the beaten tracks around it. Other consequences include littering, vandalism expressed in the spoiling of tree trunks or rock exposure, erosion of soil layer, contamination of superficial and underground waters, oppression of vegetation cover. Examples listed above do not exhaust the list of negative consequences having, as a rule, direct and indirect expression. Due to the latter, their total number may reach dozens and even hundreds of manifestations (Figure 1).



Figure 1. Traces of digression of soil cover and general oppression of vegetation at the reference site

One cannot not take into account the fact that the largest number of especially protected natural territories (EPNT) is concentrated in Tuapse district. They include 12 geological, 6 hydrological, 34 botanical, 11 complex, 1 landscape monuments of nature and 2 wildlife sanctuaries [6]. Hence, any, including recreational one, activity is subject to restriction. In this respect, ecological tourism should become a priority kind of tourism in the described territory. Its peculiarity lies in the opportunity of active leisure time of the man in the natural environment not only with the use of its recreational, cognitive and other opportunities, but with consideration of its preservation at practical level [7].

Ecological tourism is characterized by being turned towards nature and use of primarily natural resources; orientation to ecological education and enlightenment, formation of moral attitude to nature; care about the preservation of local socio-cultural environment; economic efficiency and ensuring of sustainable development of those districts, where it is performed. One of the directions of ecological tourism is the organization of ecological tracks. Unlike regular tourist paths, they are designed to solve a whole complex of tasks: expansion of elementary knowledge about objects in visitors; teaching skills of detection and assessment of the results of human effect on the environment; cultivation of ecological culture of human behavior. Together with the tasks of education, cultivation and recreation, ecological tracks contribute to the protection of nature because they are the regulators of the visitor flow. The experience of creation of such tracks can already be found in our region. The example is the path functioning in the yew and boxwood forest in the Caucasian biosphere sanctuary [1; 2]. For Tuapse district, one can propose the following itinerary for ecological track: st. 1733 km — m. Indyuk — m. Kruglaya — m. Semashkho — m. Dva Brata — st. Anastasievskaya. This route can be used for familiarization with geo-morphological peculiarities of the district and, in the whole, with mountain landscape of the North West Caucasus.

The conclusion about the need of development of ecological tourism in the considered territory is confirmed by the morphometric analysis of the relief conducted by us based on the assessment of qualitative and quantitative parameters (indicators of vertical and horizontal dissection, steepness and exposition of slopes) [3].

Successful realization of projects in the sphere of ecological tourism will depend on the correct selection of a site for organization and conduct of recreational activity, ecologically grounded development of projects and adherence to the rules, norms and instructions considering the vulnerability and assimilating ability of the natural environment. After the construction of objects of tourist infrastructure, the compulsory measure consists in the normalization of recreational load and monitoring of all components of the natural complex. As a concrete practical measure, it makes sense to develop recreational activity in other, including adjoining territories. Their development will contribute to distribution of high recreational load typical for the researched district. Such districts and separate natural objects include the upper reach of the rivers Pshisha, Gunaika as well as Pshexha with tributaries Khokhpospe, Tugups, Pshexhashka, Maratuka; low mountain sites of Skalisty khrebet; khrebet Nizhnie Vyshki.

Non-organized form of tourism in Tuapse district is determined by historically established traditions and development of infrastructure. Further uncontrolled recreational use of the territory may lead to gradual degradation of landscapes and loss of their attractiveness to the tourists. The situation becomes complicated due to the issue of future recreational activity on the territories with EPNT status,

because in spite of all recommendations, currently, there is a tendency towards the weakening of nature protection legislation [7].

Apparently, it will cause more serious, irreversible changes in the geosystems of these territories.

#### References:

1. Антипцева Ю. О. Проблемы организации экологических троп на территории Кавказского государственного природного биосферного заповедника // Актуальные вопросы экологии и охраны природы экосистем южных регионов России и сопредельных территорий. 2007. – № 20. С. 92–94.
2. Антипцева Ю. О. Развитие экологического туризма на территории Кавказского Инновационные технологии для устойчивого развития горных территорий. 2007. – № 6. С. 479–481.
3. Антипцева Ю. О., Николайчук А. В. Оценка рекреационных возможностей территории Северо-Западного Кавказа на основе морфометрического анализа рельефа // Геология, география и глобальная энергия. 2009. – № 4. С. 262–265.
4. Волкова Т. А., Мищенко А. А. Туристское природопользование как фактор устойчивого развития горных территорий / Наука, образование, общество: проблемы и перспективы развития: сборник научных трудов по материалам Международной научно-практической конференции: в 10 частях. – Тамбов, 2013. С. 41–43.
5. Доклад «О состоянии природопользования и об охране окружающей среды Краснодарского края в 2005 году». – Краснодар, 2006. 121 с.
6. Иванов А. Н., Чижова В. П. Охраняемые природные территории. – М., 2003. 193 с.
7. Официальный сайт Экологической вахты по Северному Кавказу [Электронный ресурс] – Режим доступа: URL: <http://ewnc.org/node/7485>
8. Максимов Д. В., Мищенко А. А., Мищенко Т. А. Современное состояние рекреационного комплекса и его влияние на экологическую обстановку Черноморского побережья Краснодарского края / Известия высших учебных заведений. Северо-Кавказский регион. Серия: Естественные науки. 2010. – № 1. С. 106–108.
9. Мищенко Т. А. Влияние туристских ресурсов на развитие регионального туризма и проблема их рекреационной оценки / В сборнике: Географические исследования Краснодарского края Сборник научных трудов. Ответственный редактор А. В. Погорелов. – Краснодар, 2009. С. 237–241.

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## Rural tourism on the territory of Krasnodar region

**Abstract:** Active development of rural tourism on the territory of Krasnodar region helps solve two quite important tasks: diversification of tourist product within the region's territory and development of rural area; rise in the living standards of rural population at the expense of new jobs, increase of the prestige of living in rural area, development of general infrastructure as well as enhancement of investment attractiveness of the village. Functional departmentalization within rural tourism unions may become one of the possible directions of development of rural tourism in the conditions of rural area of Krasnodar region.

**Keywords:** Krasnodar region, rural tourism, tourism, tourist and recreational complex.

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Rural tourism is an independent kind of tourism based on special forms of leisure activities (for instance, taking care of domestic animals, tasting dishes of local cuisine, walks and picnics in rural

area) and motivation of improvement of tourist trips (acquainting oneself with rural area and rural life style). The kinds of tourism directly related to rural area may include: recreational, active, cog-

nitive and ecologically consumer-oriented, gastronomic tourism, ethnographic tourism, activities at farmhouses and fruit and vegetable gardens etc.

As it is known, the term «rural area» is based on the very characteristics that distinguish this territory from urban area, such as: the size of inhabited settlements, consistency rate of settlements, dominating industries, population density, labor structure, population's life style, its mentality and traditions etc. Thus, rural area can be defined as a territorial system that corresponds to certain numeric criteria of population displacement (established at a national level) and is distinguished by predominant development of agriculture as the main sphere of population's labor as well as by spread of rural life style.

Rural tourism implies the stay of tourists in a rural house in the conditions similar to real ones, including furniture and kitchenware. But, today, objectively, there are almost no authentic rural houses on the territory of Krasnodar region or they are quite modern structures or stylistic imitations.

Active development of rural tourism on the territory of Krasnodar region helps solve two quite important tasks: diversification of tourist product within the region's territory and development of rural area; rise in the living standards of rural population at the expense of new jobs, increase of the prestige of living in rural area, development of general infrastructure as well as enhancement of investment attractiveness of the village.

Rural tourism becomes increasingly popular among tourists. Currently, this direction on the territory of Krasnodar region is in the stage of formation. About 150 enterprises holding their services out as rural tourism ones function on the territory of the region.

The peculiarities of rural tourism development on the territory of Krasnodar region include:

1) Enterprises providing services of such kind are, in majority, initially tourist organizations, not agricultural ones.

2) Main geographical destinations of rural tourism development include Azov-Black sea coast and mountain and piedmont zone, whereas steppe zone lags behind significantly in this respect.

The importance of rural tourism lies in the following positions:

- relaxation of urban dwellers in rural area, gaining knowledge about traditional folk culture;
- movement of financial means from urban to rural area;
- creation of alternative sources of employment for rural population;
- increase of the level of economic returns of the rural population;
- decrease in the process of migration of rural dwellers to cities;
- formation of the sales market for agricultural products and folk handicrafts;

- development of infrastructure of rural territories;
- preservation of natural and cultural resources of the territory;
- decrease of social tension in rural area.

Tourist activity in the conditions of modern village on the territory of Krasnodar region could involve the inclusion of traditional farmsteads in the excursion tours, organization of one-day excursions from nearby resort districts of the region. Organization of weekend tours with a short-time accommodation of tourists is also possible. The idea of organization and conduct of events on the territories of rural households (weddings, parties, corporate events) would be relevant. Everything listed above should be combined with tasting of local products, realization of souvenirs and consumer-oriented goods. Rural tourism in modern conditions can combine the elements of recreational, active, cognitive, consumer-oriented, gastronomic and ethnographic tourism. At the moment, rural tourism is developing spontaneously, fragmentarily, often in the form of separate excursions for schoolchildren and accidental tourists.

Major problems of rural tourism development at the level of rural tourism enterprises include:

- insufficient load of rural tourism objects with tourists;
- absence of a system-based promotion of rural tourism services to tourism market;
- insufficient comfort of some rural guest houses and inhabited settlements, insufficient quality of services at separate rural tourism objects;
- insufficient information for tourists about rural tourism and cultural objects, excursion events and other services.

The main goal of organization and development of agricultural tourism is the increase of life standards of rural population. The development of agro-tourism should stimulate local economy by way of formation of small economic turnovers of local resources. It can be achieved by initiating inter-industrial cooperation, when local products and services are used in the production of a tourist product.

Functional departmentalization within rural tourism unions can be one of the possible directions of rural tourism development in the conditions of rural area in Krasnodar region. For instance, when a group of enterprises are united to provide a complex rural tourism service and every enterprise is responsible for its part of product: stay, meals, participation in rural activities, conduct of master-classes, fishing etc. Thus, every enterprise will be responsible for a limited element of rural activity, which, together, will form a unified rural tourism product.

Rural tourism on the territory of Krasnodar region is not just a really existing direction of tourist activity (although, it is in the process of development), but one of those directions, which will allow a more rational distribution of tourists on the territory.

### References:

1. Волкова Т. А., Карпова Ю. И., Миненкова В. В., Максимов Д. В., Мищенко А. А. Перспективы развития туристско-рекреационного комплекса Краснодарского края/В сборнике: Наука будущего: Единое научное пространство как гарант гармоничного развития фундаментальных и прикладных научных исследований Сборник научных статей по итогам международной научно-практической конференции. Негосударственное образовательное учреждение дополнительного профессионального образования «Санкт-Петербургский институт проектного менеджмента». 2014. С. 32–39.
2. Волкова Т. А., Мищенко А. А. Проблемы и перспективы развития сельского туризма в Краснодарском крае//Наука и образование в современном обществе: вектор развития Сборник научных трудов по материалам Международной научно-практической конференции: в 2 частях. ООО «АР-Консалт». 2014. С. 61–63.
3. Волкова Т. А., Мищенко А. А. Развитие агротуризма как альтернативного вида природопользования на территории Краснодарского края//Научные аспекты инновационных исследований: материалы I Междунар. научно-практич. конфер., г. Самара, 29 мая 2013. Инсома-пресс. г. Самара. 2013. С. 56–60.



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## Coastal geosystems of Azov-Black sea coast of Krasnodar region: vulnerability sustainable development

**Abstract:** Development of coastal geosystems is one of the leading and promising directions of the activity of the regional economy; hence, it is required to plan the development taking into account the existing system of population settlement, transformation of functional structure of towns and ecological safety. The increase of anthropogenic load on the ecosystems of the Black and Azov seas related to the enhancement of recreational activity in coastal districts has negative effect on the condition of water biological resources of this basin. Due attention was not paid to the development of complex plans of evolution of coastal zones.

**Keywords:** geosystem, coastal geosystems, Azov-Black sea coast, tourism, recreation, anthropogenic load, recreational activity, sustainable development.

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The majority of researchers acknowledge the uniqueness of coastal districts as contact zones of lithosphere, hydrosphere and atmosphere [7; 9; 11; 12].

Natural-economic contact zone «land-sea» is exclusively diverse. Industry, extraction of mineral deposits, fishing, transport connections, agriculture, environmental protection and combination of residential and recreational territories were developed [5]. Apparently, natural-economic contact zone «land-sea» is the zone of intensive interaction of the population, economy and natural environment, a base for development and placement of production capacities of marine sector [4].

As it was noted by G. M. Lappo, seacoasts in middle and, to an even greater degree, sub-tropical latitudes are rich in valuable resources of multi-purpose use [8]. They are quite favorable for the development of port-industrial and recreational-tourist complexes, which are most dynamic and elaborate in their functional structure.

Development of coastal geosystems is one of the leading and promising directions of the activity of the regional economy, thus, it is required to plan the development considering the existing system of population settlement, transformation of functional structure of towns and ecological safety. This topic covers the issues of sustainable development of coastal geosystems united by common features — seaside location, history of formation, intensity and multi-directionality of development. On the other side, this territory is highly polarized — has a high share of urban population, urban areas are different in functional structure, number of people and prospects of development. Combination of different natural resources of offshore strips and coastal territories makes many districts

of the coast promising spots for intensive development. Significant part of these coasts is unique (specific) seashore landscapes (shallow spits, beaches, dunes and limans). Their border (land-sea) location ensures the performance of an important function of protection of the main coastal line from erosion, but leads to high sensitivity and dependency on any external effects (natural and anthropogenic) on the coastal system. Currently, these problems are not taken into account in the working out of plans of development of such natural geosystems by coastal municipal formations and subjects of the Russian Federation.

The increase of anthropogenic load on the ecosystems of the seas related to the recreational activity in coastal districts has negative effect on the condition of recreational resources of this district. Development of industry of coastal states, increase of the number of urban and coastal settlements, expansion of resort facilities and enhancement of the volumes of industrial-household sewage water, increasing volumes of cargo transfers at ports and shipment of oil, construction of new terminals, underwater extraction and development of deposits of oil and gas require necessary measures on the prevention of negative consequences of these changes.

In the Russian Federation, there is a conflict between the aspiration to immediately use coastal resources for consumption and the need to ensure their long-term reserve. As in other countries, this conflict has already reached a critical level. Many districts in the coastal zones are contaminated by the wastes of local and inland industrial and agricultural enterprises. Due to the contamination of the environment, the attractiveness of the territory for international

tourism is reducing; fishing industry is decreasing or disappearing completely. Currently, the concern about the advantages and harm of the development of sea oil and gas deposits is growing.

Contradictions related to the increase of use of coastal resources lead to the aggravation of the problem of socio-economic development. The problems of multiple jurisdiction and competitiveness among the resource users without the mechanisms of dispute settlement, inappropriate forms of resource protection as well as absence of national and local policy of coastal zone management that ensures sufficient information content in the process of decision-making can lead to the loss of sustainable development capacity in the future. As basic resources deplete, the conflicts may reach the scale threatening the human life and social order.

The issues of studying, use and protection of coastal zones started gaining noticeable attention of international community and government organizations in the 70s of the last century [3; 6]. Over the last 30–35 years, Integrated Coastal Zone Management (ICZM) methodology was developed abroad, which is, in fact, an economic-legal mechanism of regulation (in the conditions of market economy) of numerous contradicting interests of coastal nature users (extraction of mineral deposits at the shelf, fishing industry, sea transport, industrial and agricultural development of coastal zone, resorts, wildlife zone etc.). In the USSR and Russia, ICZM did not exist primarily because of strictly centralized political system and system of management of economy [1].

A new structural policy of development of coasts is aimed at revealing the priorities of development of different sites of the coastal zone, lessening the load of most powerful port-industrial and resort-recreational districts. Alternative methods of ICZM include the change of set of productions in port-industrial complexes; improvement of legal base; ecological-economic forecast — the assessment of the effects on the environment; the analysis of scenarios and models of development.

In practice, in most countries in the world, such coordination takes place in the form of a tough competition between separate industries, securing of regional interests before national ones and vice versa. In some countries, there are laws about the management of coastal zones aimed at the regulation of the process of development of contact zone «land — sea». The legislations of all countries regarding the coastal zone imply the leading role of the regions (states, provinces etc.) in the system of regulation of the activity in this zone. On the

other hand, the regions should take into account national interests related to the placement of means in the coastal zone required to solve the tasks beyond the local problems [15].

The need for coordination of economic activity in the coastal zones of Russia poses the problem of their sustainable development and rational organization (zoning); outlining of industrial, building, recreational, commercial, bio-meliorative and wildlife sanctuary and research zones. The solution of these problems is possible only in the condition of a system-based approach. It is required to set norms of external effect on the coastal geosystems. Such norm setting should result in reasonable limitation of the man's needs or change of methods of their satisfaction. The man should adjust his activities in the coastal zone to natural conditions regardless the ways he uses it for his own needs.

In Russia, the relevance of drawing and fulfillment of the ICZM program is determined by the following reasons:

1. There are many owners in the coastal zone; there is no common strategy of its use without damage of ecosystem.
2. The country is currently at the stage of radical transformations of all its economic and managerial zones. These transformations should also cover the coastal zones. It is required to give them scientific and well-grounded orientation.
3. In Russia, an inflow of funds for new capital projects, including coastal zone, is observed. There is a current need in creation of a sound foundation for the process of allocation of funds on the development and protection of coastal zones.
4. Regional and local authorities of coastal districts undertake new extended duties without experience or test cases. The ICZM program can help in search and formation of new managerial systems and in the opening of new opportunities for investments.
5. Due to the deficit of port capacities, a wide program of port building, which led to an incisive conflict with other users of the coastal zone, has been set forth. An urgent need to solve these contradictions and develop a fresh approach to the purpose of the coastal zones of this or that basin have come up.
6. The cost of land in the coastal zone is extremely high. The losses of the coastal territory because of its wrong use (management) imply not only negative economic but also many legal, social, medical and aesthetic consequences.

Azov-Black sea coast (ABS) of the country is one of such intensively developing regions and its unique coastal landscapes have, as a rule, apart from other things, especially high recreational potential.

Table 1. – Key problems of ecological safety at the Azov-Black sea coast of Russia

Impact of the man and his economic activity on the environment		Emergency situations caused by factors		Ecological problems
Direct	Indirect	Natural	Man-caused	
Construction and functioning of sea ports	High general density of the population	Geographical location, limitation of space	Breakage of oil pipelines	Depletion of water biological resources
Ship navigation and bottom dredging	Recreational load	Earthquakes	Ship wreckage and oil spills	Disposal of solid household wastes
		Mud volcanoes		
Waste burial	Hydro-technical construction	Strong winds	Discharge of ballast waters	Rehabilitation of Azov sea
Emissions of contaminating substances in the atmosphere	Intensification of agriculture	Flood season in Kuban river		
Discharge of toxic contaminating substances with sewage waters		Wind-driven phenomena		Rock-slide processes

The enhancement of anthropogenic load on the ecosystems of the Black and Azov seas related to the enhancement of recreational activity in the coastal districts has negative effect on the state of water biological resources of this basin. Development of the industry of sea countries, increase in the number of urban and coastal settlements, growth of resort complexes increase of the volumes of industrial-household waste waters, growing volumes of transshipment at the ports and transportation of oil, fertilizers and other mineral resources, growth of shipping industry, extension of ports, construction of new terminals, underwater extraction and exploration of oil and gas deposits require measures on prevention of negative consequences of these changes. Many objects of the environment are the factors of attraction of tourists. The paradox of tourism lies in the fact that the bigger the potential for creation of recreational environment is, the bigger number of visitors it attracts and the bigger negative influence on the quality of natural environment it has [14].

The main reasons of aggravation of ecological problems include: imperfection of legislation on nature protection and draw-

backs of the system of nature use management, absence of financing; the condition worsens by socio-economic and geopolitical circumstances (Table.1). Inevitable growth of traffic capacity of southern ports of Russia will lead to the increase of the transport load on the ecosystems [2; 15; 16; 17].

On the territory of the Azov-Black sea coast of the Russian Federation, there is a range of international projects, which are regulated by inter-state agreements: on transportation of oil and gas, sea transportation, railway and air transport, use of water resources.

With the change of geopolitical position of Russia, spatial emphases of economic development are changing significantly. The need in construction of new port complexes, including at the Black and Azov seas, arises.

The working out of complex plans of development of coastal zones hasn't been paid appropriate attention. Industry-based principle of development planning prevails; herewith, the working out of development plans is uncoordinated.

### References:

1. Айбулатов Н. А., Вартанов Р. В., Михайличенко Ю. Г. Проблема комплексного управления прибрежными зонами морей России // Изв. РАН. Сер. геогр. – 1996. – № 6. – С. 94–104.
2. Беликов М. Ю., Рябошапка В. П., Филобок А. А., Пшедагук А. Ю. Приморский горноклиматический город-курорт Сочи: взаимосвязь экологических проблем и олимпийского строительства // Современные города: проблемы и перспективы развития: Материалы Всероссийской научно-практической конференции 26 апреля 2013 г. / под ред. Б. М. Бероева, З. Ю. Калоевой, З. П. Оказовой; Сев.-Осет. гос. ун-т им. К. Л. Хетагурова. Владикавказ: Изд-во СОГУ. 2013. С. 181–188.
3. Бондаренко В. С. Региональное управление береговыми зонами морей: опыт развития капиталистических стран // Геогр. и прир. рес. – 1990. – № 2. – С. 103–111.
4. Дергачев В. А. Природно-хозяйственная контактная зона «суша – океан» // Изв. ВГО. – 1980. – Т. 112. – В. 1. – С. 40–45.
5. Дергачев В. А. Социально-экономические аспекты изучения береговой зоны океана // Вопр. геогр. – Вып. 119: Морские берега. – М.: Мысль, 1982. – С. 11–18.
6. Долотов Ю. С. Проблемы рационального использования и охраны прибрежных областей Мирового океана. – М.: Научный мир, 1996. – 304 с.
7. Дроздов А. В. Акваториально-территориальные природные системы: Физико-географический подход // Изв. РАН. Сер. геогр. – 1985. – № 6. – С. 70–80.
8. Лаппо Г. М. Города на пути в будущее. – М.: Мысль, 1987. – 236 с.
9. Лымарев В. И. Береговое природопользование. Вопросы методологии, теории и практики. – СПб.: РГГМУ, 2000. – 168 с.
10. Рябошапка В. П., Филобок А. А., Скрипниченко И. А., Чич М. Р. Экологическое состояние приморских рекреационных зон Краснодарского края // Российское общество: историческая память и социальные реалии: Материалы межрегиональной научно-практической конференции. XIV Адлерские чтения – 2008. – Краснодар: Традиция, 2008. С. 253–256
11. Сафьянов Г. А. Береговая зона океана в XX веке. – М.: Мысль, 1978. – 263 с.
12. Степанов В. Н. Мировой океан и проблемы глобальной экологии // Изв. РАН. Сер. геогр. – 1992. – № 2. – С. 64–75.
13. Филобок А. А. Азово-Черноморское побережье России: перспективы устойчивого развития или самые амбициозные проекты // Материалы XXIII Международной береговой конференции «Учение о развитии морских берегов: вековые традиции и идеи современности» 5–9 октября 2010 г. СПб: РГГМУ, 2010 г. – С. 333–335.
14. Филобок А. А. Современные экологические проблемы городов Азово-Черноморского побережья России // Проблемы устойчивого функционирования водных и наземных экосистем. Материалы Международной научной конференции, г. Ростов-на-Дону, 9–12 октября – 2006 г. Изд-во ЗАО «Ростиздат». С. 438–440.
15. Чистяков В. И., Филобок А. А. Устойчивое развитие городов Азово-Черноморского побережья России в новых геоэкономических условиях: Монография. – Краснодар: Просвещение-Юг, 2008. – 308 с.
16. Чистяков В. И., Мищенко А. А., Волкова Т. А., Филобок А. А. Ключевые проблемы экологической безопасности Азово-Черноморского побережья России // Морские берега – эволюция, экология, экономика: Сб. материалов XXIV Международной береговой конференции, посвященной 60-летию со дня основания Рабочей группы «Морские берега». Т. 2. Краснодар: Издательский Дом – Юг. – 2012. – С. 104–108.
17. Чистяков В. И., Филобок А. А. Современные проблемы экологической безопасности на Азово-Черноморском побережье России: природные условия и хозяйственная деятельность // Сборник материалов XXII Международной береговой конференции «Проблемы управления и устойчивого развития прибрежной зоны моря», г. Геленджик, 16–20 мая 2007 г. – Краснодар: Изд-во ООО «Эдарт принт», 2007. – С. 298–301.

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## Tourist-recreational complex of the region: structure and management

**Abstract:** The performance of the activity on organization of recreation for both, users of recreational activities and tourists is an integral part of the functioning of Tourist-Recreational Complex (TRC). TRC can be characterized as a sophisticated system of socio-economic relations between enterprises and organizations forming this complex on a certain territory with tourist-recreational resources and respective infrastructure, which require effective management aimed at rational organization of quality services in the sphere of tourism with the purpose of making profit. TRC management within the country is realized at three major levels (macroeconomic, mesoeconomic and microeconomic). TRC, as an object of management, requires the formation and functioning of an optimal multi-layer system of management, the significant role of which belongs to self-organization and flexibility at lower levels. In modern conditions, the main tasks of every subject include self-identification in the common system of economy, independent formation of the strategy of own development, definition of priority directions of development of the economy, which will be able to «pull out» other sectors of the economy.

**Keywords:** tourism, recreation, tourist-recreational complex.

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It should be noted that recreation and tourism are very close notions, which characterize all kinds of tourism aimed at restoration of spiritual and physical strengths of the man, recovery, relaxation, farm-house recreation, eco-tourism etc. Recreation differs from tourism only in the fact that it presupposes recreational and tourist activity both, on the territory of permanent residence of a citizen (user of recreational activities) and beyond it. And tourism presupposes going away from the place of permanent residence.

The performance of the activity on organization of recreation for both, users of recreational activities and tourists is an integral part of the functioning of Tourist-Recreational Complex (TRC). Traditionally, the notion of tourist complex (TC) includes the combination of different means of accommodation, transportation means, public eating facilities, establishments of entertainment, cognitive, business, sport and other purpose performing excursion, guide and translation services [6, p. 82]. Apart from the above described objects, TRC also includes recreational component, which is represented by different natural resources, objects of infrastructure of the sphere of tourism offering the services to both, tourists and users of recreational activities, i. e. local citizens. The answer to the

question about what concrete elements TRC consists of is also ambiguous. There are many definitions of TRC, the main of which are presented in Table 1.

Opinions of the authors differ in different approaches to the study of this notion, the basis of which consists of such components as:

- infrastructure of tourist industry;
- tourist-recreational resources on a certain territory;
- sector, which unites enterprises of tourist and service sphere.

Tourist-recreational resources include natural, archaeological, social-economic objects and phenomena, which can ensure sport, cognitive and health-improving tourism. The main components of tourist-recreational resources are health-improving, cognitive and sport [9].

Health-improving resources include treatment-resort and therapeutic resources (represented in Krasnodar region by therapeutic-climatic areas, mineral sources and therapeutic muds). Therapeutic resources include relief, climate, water and vegetative resources. Excursion-cognitive resources can be represented by the monuments of nature, history, culture, archeology and other notable objects. Concentration of specific objects contributes to

the mass development of cognitive tourism. The cognitive tourism may also include the resources of geographical specifics — place names, legends and myths. The resources of sport tourism consist

of more attractive and close to extreme elements, which include hard-to-reach rocks and canyons, impassable wild woods, heaps and other natural hurdles.

Table 1. – Definitions of the notion tourist-recreational complex (TRC)

Voronkova L.P	Territorial and economic-organizational union of the group of tourist enterprises: hotels, restaurants, tourist camps, campings etc.
Klochkova T. V.	Combination of sectors, which ensure the production of recreational-tourist product formed as a result of integration of 3 groups of sectors: treatment and resort, tourism and excursion, sport and recreation.
Kotlyarov E. A.	A part of general economic complex of the territories of different level, combination of recreational establishments and accompanied organizations of infrastructure united by close production and economic relations as well as mutual use of geographic location, natural and economic resources of the territory occupied by this or that complex.
Shtrek P. A.	Combination of economic relations and institutes defining the character of functioning, interaction of objects of economic management ensuring the production and realization of tourist-recreational services.
Chudnovsky A. D., Zhukova M. A.	Combination of means of accommodation, transport means, public eating facilities, establishments of entertainment, cognitive, business, sport and other purpose performing excursion, guide and translation services.
Malysheva G. M.	New forms of cooperation of recreational and cocurrent sectors, combination of recreational establishments and cocurrent enterprises of infrastructure united by close production relations as well as mutual use of geographical location, natural and economic resources on the territory occupied by the complex.
Polyakova I. L.	Combination of enterprises (tourist service and goods suppliers) formed purposefully and functioning to satisfy the needs of tourists, concentrated on a limited territory, possessing certain tourist-recreational resources and tourist and sustaining infrastructure.

To use all recreational resources, the following characteristics are important:

- picturesqueness. Excursion object and area where people rest should be beautiful. The notion of beauty is mainly subjective, but there are some universally accepted norms;
- diversity. It is preferable that a recreation area has different natural complexes and cultural recreational facilities. One tour should preferably combine the events different in tourism purposes;
- uniqueness. The rarer the object is, the more valuable it is. There are objects unique in the world scale (volcanoes, Baikal lake), in all-Russia scale (Black Sea coast of the Caucasus), in regional scale (Azishskaya cave for Apsheronsk district), in local scale (waterfalls at the river Pshada, mount Sober-Bash etc.);
- popularity. The derivative from uniqueness, because the information about uniqueness spreads among wide masses of the population;
- accessibility by transport. This notion includes the fare fee, type of vehicle, traveling time, traffic frequency, its comfort etc. It depends on both, the territory where the object is located and the place gathering of a tourist group;
- conditions of service defined by recreational infrastructure of the district of the location of the object. It presupposes the availability of tourist and treatment-resort establishments, their capacity, comfort, qualitative condition, profile and other characteristics,

availability of road traffic network and institutions serving it (terminals, ports, stations, baggage rooms etc.), availability and quality of communication institutions, financial institutions, engineering communications etc. [4].

The development of recreational space — the degree of transformation of initial natural space in the process of recreational activity depends on many factors. Moreover, the development of recreational space can be of both, natural and social-cultural character. Evolution is typical for any recreational space, i. e. one can say that recreational space has a certain life cycle.

Thus, TRC can be characterized as a sophisticated system of socio-economic relations between enterprises and organizations forming this complex on a certain territory with tourist-recreational resources and respective infrastructure, which require effective management aimed at rational organization of quality services in the sphere of tourism with the purpose of making profit. And, currently, in the conditions of market economy, it is very relevant, especially since the tourism industry is one of quite promising and dynamically developing sectors of both, national and world economy.

The system-forming elements of TRC include economic entities contained in the tourism industry; tourist resources as factors of formation and satisfaction of the need of tourism and recreation; users of recreational activities (tourists) as consumers of tourist product. The presented TRC systems is shown in Figure 1.

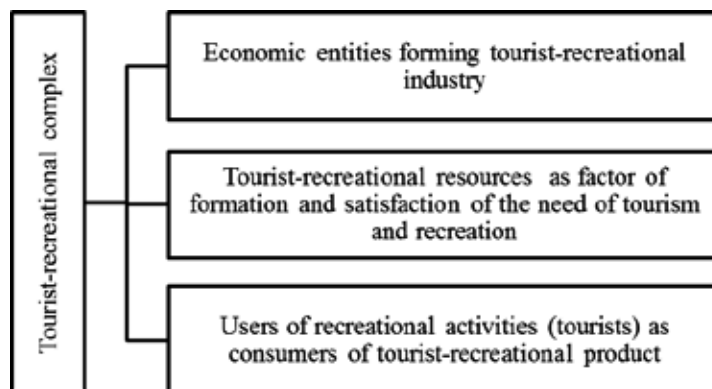


Figure 1. Sub-systems of tourist-recreational complex

Such structure reflects only basic elements of TRC (i. e. economic entities), resources and consumers of TRC and doesn't have an interlink, namely, organizational-managerial component, which, undoubtedly, is also an interlink between the subjects and objects in the sphere of tourism. Generalizing the above said, having considered different points of view about the essence, content and structure of TRC, one may conclude that TRC system includes such sub-systems as:

- tourist-recreational resources, i. e. social-cultural objects including objects for tourist display, natural, historical as well as other objects, which can satisfy spiritual and other needs of the man contributing to the keeping up of their life activity, restoration and development of physical strengths;

- tourist industry including the combination of organizations (establishments), which perform tour operator and tour agency activity as well as combination of operators of tourist information systems, organizations (establishments) that provide the services

of guides, guides-translators and instructors, combination of public eating facilities, hotels and other means of accommodation, facilities of treatment-resort healing and recreation, transportation means, facilities and means of entertainment, objects of cognitive, business, treatment-healing, sport and other purpose;

- organizational-managerial component of TC including the main functions of management (i. e. planning, organization, coordination, control, motivation and management in the sphere of tourism);

- consumers of tourist-recreational product.

Close and effective interaction of these sub-systems as well as independent development of each of them contributes to the formation of TRC as a unified complex. But it also requires the creation of an effective mechanism of TRC management both, at the level of an enterprise and in wider scale. The mechanism reflects the making of certain managerial and organizational decisions, which should have effective impact on the operation of TRC.

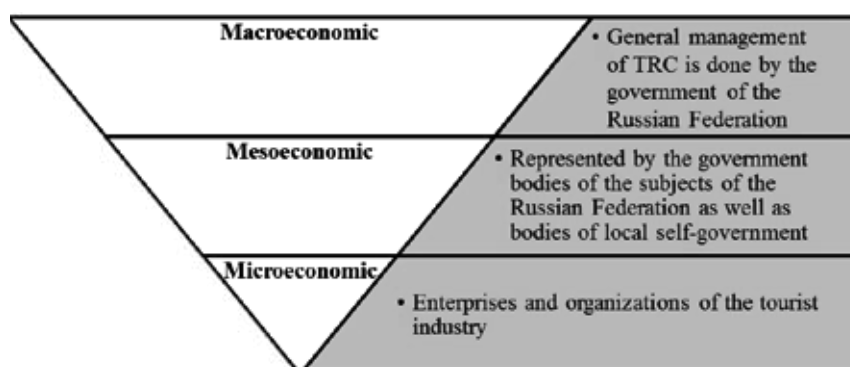


Figure 2. The hierarchy of TRC management

The TRC management within the country is realized at three major levels (macroeconomic, mesoeconomic and microeconomic). The effective mechanism will lie in the fact that TRC will be presented as a system consisting of small, main, basic elements presented at the microeconomic level. The decision-making at the lower level will have direct impact on the above placed levels and vice versa. The hierarchy of impact of all levels is shown in Figure 2.

TRC, as an object of management, requires the formation and functioning of an optimal multi-layer system of management, the significant role of which belongs to self-organization and flexibility at lower levels, i. e. the microeconomic level is a base for the development of the complex in a wider scale. The very consideration of the mechanism of management and method of improvement of the activity at the level of tourist enterprise contributes to the deeper understanding of the principle of TRC organization in the regional or country scale.

At the macroeconomic level, a state policy in the sphere of tourism, basic norms and rules, various programs of tourism development are being designed; priority directions, standardization and classification of the objects of tourist industry, information support, ensuring of tourist safety and other aspects are being defined. At the mesoeconomic level, regulation and coordination of tourism within the region, as well as state policy in the sphere of tourism is conducted; at the regional level, there is assistance in the promotion of tourist product, creation of new kinds of tourism, protection of tourist resources etc. At the microeconomic level, one takes part in everything, which is typical for two previous levels; i. e. one takes part in the realization of federal and regional programs of formation and development of tourism, promotion of tourist product both, at local and world tourism market, and, most importantly, new tourist products and services are created, which is the base for the functioning and development of the sphere of tourism. Entrepreneurial initiative, which has favorable effect on the life standards of the population,

because new enterprises and organizations in the sphere of tourism appear, leading to the creation of additional jobs and, consequently, economic growth, takes place at the very microeconomic level.

In modern conditions, the main tasks of every subject include self-identification in the common system of economy, independent formation of the strategy of own development, definition of priority directions of development of the economy, which will be able to «pull out» other sectors of the economy.

The development of recreational sector in the region will automatically lead to the following processes:

- 1) accelerated development of economic structure of a certain part of the region at the expense of additional income to the local budget, which can be used for further development of the region;
- 2) increase of jobs at the expense of recreational services both, in the recreational sector of the economy, and in the sectors indirectly related to recreation; reduction of unemployment; prevention of the migration of the population from the region;
- 3) improvement of the infrastructure, communal-household utilities, road construction;
- 4) significant change of the structure of balance of monetary return and expense of the population throughout the territory of the country in the favor of recreational districts;
- 5) expansion of the demand on the goods of local goods manufacturers and stimulation of development of local industry;
- 6) improvement of ecological situation in the region, ensuring of financing of natural protection tasks;
- 7) increase of the list of specializations in demand in the region;
- 8) increase of the revenue of the region in the form of foreign currency at the expense of development of foreign tourism.

The development of all these processes will allow removing social-economic tension, to a significant degree, in the region and will be one of the factors of its sustainable development.

Thus, at the modern stage, one of the main goals of the system of management of tourist activity in Russia is to create a highly effective TRC, which is a sophisticated system of socio-economic relations. To do it, it is required to develop an effective method, complex of

measures aimed at the improvement of the activity of enterprises and organizations in the sphere of tourism, TRC in the whole, which will ensure quite wide opportunities for the satisfaction of consumers' demand for tourist services in order to obtain final result (profit).

#### References:

1. Актуальные проблемы развития туризма Южно-Российского региона: Тез. докл. Шахты: Юж.-Рос. гос. ун-т экономики и сервиса, 2012.
2. Афанасьев О. Е. Рекреология. Методическое пособие/Днепропетровск, 2009.
3. Барчукова Н. С. Международное сотрудничество государств в области туризма./Н. С. Барчукова. – М.: Международные отношения, 2011.
4. Волкова Т. А., Карпова Ю. И., Мищенко А. А., Задорожня В. В. Мифологизация рекреационного пространства как фактор освоения территории/В сборнике: Географические исследования Краснодарского края Сборник научных трудов. Ответственный редактор: А. В. Погорелов. Краснодар, – 2012. С. 173–177.
5. Мищенко Т. А. Влияние туристских ресурсов на развитие регионального туризма и проблема их рекреационной оценки/В сборнике: Географические исследования Краснодарского края Сборник научных трудов. Ответственный редактор А. В. Погорелов. Краснодар, – 2009. С. 237–241.
6. Мищенко Т. А. Развитие рекреационного хозяйства как фактор, влияющий на экономический потенциал региона/В сборнике: Географические исследования Краснодарского края Сборник научных трудов. Ответственный редактор А. В. Погорелов. Краснодар, – 2007. С. 251–252.
7. Перспективы развития туристско-рекреационного комплекса Краснодарского края/Волкова Т. А., Карпова Ю. И., Миненкова В. В., Максимов Д. В., Мищенко А. А./В сборнике: Наука будущего: Единое научное пространство как гарант гармоничного развития фундаментальных и прикладных научных исследований Сборник научных статей по итогам международной научно-практической конференции. Негосударственное образовательное учреждение дополнительного профессионального образования «Санкт-Петербургский институт проектного менеджмента». – 2014. С. 32–39.
8. Полякова И. Л. Туристско рекреационный комплекс: сущность, функции и структура/Вестник Оренбургского государственного университета. – 2011. – № 13 (132). С. 376–382.
9. Самойленко А. А. Природно-ориентированный туризм в горно- предгорных районах Краснодарского края: состояние, регулирование, стратегия развития: монография. Краснодар, 2006.
10. Сердюкова Н. К. Внутренний туризм: актуальные вопросы управления и развития. Terra Economicus. 2009. Т. 7. № 3–3. С. 144–146.

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## Simulation modelling as a tool of study of geosystems of tourist-recreational type

**Abstract:** Simulation modeling is rarely used in the study of territorial tourist-recreational systems. Primary characteristics that should be taken into account in the modeling of tourism development in a certain territory include: economic and geographical location of the territory; objects acting as resources of tourism; existing recreational loads on the territory; visitor capacity of the functioning recreational objects etc.

**Keywords:** simulation modeling, tourism, recreation, tourist-recreational complex, geosystem.

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Tourist-recreational complex is a complex socio-economic system. The notion «complex system» implies the structure including

a big number of links, a structure of big order with non-linear feedback. Socio-economic, ecological, political, technical, geographical

systems are complex by definition. Economic processes and international trade, national government, urbanized territory as well as all social systems refer to such class. complex systems are characterized by regularities, which should always be taken into account during their research, development forecast, decision-making, management etc. [2]. These are closely interconnected: regularities of interaction of parts and whole (wholeness — emergence, integrity); regularities of the hierarchical order of the systems (communicativeness, hierarchical pattern); regularities of the functioning and development of the systems (historicity, self-organization); regularities of feasibility of the systems (equifinality, law of requisite variety, potential efficiency); regularities of goal formation [1; 4].

Such complex, multi-factor systems as geosystems of tourist-recreational type are complex for research. Simulation modeling can serve as one of the most effective methods of study of the processes taking place in such systems. Methods of simulation modeling allow viewing the behavior of the system in different conditions of development.

Simulation modeling is extremely rarely used in the study of territorial tourist-recreational systems. But the experience of application of this method in other socio-economic systems speaks about the fact that its use in the direction of analysis and forecast of development of the geosystems of tourist-recreational type can be successful.

The very system-based dynamics is one of the most powerful tools used for the analysis and design of complex systems providing an opportunity to experiment with them in those cases, when it is almost impossible or unreasonable to do at a real object [2].

The spread of computer modeling is related to the significant technological development of modeling systems, which, currently, are a powerful analytical tool incorporating the whole range of advanced information technologies. The notion «computer modeling» in the sphere of information technologies is relatively new. Currently, computer model is understood as structurally-functional and simulation models. The first type of models is a conventional image of the object or some of their systems (or processes) described with the help of interrelated computer tables, block-schemes, diagrams, charts, figures, animated fragments, hyper-texts etc. and reflecting the structure and interrelations between the elements of the object. Simulation model is a separate program (combination of programs, program complex) allowing, with the help of the sequence of calculations and graphic reflection of their results, reproducing (simulating) the processes of functioning of the object, system of objects provided the effect of different, as a rule, accidental factors on the object [2].

Often, during the study of complex systems, the researcher faces certain difficulties in defining the structure of the system, dynamics of its development, such features as sustainability, wholeness etc. Such difficulties can be eliminated with the help of methods of computer modeling of complex systems. In the specified case, the researcher obtains qualitative characteristics of the researched model. Quantitative characteristics may include, as minimum, forecast values of the variables. Moreover, it is possible to give a new explanation of previous values of the variables, detect earlier unidentified relations between the elements of the system.

The use of simulation modeling to define optimal directions of impact on the system to obtain maximally favorable values of development of this system can be considered the most effective.

One of the significant advantages of use of computer modeling in the study of complex systems is the opportunity to take into account the bigger number of variables. Herewith, it becomes possible to fore-

tell the development of non-linear processes and appearance of synergetic effects. The forecast of development of the system, obtained with the help of computer modeling, will allow determining which managerial decisions can lead to most effective development.

Application of the method of system-based dynamics allows modeling a territorial tourist-recreational complex as a complex system, which, in turn, consists of heterogeneous elements, which are complex systems, interrelations between these elements, which include material and information flows.

Simulation modeling of geosystems of tourist-recreational type, as modeling of other systems, should be based on a concrete description of the object of modeling. The degree of similarity of the researched geosystem and generated model is a very important moment in this process. Special attention should be paid to the model elements: it is required to monitor the conformity of modeled elements to the elements of really existing geosystems having the most important values from the point of efficiency of functioning of the system in the whole. Herewith, it is required to describe not only the regularities and characteristic peculiarities of functioning of each element of the geosystem of tourist-recreational type, but also the peculiarities of interrelation of these elements. The main advantage of work with simulation model is the possibility of conduct of experiment, which, in the process, is similar to the process taking place in the geosystem.

The fact that the dynamic processes take place in the simulation model in the conditions of system time, which is the simulation of real time, is quite a convenient peculiarity of the simulation model. Herewith, the chronology of model development can happen in two directions: the countdown can happen either according to definite set sections or by way of transition from event to event. In the second case, an allowance that the model between the events is static and does not undergo changes is possible.

The main purpose of simulation modeling lies in the following [6]:

1. Distinguish basic, fundamental variables; assess the degree of the impact of their change on the researched parameters of the system as well as define technological, organizational or managerial parameters, which, most often, have substantial effect on the value of functioning of the system;
2. Study the impact of various organizational, managerial and technical-economic changes on the value of functioning of the system;
3. Evaluate various variants of technical decisions, management strategies during the search of optimal structure of the system.

It is important to emphasize the scheme of construction of simulation model according to the method of description of behavior dynamics. The model can be described through events, works (activities), processes and transacts.

The event is the reason of immediate change of state of a component of the system or states of the system in the whole. Usually, the events are classified into the events of sequence, i. e. the events that regulate the initialization of processes or separate works inside the process, and the events of change of states of the system or its elements. On the basis of events, it is reasonable to build a model in order to study cause-and-effect relations typical for the system [3].

Primary characteristics, which should be taken into account in modeling of tourism development on a certain territory, are: economic and geographical location of the territory; objects acting as resources of tourism; existing recreational loads on the territory; visitor capacity of the functioning recreational objects etc.



**References:**

1. Волкова В. Н., Денисов А. А. Основы теории систем и системного анализа: Учебник. – СПб.: Изд-во СПГГТУ, 1998.
2. Горелова Г. В. Когнитивный подход к имитационному моделированию сложных систем/Известия ЮФУ. Технические науки. – 2013. № 3 (140).
3. Гущина А. А., Кемалов Б. К. К вопросу об имитационном моделировании/Труды международного симпозиума Надежность и качество. – 2009. Т. 1.
4. Кабаян Н. В. Имитационное моделирование направлений развития туризма в рекреационных зонах региона: на материалах Республики Адыгея: дисс. ... канд. экон. наук. – Ставрополь, – 2005.
5. Королёва Н. В. Имитационное моделирование направлений развития туризма в рекреационных зонах региона (на материалах Республики Адыгея). – Майкоп: Изд-во АГУ, – 2007.
6. Лебедев А. Н. Моделирование в научно-технических исследованиях. – М.: Радио и связь 1989 г.

## Section 12. Agricultural sciences

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### Maple ash (*Acer negundo* L.) in gardening in small north towns

**Abstract:** Questions of use *Acer negundo* L in gardening school territories of the small northern cities are considered. The biometric sizes of seeds of a Maple ash are specified. High quality of seeds of Maple ash is defined as high that speaks about successful acclimatization of introduced species in the taiga conditions.

**Keywords:** alien crops, fruits, samara, maple ash.

Homeland of the maple ash maple or American maple (*Acer negundo* L.) is North America. It grows along rivers and lakes. It raises into the mountains up to 1800 m above sea level. In vivo it to 25 meters in height.

It is introduced in Europe in the XVII century. In Russia it grows since 1796 (Imperial Botanical Garden, St. Petersburg). In the XIX century it was able to get seedlings from seeds imported from Canada, and in the 1920s began to be observed its self-seeding under natural conditions.

As a result of introduction tests of ash-leaved maple in the Sev-NILH dendrological garden, N. D. Kondratiev [2, 17] characterizes this taxon as follows: "An unpretentious fast-growing tree. It loves of light. It is drought-resistant. Foliage is light green, crown is drafty ... It tolerates pruning. It has exceptional speed growth." N. A. Demidov and T. M. Durkina [1, 87] point out that under the conditions of V. N. Nilov dendrological garden the maple ash at the age of 28 maple reached a height of 4.3 meters, in the city of Syktyvkar in the 20 years of age — 6.4 m [3, P. 43].

In dendrogarden ASTU (CNPF) its height in the age of 11 years was 5.5 m [4, 93], in the Velikiy Ustyug at 16 years of age — 8.7 m. For the soil it is undemanding, it carries the concentration. It tolerates adverse conditions (atmospheric haze) of the urban environment of small northern settlements. It is characterized by a good natural regeneration and rapid growth. Ratoons and abundant renewal inconvenienced when caring lawns, reduce the attractiveness of the greening object, what ultimately determines the appearance of features in the maintenance of green plantings with ash-leaved maple.

Spears are decorative — olive-green or brownish-red, smooth, sometimes with a whitish or bluish bloom. In very severe winters spears of the current year frost over. Leaves are complex, from 3–5 and even 7 leaves, keep the tree until late autumn.

Flowering and fruiting from 10–15 years. In some years (2015) there are abundant harvests—5 points on a scale of fruiting Capper. Fruits are samaras length of  $30.4 \pm 0.4$  mm hanging on the trees all winter, attracting bullfinches and waxwings.

Special admiration and curiosity among tourists is the fruit abscission. Samara (half of the spear), falling, is spinning around its center, describing a helical path. The effect of this movement is the same as the helicopter coming down with the engine switched off:

the propeller blades, rotary action of air flow, allow the helicopter to successfully plan.

The object of seed harvesting were the landscaping planting ash-leaved maple on the territory of secondary school № 4 of the town Veliky Ustyug (61° N, 46° E). Forests in the area of Veliky Ustyug belong to the middle taiga subzone. They are characterized by natural and historical poverty of dendroflora—a small number of tree species that form its membership. Brief description of the climatic conditions is reduced to the following basic parameters. Frost-free period is 110 days. Sum of temperatures above 10 °C is 1650 the average temperature in 13 hours at 21 °C in July. The absolute minimum is –48°S. The amount of rainfall during the year is 500 mm, for the period with a temperature above 10 °C—240 mm.

It is generally recognized that the success of growing high-quality planting material is largely determined by the quality of the seed. Especially this thesis is relevant with a limited number of seed plant introductions planned for the further implementation of the green spaces of cities and towns.

Going over a full cycle of the ontogenetic development of plants indicate their successful introduction.

Our research of ash-leaved maple seeds show high adaptation to this type of climate the taiga zone of the north-east of the Russian Plain and in particular to the built environment of small northern towns. Weight of 1000 seeds in the air-dry state, as one of the most important indicators of quality, is 32.35, the seeds are characterized by the following average biometric dimensions: length— $17,2 \pm 0,3$  (min—14,0, max—20,0), width— $4,4 \pm 0,04$  (min—3,8, max—4,7), thickness —  $1,9 \pm 0,02$  (min—1,7, max—2,2) mm.

The maple ash seeds reached a high purity—72.5%, which indicates the successful acclimatization of introduced species in a fairly harsh climate of the taiga zone.

In conclusion, it should be noted that the ash-leaved maple enriches the decorative features of landscaped park groups, provides expansion of aesthetics greenery planting gardens and boulevards, as well as scientific and cognitive function of schoolyards plantations. The author is of the opinion that representatives of ash-leaved maple should be present in the collection of schoolyards crop plants, but with the negative properties of the form should be given special attention when carrying out.

## References:

1. Demidova N.A. The catalog of a collection of wood plants of a dendrology garden of V.N. Nilov/N. And Demidova T. M. Durkina. – Arkhangelsk: Truth of the North, 2013. – 140 p.
2. Kondratyeva N. D. Representatives of Aceraceae Lindi family in gardening of the North//Materials of scientific and practical conference (seminar) “Gardening of the cities and settlements of the Arkhangelsk region”. – Arkhangelsk, 1999. – P. 17–18.
3. Malakhovets, P. M. A practical grant on gardening of the cities and settlements of the Arkhangelsk region/P. M. Malakhovets, V. A. Tissova, G. I. Travnikova, V. S. Tsvil. – Arkhangelsk, 1999. – 71 p.
4. Malakhovets, P. M. Decorative trees and shrubs in the north. – Arkhangelsk, 2002. – 127 p.

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## The study of morphological traits of seeds and ovaries in wild forms of cotton

**Abstract:** This article describes the size of the ovaries and seeds in the development process, as well as the change of number of seeds in the process of maturation. And also calculated the potential seed production and the real seed productivity.

**Keywords:** cotton, seeds, ovary, ovule, morphology.

### Introduction

Cotton is one of the leading industrial crops. It is hardly possible to find a branch of the economy, which would not have used the products obtained from the cotton plant. That is why the cotton in its importance to the economy is on a par with metal, fuel and bread. Cotton is the most important economic culture and the most universal among other crops. From all parts of the cotton plant — the seeds, leaves, stems, roots, you can receive a variety of products.

In the genus *Gossypium* L., according to a recent classifications, there are about 35 species [8, 36–42] and 50 species [5, 71–102; 7, 91–114], native to tropical and subtropical regions of the 5 continents of the world. They occupy space located on two sides of the equator and 200 north and south noun — in North and South America, Africa, Asia, India, Australia; on the islands: the Antilles, Hawaii and Cape Verde. Some of them are small or narrow ranges, while others are very narrow and are endemic species. Representatives of the genus *Gossypium* L. distinguished by great morphological diversity. The diversity of wild and cultivated species and forms of cotton, many of whom are carriers of economic and biological characteristics — a rich source of genetic resources. However, the coefficient of these resources in improving and creating new vital varieties of cotton in the world is extremely low. In practice, mainly used 4–5 representatives (out of 50), which served as the basis for creating varieties of past and present selection, the so-called cultivated tetraploid species — *G. hirsutum* L. (Mexican), *G. barbadense* L. (Peruvian) and diploid — *G. arboreum* L. (Indian), *G. herbaceum* L. (Afro-Asiatic). In world practice, dominated by varieties that are based on the Mexican (*G. hirsutum* L.), accounting for 90% of the annual cotton harvest. The remaining members of the genus *Gossypium* L., especially wild is still a potential gene pool. The limited use

of the existing biodiversity in the nature leads to genetic uniformity of modern varieties, degeneration and other negative consequences and a lack of modern domestic and foreign selection.

A large arsenal of knowledge of this culture has accumulated in the past years literature. Much attention is given to the study of the morphological and anatomical structure of the generative organs of cotton, having great scientific and practical importance. Thus, the structure of the skin signs of mature seeds and leaves are used as a taxonomic scientists in solving problems of systematics of representatives of different families, and in particular the family. Malvaceae [1, 1–263; 6, 108–165; 11, 179–184].

In modern selection parents often used perspective varieties wild species, because they have very valuable biological properties for selection. In modern literature there are works devoted to the study of correlative links between the anatomical structure of the generative organs and biologically valuable signs.

In the literature on cotton are rarely given the size of the mature seed, but more often the terms are used in the characterization of fruits and seeds — large, medium, small [3, 1161–1169; 8, 74–81]. Corner has been studied the dynamics of development of seed dicotyledons in detail [2, 174–381]. Changes of size of ovaries and ovules of cotton in their development processes have not been studied.

The seed cotton productivity is little studied question and, especially, the potential that have important theoretical and practical value, these data allow us to judge the potential possibilities of plants and predicting yield. Data on seed production of varieties and some forms of cotton are available for work [13, 5–51; 12, 92–96; 4, 52–55], linear hybrids [9, 188–190] and others. Typically, data are given on the number of full (knotted) and “undeveloped seeds” in mature pods.

**Material and methods**

The material of the study is based on three forms of *Gossypium barbadense* subsp. *ruderales*: pisco, parnat, ishan nigeria 2 species (brown and white) and 1 form subsp. *Vitifolium brasilense* 2 varieties (red and green). Experimental research work studies were carried out in conditions pushed plot experiments in the area of taxonomy laboratory and the introduction of cotton of the Institute of Genetics and Experimental Biology of Plants of ANRUz. The phenological observations, surveys, morphological description of the test plants, labeling are conducted in the vegetation period.

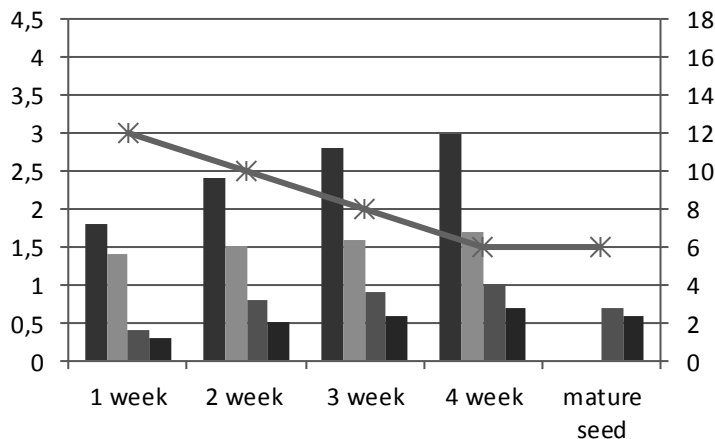
**Results**

In cotton fruit — 3–5 alopecia syncarpous boxes having a different shape, size and number of seeds in each nest. In studied rep-

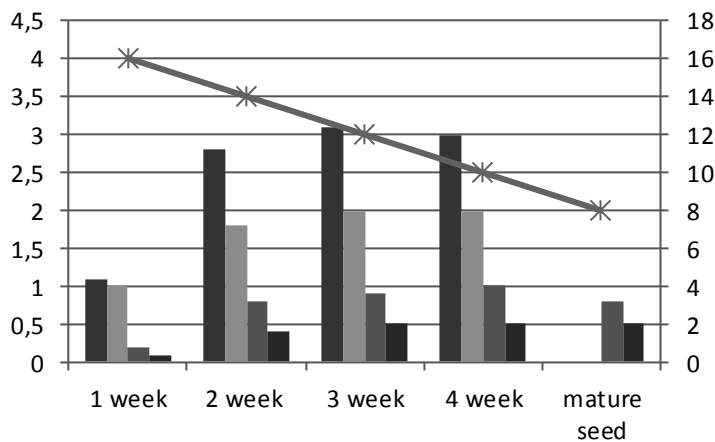
resentative of boxes have 3 folds. At all stages of development of the largest ovaries in ishan nigeria (white) and brasilense (green). And 4-week old, also have brasilense (red) (Figure 1).

Ovules and mature seeds largest in all stages of development and also in ishan nigeria (brown and white.). Most small ovules and seeds in both species subsp. *vitifolium brasilense* and subsp. *ruderales*: pisco.

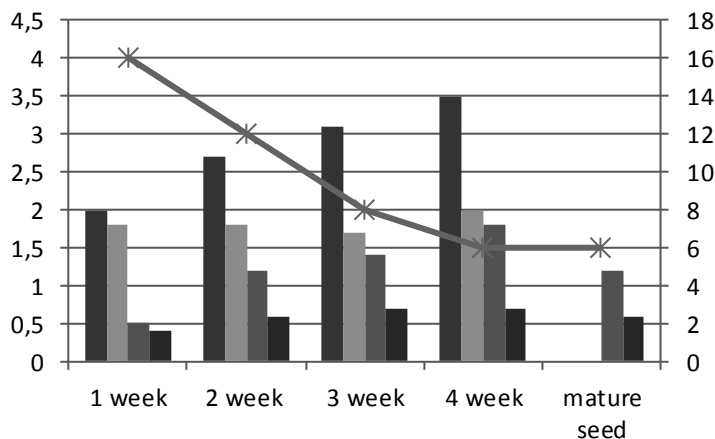
The number of ovules and seeds in one ovary and mature pods varies greatly depending on the stage of development, with the exception of two brasilense (Fig.1) varieties. In all stages of development practically they have not formed undeveloped seeds. There are 16–18 pc in ovaries. The remaining in one-week ovaries there are 12–16 pc. and maturity is 6–10 pcs.



pisco



parnat



ishan nigeria (brown)

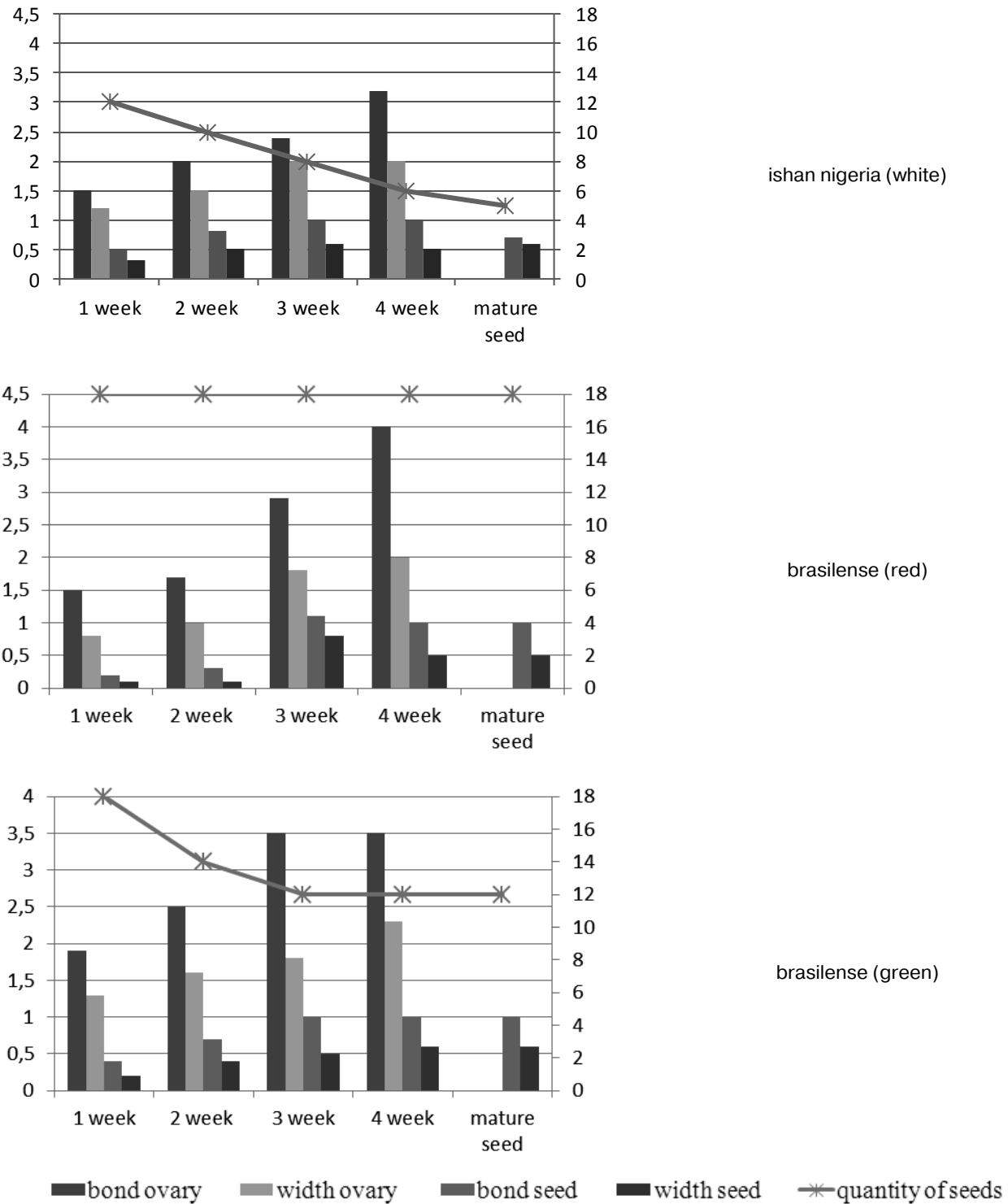


Fig 1. Dimensions uneven ovaries and ovules, and the amount of the seed in a one ovary in the process of maturation

**Discussion**

The findings provide a glimpse of a much greater seed production potential (CAP), in comparison with the real (CPR). The reasons for this phenomenon may be different- genetic, biological, physiological, biochemical, poorly studied in cotton. According to

some authors who have studied the interspecific compatibility and setting seed of hybrids, they are associated with cytological and embryological disorders in the early stages of development — micro and megasporogenesis and the process of fertilization. All that matters is the quantity and quality of pollen, as well as external factors.

**References:**

1. Abdullaev A. A., Darieva A. S., Omelchenko M. V., Klyath V. P. Rizaeva S. M., Saidaliev S., Amanturdiev A. B., Khalikov M. B. Atlas of genus *Gossypium* L. – Tashkent: Fan, 2010. – 263 p.
2. Corner E. J. H. Plant seeds of dicotyledons. Cambridge University Press. 1976. – 552 p.
3. Darieva A. S., Valichek P. K. By the differentiation of species *Gossypium klatschaum*, *G. davidsonii*. // Botanical Journal, 1980. – V. 65. – P. 1161–1169.

4. Erkenova E. M., Abuhovskaya A. L., Idiatulina D. L. The potential and real seed production of some forms of Uzbek cotton//Biology Journal, 1988. – № 4. – S. 52–55.
5. Fryxell P.A. A revision of the Australian species of *Gossypium* with observations on the occurrence of *Thespesia* in Australia. Austral. J. Bot. 1965;13 (1): 71–102.
6. Fryxell P.A. A revised taxonomic interpretation of *Gossypium* L. (*Malvaceae*)//Rheedea. – 1992. – V. 2 (2). – P. 108–165.
7. Fryxell P.A. Lyn Graven and J.M. Stewart A revision of *Gossypium* sect–*Grandicalyx* From northwestern Australia, including the description of six new species. Systematic Botany. – 1992, 17 (1). P. 91–114.
8. Mamatyusupov A. S., Dariev A. S., Klyath V.P. The structure and arrangement of epidermal cells spermoderm of African and Asian species (A, B, E –genomes) of the genus *Gossypium* L.//Reports of the Academy of Sciences of the Republic of Uzbekistan – Tashkent: Fan, – 2005. – № 1. – S. 74–81.
9. Kadyrova N. C., Abdulov I. A., Asimova D. E. The study of seed production of cotton in the collection of genetic diversity lines//Global gene pool of cotton –the basis of fundamental and applied research: Proceedings of the international conference. – Tashkent, 2010. – P. 188–190.
10. Mauer F.M. Cotton. Origin and taxonomy. Tashkent, – 1954. – Volume 1–478 p.
11. Reeves R. G. Origin of the fringe tissue of the cotton seed.//Bot. gaz. – 1935. – V. 7. – P. 179–184.
12. Sherimbetov A. G., Dzhumabekov H. A. Features of fertility components cotton inbred lines and their hybrids *G. hirsutum*L.//Achievements of Genetics and Breeding in the precocity and sustainability of agricultural plants to biotic and abiotic factors of the environment: Materials of the republican scientific-practical conference. – Tashkent, 2011. – P. 92–96.
13. Zhestyanikova L. L., Moskalev G. I. Technique anatomical studies of crop plants. – Leningrad: AIP Academy of Agricultural Sciences, 1981. – 65 p.

## Section 13. Technical sciences

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### Estimation of sediment loads: the Tuyamuyun reservoir on Amudarya river

**Abstract:** Dams and reservoirs greatly influence flow and sediment discharge regimes of rivers and can have significant impact on downstream reaches water quality. Bed load sediment management in reservoirs is required to save the reservoir capacity. In the paper a method for estimation of sediment accumulation/and removal is presented. The method allows determining future trends of the reservoir sedimentation.

**Keywords:** Reservoir, sedimentation, water turbidity, river runoff, removal, elevation.

**Background.** The Amudarya River is one of main water source for the Central Asian countries which plays a key role in their development. Water deficit is bound to increase, especially in the light of climate change and increase in demand for food production. Anthropogenic pressure has changed a natural hydrologic regime of the river. An original sediment concentration in the Amudarya water was broken due to its accumulation in the reservoirs as Nurek and Tuyamuyun Hydro Complex (THC) and huge volume of water diverting to the irrigation canals in the mid-stream (KMK, ABMK and Karakum canal). Average monthly turbidity along with the

river varies within the following ranges/UZGIDROMET/: at the Kerki station — from 0.72 to 19 kg/m<sup>3</sup>, at the Darganata station — from 0.30 to 7.0 kg/m<sup>3</sup>, at the Tuyamuyun station — from 0.02 to 1.8 kg/m<sup>3</sup> and the Kipchak station — from 0.04 to 0.89 kg/m<sup>3</sup>. Because of accumulation of sediments in the Channel reservoir of the THC the water flow in the lower sides of the Amudarya River has a low turbidity, the water is cleaner. Totally suspended matters and bed load varies from 4 to 10 Mio ton a year. In Fig.1 water inflow to the reservoir and outflow (a) and accordingly sediment transportation (b) is presented.

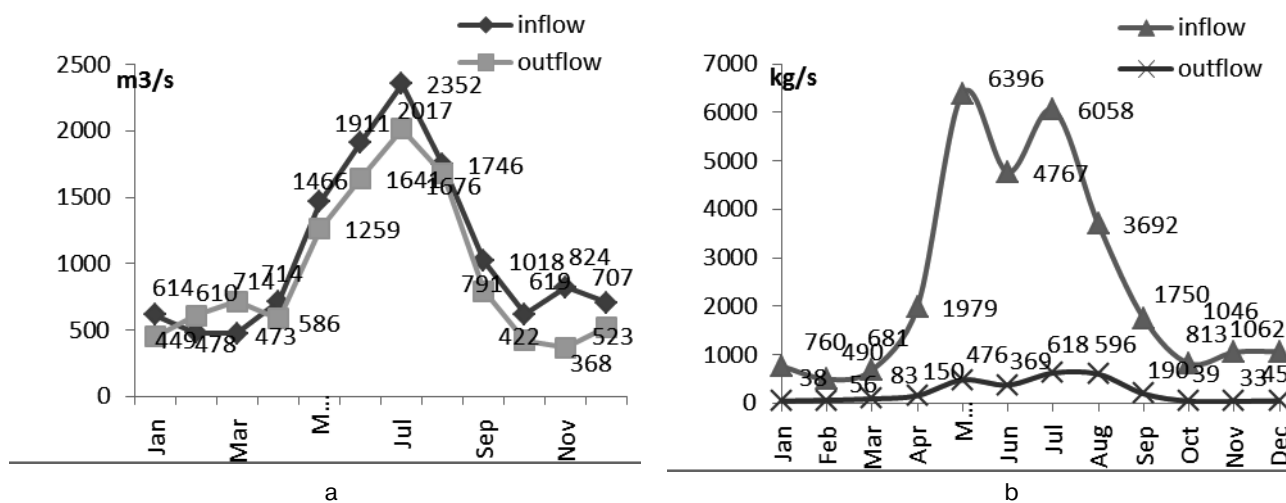


Fig. 1. Average water and sediments inflow and outflow from the Channel reservoir

The reservoir operation was started in 1981 and during this period the reservoir has been deformed significantly and lost over 40% of operational capacity. The field investigations conducted by SANIIRI 1985–2005 and the last by the BMC in 2008 and the data provided by the THC Management Unit allowed analyzing sediment accumulation and removal processes in the Channel reservoir. Average annual sedimentation volume for operation period (from 1981 to 2015) consists of 22.0 Mio m<sup>3</sup> a year. The most intensive accumulation of sediments took place in 1991–1992 (222 Mio m<sup>3</sup>) and in 1998 (108 Mio m<sup>3</sup>). Maximum removal of sediments has been observed in 1986 (135 Mio m<sup>3</sup>) at the 20, 8 km<sup>3</sup> runoff, 1997 (56 Mio m<sup>3</sup>) at the runoff of 18, 3 km<sup>3</sup> and 2000–2001 (110 Mio m<sup>3</sup>) at the runoff of 18,7 and 13,6 km<sup>3</sup>.

As a result of study of sediment accumulation and transport through the Channel reservoir allow to divide it into 3 sections according to sedimentation rate: **the first section** (15 km section from the dam) consisting 110 Mio m<sup>3</sup> of the reservoir capacity is totally covered by sediments. By 2015 an elevation of its bed has increased by 5 m. Sediment volume consisted 11% of total accumulated volume in the reservoir. Next 30 km is **the second section**, characterized by fluctuation of the accumulated 17.7% volume. After 25 years operation a sediment volume in this section consisted 36% of the initial volume. Sediments arriving from the third (upper located) section and its transition depend on the dam operation regime and inflowing and outflowing runoff. **The third section** with a length of 45–50 km is the most liable to water level change

and the main sediment accumulation area. Regular replacement of sediments takes place depending on operational regime of the dam. In this area often an accumulation process can be alternated with removal and vice versa. For example, according to the data from 2011 the removal volume at the 3-section reached to 80–100 Mio m<sup>3</sup>, at the same time at the 2-section took place a sedimentation

up to 100 Mio m<sup>3</sup>. A percentage of sedimentation relatively to the total volume of the reservoir is 71,3% in the III-section.

The reservoir morphology has been studied based on measurement data for the period from 1985 to 2008, and calculated to 2014. Allocation of sediments by the reservoir bed elevation is presented in Fig. 2.

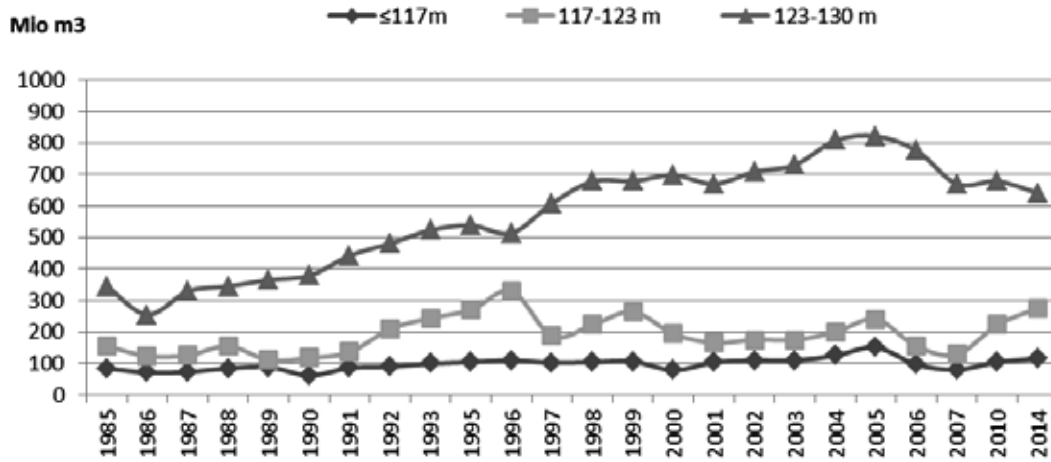


Fig. 2. Sediment accumulation dynamics in the Channel reservoir by elevations

**The THC Channel reservoir sedimentation computing.**

The initial capacity of the reservoir is  $W_i = W_r = \omega L$ , i. e. water volume in the reservoir is equal to the original river volume, where the flow transports all suspended matters. Here,  $\omega$  is a river cross-section area, m<sup>2</sup>;  $L$  — is a length of a dam influence (backwater length).

In this case, at  $\frac{W_r}{W_i} = 1$ , water cleaning (lightening) rate is  $\varepsilon = 0$ . But in the case, if  $W_i > W_r$  and  $\frac{W_r}{W_i} < 1$  then,  $\varepsilon > 0$ . Accordingly,

$$\varepsilon = f\left(\frac{W_r}{W_i}\right).$$

Water cleaning (lightening) rate is divided into two stages: at the 1-stage  $\varepsilon = 1$ , at the 2-stage as the  $\frac{W_r}{W_i}$  increases and “ $\varepsilon$ ” decreases from 1 to 0. Criteria of a transition from the 1-stage to the 2 — stage is  $\frac{W_r}{W_i} = 0.12$ .

For calculation of reservoir sedimentation the following input data is required: a design volume of a reservoir —  $W_d$  (Mio m<sup>3</sup>); an initial volume of a reservoir (it may be the last measured volume) —  $W_m$  (Mio m<sup>3</sup>); average monthly inflow —  $Q$  (m<sup>3</sup>/s); water level elevation by the 1 day of a considering period (month) —  $H_i$  (m); water level elevation by the last day of the period (month) —  $H_l$  (m); initial joint level elevation —  $H_{ji}$  (m); calculated full volume of a reservoir —  $W_c, W_{c-1}, \dots, W_{c-n}$ .

Water volume in the reservoir on a joint level elevation will be calculated by the formula  $W_i = \frac{W_r(H_{ji} - W_r)}{H_{ni} - H_d}$ . Where,  $W_r = 165$

Mio m<sup>3</sup> is an original river flow volume on average discharge of 1800m<sup>3</sup>/s for the period of last 30 years on 110 km distance of the Channel reservoir;  $W_r = 110m$  — dam invert level elevation,  $H_{ni} = 130$  m — normal operating level (Fig. 3).

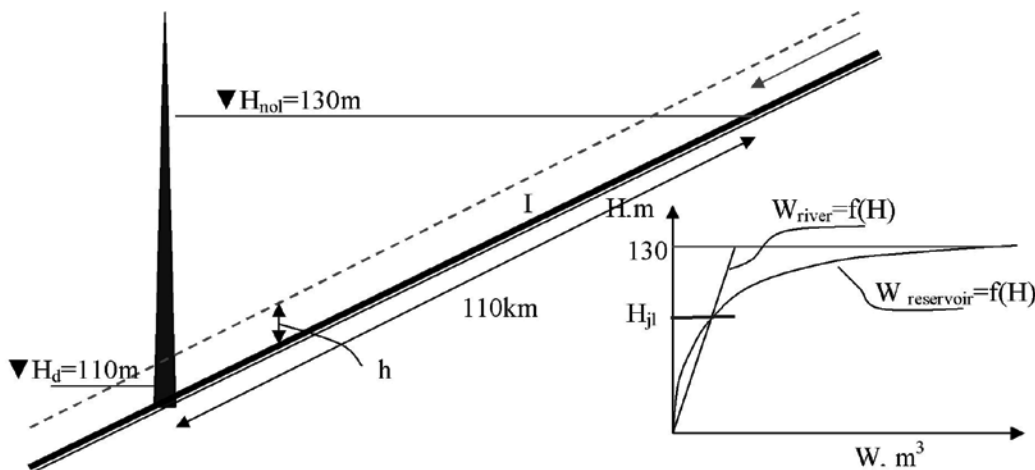


Fig. 3. Scheme for the calculation

Width of a considering part of the river stream is estimated by the formula  $B = \frac{Q}{Vh}$ . Here,  $V = 1.2$  m/s — average flow velocity for Amudarya,  $h = 2.5$  m — average flow depth at the THC. Water turbidity —  $\rho$  (kg/m<sup>3</sup>) depends on flow discharge and turbidity coefficient —  $\rho = KQ^{0.9}$ . Here,  $K$  — a turbidity coefficient: for the January-May period  $K = 0.0035$ ; June-December  $K = 0.0025$ /by SANIIRI/. Other

characteristics for computing are identified by the following relations:

- river runoff for a considering period (Mio m<sup>3</sup>) —  $R = Qt$ ,  $t$  — period (s).
- inflowing sediment runoff for a the period (month) (Mio m<sup>3</sup>) —  $R_s = 0.0012V\rho$
- initial sediment volume by the last measurement (Mio m<sup>3</sup>) —  $W_s = W_d - W_m$ ;



• average sedimentation level elevation –  $H_{ws}$  (m), for the Channel reservoir at  $W_s > 1000$  Mio  $m^3$ , then  $H_{ws} = -10^{-6}W_s^2 + 0.0067W_s + 119.66$  ;

• water volume in reservoir (Mio  $m^3$ ) –  $W_i = \frac{W_c(H_i - H_d)(H_i - H_{ji})}{(H_{nl} - H_{ji})(H_{nl} - H_d)}$ , where  $i=1,2, \dots n$ ;

• additional turbidity at a sediment removal ( $kg/m^3$ ), at  $H_i < H_{ji}$  and  $H_f < H_{ji}$  then  $\rho_{add} = 0.83B\mu \cdot \frac{H_{ws} - H_f}{IQ}$ , here  $\mu = 0.0008$  – sediment removal intensity (mm/s),  $I = 0.00018$  – the river gradient;

• water lightening coefficient –  $\varepsilon = 0$  at  $H_i \leq H_{ji}$  and  $H_f \leq H_{ji}$ ;  
if  $H_i > H_{ji}$  then  $\varepsilon = 0.041 \cdot \left[ \frac{W_r(H_{nl} - H_{ji})}{W_r(H_i - H_{ji})} \right]^{-1.5}$  ;

• sedimentation/removal volume at filling up of the reservoir –  $W_{st}$ .  
At  $H_i > H_{ji}$  and  $H_f > H_{ji}$  and  $H_i < H_f$ , then  $W_{st} = 1.2\rho \cdot \frac{R - [VW_i(1 - \varepsilon)]}{W_f}$

If  $H_i < H_f$  and  $H_f > H_{ji}$  and  $H_i < H_{ji}$ , then below  $H_{ji}$  (removal)  $W_{st} = 1.2\rho_{add} \cdot \left[ \frac{R(H_i - H_{ji})}{H_i - H_f} + W_i - W_f \right]$ , and above  $H_{ji}$  (sedimentation)

$W_{st} = 1.2\rho_{add} \cdot \left[ \frac{R - R(H_i - H_{ji})}{H_i - H_f} \right] - \frac{V[1 - W_{ji}(H_i - H_{ji})]}{W_f(H_i - H_f)} \cdot (1 - \varepsilon)$

• sedimentation/removal volume at outflowing (month) –  $W_{st}$ :  
at  $H_i > H_{ji}$  and  $H_f > H_{ji}$  and  $H_i > H_f$ , then  $W_{st} = 1.2\rho V \varepsilon$ ; if  $H_i > H_{ji}$  and  $H_f < H_{ji}$  and  $H_i > H_f$ , when  $H > H_{ji}$  (sedimentation) then  $W_{st} = 1.2\rho_{add}\varepsilon R \cdot \frac{H_i - H_{ji}}{H_i - H_f}$ ; at  $H < H_{ji}$  (removal) then

$W_{st} = 1.2\rho_{add} \cdot \left[ \frac{R - R(H_i - H_{ji})}{H_i - H_f} \right] + W_{ji} - W_f$ .

• joint level elevation by the end of a period (month) at  $H_i < H_{ji} < H_f$  (sedimentation process)  $H_{j(i)} = H_{j(i-1)} + \Delta h_s$ . Here,  $\Delta h_s = \frac{W_s I}{3B_r(H_{j(i-1)} - H_d)}$  – sediment layer height, m; at

$H_i < H_{ji} > H_f$  (removal)  $H_{j(i)} = H_{j(i-1)} - \Delta h_r$ .

Here,  $\Delta h_r = \frac{W_s I}{B_r(H_{j(i-1)} - H_d)}$  – removed layer thickness, m.

**The Channel reservoir capacity calculation and future trends.**

Firstly, the estimation was carried out based on the hydrological data and real operation regimes of the reservoir. In that case 1996, 1999, 2002 and 2003 were mean water years, 1997, 2000, 2001 and 2008 – dry and 1998, 2011 were wet years. Estimation results at different water years are given in the table 2.

Table 2. – Sediment accumulation depending on the river runoff

Water rate	Description	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
High water year	Water turbidity	kg/m <sup>3</sup>	0,96	1,45	1,56	1,79	4,42	4,95	4,85	3,10	1,77	1,05	0,94	1,05	
	Sediment inflow	Mio m <sup>3</sup>	1,58	3,44	4,42	5,68	39,68	48,79	70,17	27,26	8,10	2,78	2,11	2,76	216,78
	Accumulated sediment volume	Mio m <sup>3</sup>	1,43	3,44	3,57	4,28	29,95	27,16	56,99	15,97	3,05	1,72	1,13	1,82	150,50
	Removed sediment volume	Mio m <sup>3</sup>	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Low water year	Water turbidity	kg/m <sup>3</sup>	1,40	0,84	0,67	0,50	1,12	1,05	1,03	0,75	0,60	0,45	0,45	0,58	
	Sediment inflow	Mio m <sup>3</sup>	3,53	1,09	0,73	0,39	2,19	1,83	2,68	1,37	0,82	0,46	0,44	0,80	16,33
	Accumulated sediment volume	Mio m <sup>3</sup>	2,69	0,72	0,20	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,20	0,48	4,28
	Removed sediment volume	Mio m <sup>3</sup>	0,00	0,00	0,00	8,97	4,00	17,79	26,13	17,70	13,91	10,36	3,37	0,00	102,23
Mean water year	Water turbidity	kg/m <sup>3</sup>	1,04	0,58	0,40	1,36	2,30	1,98	1,91	1,17	0,92	0,71	0,53	0,61	
	Sediment inflow	Mio m <sup>3</sup>	1,86	0,49	0,25	3,16	9,98	7,01	9,81	3,50	2,03	1,20	0,65	0,89	40,83
	Accumulated sediment volume	Mio m <sup>3</sup>	1,31	0,27	0,05	1,67	5,78	2,68	2,69	0,24	0,43	0,70	0,42	0,35	16,58
	Removed sediment volume	Mio m <sup>3</sup>	0,00	0,00	1,39	6,76	0,00	0,00	0,00	6,05	8,65	0,00	0,00	0,00	22,86

In order to assess an accuracy of the results the actual data were compared with estimated, which showed its precision. In addition,

the method developed can be used for prediction of the reservoir capacity loss. Calculation results are shown in Fig. 4.

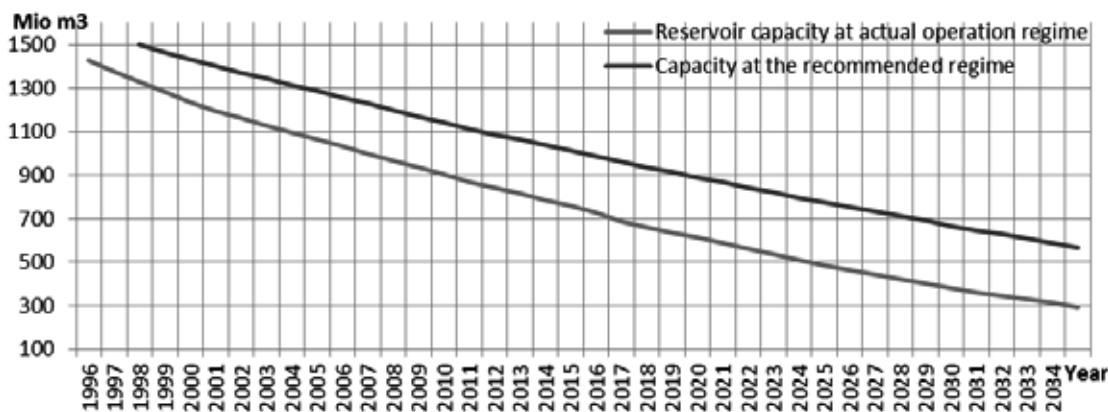


Fig. 4. Dynamics of the reservoir capacity change and its prognosis for future

Comparison of the estimation results carried out to identify of effective dam operation regime showed that at the operation regime developed by SANIIRI the reservoir sedimentation intensity is lower for 1.4 times than at the real one. Incoming and outflowing

balance of sediments in the reservoir will happen at the reservoir capacity of 680–700 Mio m<sup>3</sup> (what means 30% of design volume), what will take place at the present operation regime by 2019–2020, but at the improved operation terms — by 2030.

#### References:

1. Barishnikov N. B. Anthropogenic impact on river bed evolution. – Leningrad publishing. LGM, – 1990.
2. Berkovich K. M. Channel processes in the rivers in the area of influence of reservoirs. Faculty of Geography, – Moscow State University, – 2012.
3. Ikramova M., Khodjiev A. Tuyamuyun water works operation improvement. Agriculture of Uzbekistan, – Vol. 4, – 2008.
4. Estimation of channel water balances. Methodical instructions for Hydro Meteorological Services. Saint Petersburg, GIDROME-TEOIZDAT, – 2007.
5. Savitchev O. G., Krasnoshyokov S. Y., Nalivayko N. G. Regulation of river flow. Tomsk Polytechnic University. – Tomsk, – 2009.
6. Shmakova M. V. The methodology of calculation of sediment discharge for unstudied rivers. – Cheboksary, Perfectum edition, – 2012.
7. Skrilnikov V., Keberle S., Beleskov B. Improving efficiency of water reservoirs. – Tashkent, Mekhnat Printing, – 1987.

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## Determination of optimal parameters of purification water surface from oil and oil products by sorbent on the basis of worn automobile tires

**Abstract:** The article describes an identification of optimal parameters for surface water purification from oil and oil products by sorbent based on worn automotive tires. In thus Optimal parameters for water surface purification from oil and oil products by sorbent have been found out on the basis of constructed regression model of the process.

**Keywords:** rubber crumb, sorbent, purification of water surface, method of experiment planning, mathematical model.

Sorbents are known to be used on eliminating environmental pollution in case of oil and oil product spills from tankers and oil pipes in reservoirs. However, all known sorbents don't provide required extent of purification and it takes much time to absorb oil and oil products. Rubber, being an elastomer material with a unique complex of properties is a large-tonnage product of chemical technology, one of the final products of oil and gas refining chain which is widely applied in different branches of industry and every day life. The scale of production of rubber products as well as formed rubber wastes are rather high [1; 2].

The tread of tires is produced from tread rubber (TR) on the basis of butadiene-styrene and divinyl rubber mixture BSR + SDR (70: 30), containing 50 mass fraction of technical carbon [3; 4].

The investigations carried out by us showed that crumb of rubber tread (CRT) differs from other tire rubber crumbs because of high rigidity, when crushed it doesn't roll up but has elastic grid structure, thus it has high adsorption surface.

Besides all mentioned characteristics of tread tire allowed to obtain on its basis not conglutinated rubber crumb with dimensions 0,06–0,08 mm, without applying additional materials and to use it successfully. Obtained results are shown in Tables 1; 2

Table 1. – Association between water surface purification rate and amount of sorbent

Sorbent amount, gr	Amount of oil spill	Amount of absorbed oil, gr	Oil absorption coefficient	Rate of water surface purification, %
0,5	10	2,5	5	25
1,0	10	5,0	5	50
1,5	10	7,5	5	75
2,0	10	10	5	100

Table 2. – Oil absorption rate

Time for oil absorption second	Oil absorption rate, %	
	Known sorbent	Suggested sorbent
60	145	–
5	–	350
10	–	420
15	–	500
20	–	500

Sorbent can also be used for purification of industrial drain from oil and oil products (Table 3). The main feature of rubber crumb as a sorbent is its similarity to oil floatation.

Due to its lattice structure, the crumb of tread tire swells in the oil and provides its retention. As a result, agglomerate having much lower density than water is formed on the treated sur-

face and occupies much smaller area in comparison with sorbed oil slick. This agglomerate is easily collected by any mechanical technique, for example, by means of metal mesh buckets. After maximum oil separation obtained agglomerate was reused by us and then was applied for road asphalt modification. Obtained data are shown in tables 4–6.

Table 3. – Technical characteristics of sorbent based on worn tires

Indicators	Value
Absorption mass capacity of oil products, kg/kg Shelltic W	14–20
Apparent density kg/m	85
Particle size, mm	0.06–0.09
Trapping and holding of vapor and odors, %	98
Thermal stability, C°	200
pH of water extract	5.5–6.5
Abrasivity	missing
Purification efficiency of industrial drain from oil products, %	99.1
Purification efficiency of water from heavy metals (Pb, Cu, Cr), %	88.3–99.5
Purification efficiency of water from hydrocarbons, %	99.5–99.6
Purification efficiency of water from pesticides, %	99.4–99.9

Table 4. – Obtained content of mass fraction of samples after modification

Component name	Samples				
	1	2	3	4	5
	Content of mass fraction				
Bitumen	100	100	100	100	100
TR	2	4	6	8	10
Sulphur	-	-	-	1	2

Table 5. – Physico-mechanical properties of composition on the basis of rubber dust

№	Indicators	Samples				
		1	2	3	4	5
1	Needle penetration at 25 °C	38	72	100	71	96
2	Softening temperature, °C	49	68	82	56	75
3	Brittleness temperature, °C	–10	–10	–26	–8	–20
4	Extensibility at 25, °C	40	60	70	55	60
5	Density, gr/sm <sup>3</sup>	2,34	2,36	2,38	2,2	2,4
6	Temperature changes at T=65 °C	7	6	6	6	6
7	Strength limit at 20 °C	2,4	3,0	3,5	3,1	3,4
	50 °C	0,9	1,0	1,2	1,1	1,3

Table 6. — Indicators of physico- mechanical properties of asphalt concrete mixtures

Indicators	Samples			
	1	2	3	4
Strength limit under compression, MPa at temperature 20 °C	2,2	–	–	–
50 °C	0,9	–	–	–
Water resistance coefficient under sustained water saturation, % in volume	0,86	0,90	0,94	0,90
Water resistance coefficient	0,90	-	0,95	0,89
Soaking%, in volume	0,6	0,9	0,5	1,0
Residual poposity, % in volume	2,1	2,4	2,0	2,3

Using experimental planning method (7,8), there are shown investigations on applying crumb of rubber as a sorbent for purification water surface from oil and oil products with the purpose of

constructing regression mathematical model on the basis of its optimization. Basic input and output parameters of the examined process have been determined on the basis of numerous investigations.

Table 7. – Physico-mechanical indicators of macadam and mastic asphalt concrete MMA-15 while injecting CRT into aggregates

№	Indicators	Standard norms 31015-2002	0% CRT	0,1% CRT	0,2% CRT	0,3% CRT	0,5% CRT
1	Density, gr/sm3	–	2,38	2,39	2,395	2,406	2,4108
2	Residual porosity,%	2,0–4,0	3,64	3,57	3,13	2,46	1,83
3	Water saturation,% in volume	1,5–4,0	3,07	2,68	2,52	2,33	2,05
4	Strength limit under compression, MPa at temperature: 200°C 500°C	2,5 0,70	3,51 0,72	4,08 0,78	4,26 0,85	4,59 0,89	4,72 0,92
5	Coefficient of water resistance	–	3,85	0,88	0,90	0,92	0,94
6	Coefficient of water resistance under sustained water saturation (15 days)	0,75	0,83	0,84	0,87	0,89	0,91
7	Crack resistivity-tensile strength limit at temperature °C, MPa	3,0–6,5	3,95	4,36	4,58	4,75	4,66
8	Coefficient of interior friction tg	0,94	0,91	0,92	0,92	0,93	0,93
9	Shear adhesion at temperature 500 °C, MPa	0,20	0,20	0,32	0,55	0,59	0,63
10	Adhesive fluidity indicator,%	0,20	0,20	0,19	0,15	0,13	0,11

Table 8. – Basic factor levels and their change limits

Name	Real factor values		
	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>
Basic level	1,25	6,5	6,5
Change limit	0,1	1	1
Lowest change limit	0,5	3	3
Highest change limit	2,0	10	10

Table 9. – Planning test for water surface purification and oil products on the basis of sorbent crumb rubber, obtained on the basis of tire tread parts of worn automobile tires

Sorbent amount, gr X <sub>1</sub>		Oil spill amount, gr X <sub>2</sub>		Amount of absorbed oil, gr. X <sub>3</sub>		Level of water surface purification,% y
Encoded values	Real values	Encoded values	Real values	Encoded values	Real values	
+1	2.0	+1	10	10	10	100
+1	2.0	+1	10	3.0	3.0	70
+1	2.0	-1	3	10	10	100
+1	2.0	-1	3	3.0	3.0	70
-1	0.5	+1	10	10	10	100
-1	0.5	+1	10	3.0	3.0	30
-1	0.5	-1	3	10	10	70
-1	0.5	-1	3	3.0	3.0	30

The basic output parameter process is the level of water surface purification- y<sub>i</sub> actors influencing on parameter process are X<sub>1</sub> – sorbent amount, X<sub>2</sub> – oil spill amount, X<sub>3</sub> – amount of absorbed oil. The table shows basic factor levels and their limit changes. Rotatable plan – method of experiment planning (8–10) was used to investigate crumb of rubber tread as a sorbent for purification water surface from oil and oil products. When examined in a lab unit matrix planning was worked out and experiments were carried out according to rotatable plan the results of which are shown in table 8.

Dependence of each output parameter process y<sub>i</sub> – on output factors X<sub>j</sub> (j=1, 3) we'll represent in the following polynomial type:  $Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_{12}X_1X_2 + b_{13}X_1X_3 + b_{23}X_2X_3 + b_{123}X_1X_2X_3$  (1) where – X<sub>1</sub> – process factors, b – coefficient evaluation of regression equations defining linear effects and interaction effects.

Regression equation coefficients were defined by familiar formula (1)

$$b_i = \frac{\sum_{j=1}^n X_{ji} Y_j}{N}, \quad (2)$$

Where – (1) equation coefficients; N – total number of carried out experiments; X<sub>i</sub> – encoded and real values of basic process factors.

The following regression equation coefficients have been obtained:

where –  $b_0 = 95.331, b_1 = 0.380, b_2 = 0.460, b_3 = -0.400, b_{12} = 0.017, b_{13} = -0.001, b_{23} = -0.018, b_{123} = -0.0067$

The following regression equation has been obtained on the basis formula (2) accounts:

$$Y = 95.331 + 0.380X_1 + 0.460X_2 - 0.400X_3 + 0.017X_1X_2 - 0.001X_1X_3 - 0.018X_2X_3 - 0.0067X_1X_2X_3 \quad (3)$$

Then, statistical analyses of obtained regression equation were carried out (3):

- a) Experiment errors;
- b) Value of regression equation coefficients (3)

### References:

1. Shershnev, P. P., – 1998, Russian Federation Patent – No 2108147.
2. Kablov V. F., Jeltobryukhov V. F., Mikhachuk T. A., Kargin Y. N., – 2000, Russian Federation Patent – No 2148024.
3. Karayev S. F., Shikhaliyev K. Ecological issues of oil and oil products and new methods for treatment of oil and oil products from water surface, Hannover (in Russian), – 2014, P. 444.
4. Akhnazarova S. L., Kafarov V. V., “Optimization of an experiment in chemistry and chemical technology” (in Russian), – 2001, P. 41–42.
5. Yusubov, F. V., Zeynalov, R. I., Ibragimov, Ch.Sh., J. Chemistry and technology of fuel and oil (in Russian). – Moscow, Russia, – 2001 (1), P. 41–42.
6. Shikhaliyev K. S., Bilalov Y. M., Ibragimov S. M., J. Azerbaijan Oil Industry (in Azerbaijani) – Baku, – 2010 (8), P. 60–62.
7. Aliyeva S. F., Chemistry J. and petrochemistry (in Azerbaijani), – Baku, Elm, – 2004 (3), P. 60–62.
8. Yusubov F. V., Mamedov E. A., Chemistry J. and technology of fuel and oil (in Russian), – Moscow, – 2012 (2), P. 48–51.
9. Yusubov F. V., Chemistry J. and technology of fuel and oil (in Russian), – Moscow, – 2007 (4), P. 16–18.
10. Yusubov F. V., Zeynalov F. V., Ibragimov Ch.Sh. Applied Chemistry J. (in Russian), – Moscow, – 2001 (69), P. 59–62.

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## Effect of temperature of steady heating components of cotton-seed at drying process

**Abstract:** The problem of temperature regime effect on the heating cotton-seed components in the drum (cylindrical) dryers have not been studied profoundly. In the article were received mechanisms (principles) of heating cotton-seed components in the drum dryers in relation to the initial of cotton-seed humidity; and mechanisms (principles) of efficiency of material which is drying.

**Keywords:** drying, cotton-seed, fiber, seed, temperature, heating, humidity, uniformity.

**Introduction:** One of the present-day quotes in organization of dry process is studying the heating temperature of cotton-seed components at process of its thermal deprive. Apparently, the less temperature of heating amount is the less probability of getting worse of its natural properties.

There [1] have been determined the mechanisms (principles) of initial humidity and temperature of dry agent on the heating of cotton-seed components. But the productivity of dry drum with humid cotton-seed has not been taken into consideration in the article, and the research was done by initial humidity till 14%.

**Experimental researches:** Our researches were done on the dryer 2SB-10 with humid cotton-seed by dry agent temperature  $T=100$  and  $200$  °C, by productivity 3,5 and 10 t/h. The research object was cotton-seed of variety C-6524, and industrial sort II, with initial humidity  $W=10,5$  and  $22,3$  percent.

Tests have been done in-one, two, and three times (multiply) drying.

Analysis of receiving regress equations shows that all accepted factors have been highly influenced on the output parameters either independently or during interaction.

Processing of experiments results on the computer let us to get the individual regress equations for each dry multiplicity [2].

The regress equation for the one-time drying of fiber heating temperature is:

$$Y_b = 47,7 - 4,29X_1 - 3,79X_2 + 11,2X_3 - 0,79X_1X_2 - 2,79X_1X_3 - 1,29X_2X_3$$

The regress equation of temperature of heating seeds:

$$Y_c = 41,08 - 3,41X_1 - 2,33X_2 + 9,58X_3 - 0,83X_1X_2 - 1,91X_1X_3 - 0,83X_2X_3$$

The regress equation for two-times drying of fiber temperature heating is:

$$Y_b = 59,6 - 5,12X_1 - 6,5X_2 + 12,9X_3 - 3,5X_1X_3 - 1,87X_2X_3$$

The regress equation of temperature of heating seeds:

$$Y_c = 53,16 - 4,75X_1 - 5,75X_2 + 11,0X_3 - 2,75X_1X_3 - 1,25X_2X_3$$

The regress equation for three-times drying temperature of heating fibers:

$$Y_b = 74,37 - 6,875X_1 - 9,12X_2 + 19,37X_3 - 4,75X_1X_3 - 2,12X_2X_3$$

The regress equation of temperature of heating seeds:

$$Y_c = 68,75 - 6,5X_1 - 7,25X_2 + 17,5X_3 + 4,75X_1X_3 - 1,5X_2X_3$$

Test results allowed (permitted) to determine exactly, that more intensive cotton-seed heating take places at parallel drying than the other variants.

**Results analysis:** Digital calculations of regression function of equation in different amount (value) of the main factors influencing on the heating temperature of fibers and seeds have been done to analyze and receive mathematical models.

The results of digital calculations of production tests were done on computer and shown on drawings (see picture 1–5).

We define attitude toward fiber temperature  $t_f$  to seeds  $t_c$  with non-dimensional coefficient  $\theta$  for full calculations analysis of influence on cotton-seed's initial humidity, productivity of dry drum on humid cotton-seed, temperature dry agent and multiplicity of drying on cotton-seed components heating:

$$\theta = \frac{t_f}{t_c}, \theta_{max} = \frac{t_f^{M.d.}}{t_c^{M.d.}} \tag{1}$$

where  $t_f^{M.d.}$  and  $t_c^{M.d.}$  are maximal allowable temperature of fiber and seed appropriately.

As you see, current coefficient of cotton-seed during drying must be less or equally of amount  $\theta_{max}$ ; it means  $\theta \leq \theta_{max}$ . If  $t_f^{M.d.} = 105^\circ\text{C}$ , and  $t_c^{M.d.} = 70^\circ\text{C}$ , it is means  $\theta = 1,5$ .

Besides that, it is necessary to do appropriate conditions for equably drying of cotton-seed components in order to warm components equably and coefficient is not exceeded 1,5.

There are amounts of  $\theta$ , dependence on the initial humidity of cotton-seed, productivity of dry agent and multiplicity of drying in the table № 1.

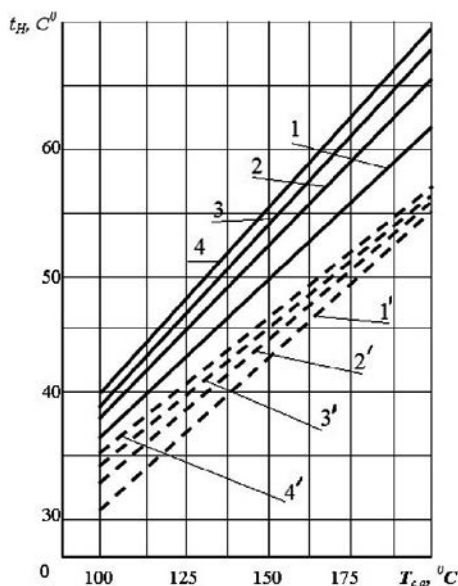
Table 1. – Importance of stretch coefficient

№ п/п	Factors			Drying multiplicity		
	Initial humidity of cotton, W, %	Productivity П, т/ч	Temperature of heat carrying agent T, °C	One-time drying	Two-times drying	Three-times drying
1.	10,5	3,5	100	1,18	1,10	1,08
2.	22,3	3,5	100	1,19	1,11	1,09
3.	10,5	10,0	100	1,16	1,10	1,06
4.	22,3	10,0	100	1,14	1,11	1,05
5.	10,5	3,5	200	1,23	1,14	1,09
6.	22,3	3,5	200	1,20	1,13	1,12
7.	10,5	10,0	200	1,17	1,14	1,07
8.	22,3	10,0	200	1,13	1,12	1,07

Analysis of table facts shows, that the least steadiness come out at one-time drying, where the temperature of dry agent is  $T=200^\circ\text{C}$ , and the highest steadiness come out at three-times consecutively drying, at more productivity and in the soft regime drying (where the temperature of dry agent is  $T=100^\circ\text{C}$ ).

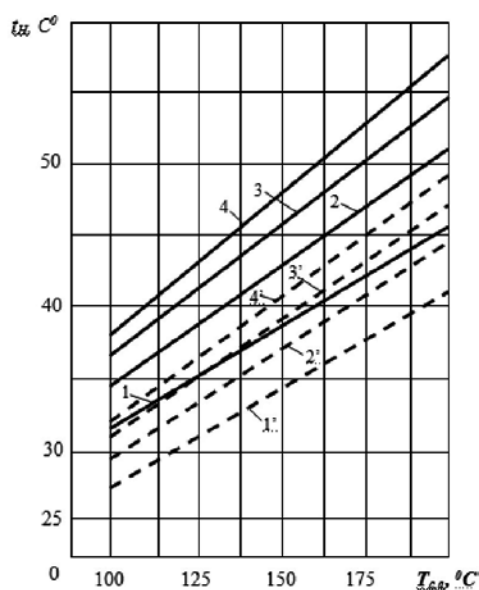
The analysis of picture from 1 to 5 shows that the speed of seeds heating is low than the speed of fibers heating, and they achieve slower limiting heating temperature. With the increasing of tempera-

ture of dry drum on humid cotton-seed, especially at the most initial humidity of cotton-seed, the difference between the heating temperature of fiber and seeds is increasing. Despite the fact that a little drop of temperature, seeds are dried very slowly. Because of high temperature in the beginning of the process it is inevitably transference of humidity particles from surface into the seeds, and also it is inevitably influence of negative-braking effect on the gradients of temperature.



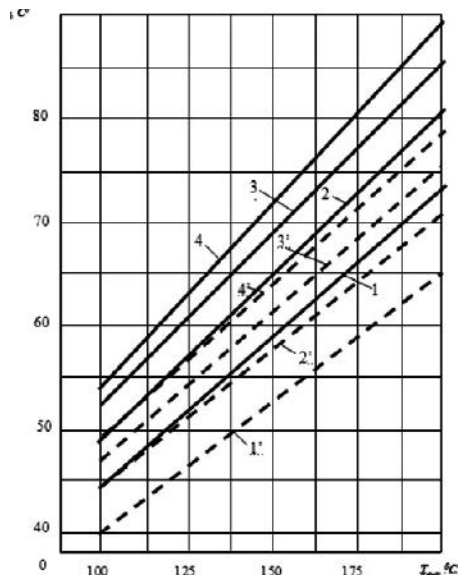
Picture 1. Dependence of heating temperature of fibers and seeds on temperature agent with the initial humidity of cotton-seed where  $W_{0/c} = 10,5\%$ ; 1, 2, 3, 4 and 1', 2', 3', 4' — according to fibers and seeds with productivity 10; 7; 5 and 3,5 within the limit of an hour

One-time drying

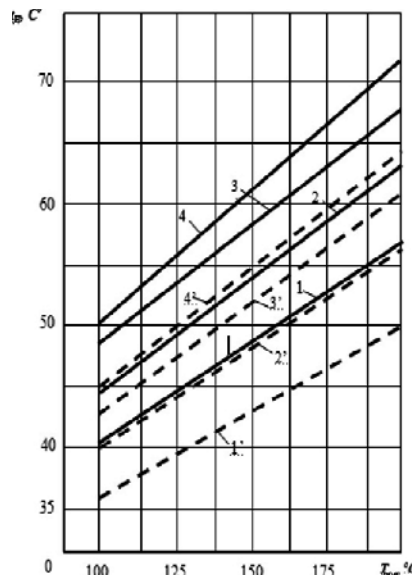


Picture 2. Dependence of heating temperature of fibers and seeds by drying temperature agent with the initial humidity of cotton-seed where  $W_{0/c} = 22,3\%$ ; 1, 2, 3, 4 and 1', 2', 3', 4' — according to fibers and seeds with productivity 10; 7; 5 and 3,5 within the limit of an hour

Two-time drying

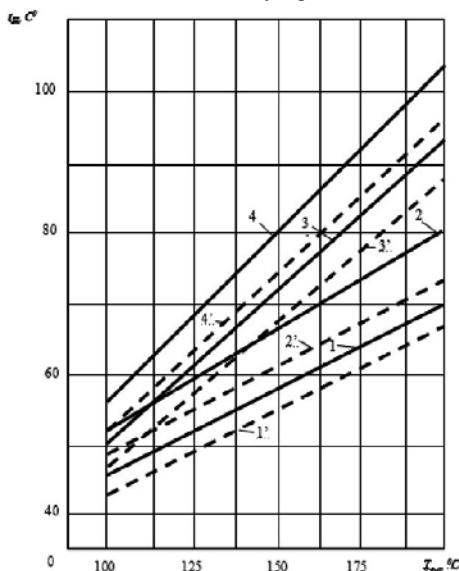


Picture 3. Dependence of heating temperature of fibers and seeds on temperature agent with the initial humidity of cotton-seed where  $W_{x/c} = 10,5\%$ ; 1, 2, 3, 4 and 1', 2', 3', 4' — according to fibers and seeds with productivity 10; 7; 5 and 3,5 within the limit of an hour



Picture 4. Dependence of heating temperature of fibers and seeds on temperature agent with the initial humidity of cotton-seed where  $W_{x/c} = 22,3\%$ ; 1, 2, 3, 4 and 1', 2', 3', 4' — according to fibers and seeds with productivity 10; 7; 5 and 3,5 within the limit of an hour

Three-time drying



Picture 5. Dependence of heating temperature of fibers and seeds on temperature agent with the initial humidity of cotton-seed where  $W_{x/c} = 22,3\%$ ; 1, 2 and 1', 2' - according to fibers and seeds with productivity 10; 7; within the limit of an hour; 3, 4 and 3', 4' - according to fibers and seeds with productivity 10; 7; within the limit of an hour with the initial humidity.  $W_{x/c} = 10,5\%$

Exception or decreasing of putting on the brakes effects of temperature gradient and increasing a coefficient of humidity diffusion from the seeds, possible during drying with relatively the equal temperature in all volume of layer, close to maximum permissible value, that it is achieved by increasing of seed heating speed in the beginning of drying process of cotton-seed in the regime which ensures a heating without maximum permissible value of temperature.

**Conclusions:** Heating process of fiber and seeds in one-time, two-time, and three-time drying of cotton-seed has been considered. It was settled that with the increasing of multiplicity of drying coefficient of unevenness heating components of cotton-seed have been lessened and brought to unit of power.

It is settled by studying of multiple drying, that equably heating of cotton-seed components can be provided by increasing of productivity of dryer and decreasing temperature of dry agent.

References:

1. Krygina L. F., Khafizov E. K., Salvin K. M. The influence of temperature of drying agent on the heat of cotton-seed influence on its humidity./Cotton industry. T., 1988. – 14. – P. 24–25.
2. Sevostyanov A. G. Methods and resources of mechanical-technological processes in textile industry. MSTU, OOO Sovyage Beveau, – M., 2007.

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## Definition of area of soft temperature drying condition

**Abstract:** The question about the influence of temperature condition on uniformity of drying of components of raw cotton and on their quality in drum driers has not been studied thoroughly. In the article you can find practical recommendations on choosing the drying conditions depending on initial moisture of raw cotton, output of the dryable material, which guarantee maximal keeping of natural properties of fiber and seeds.

**Keywords:** drying, drier, raw cotton, fiber, seeds, moisture, uniformity.

The conditions of drying by means of hot air are characterized by three parameters: moisture content, speed of air movement and temperature. These parameters influence duration of process and quality of the dryable material. Therefore it is necessary to choose such drying conditions when with the smallest duration and with the smallest expense of heat the best technological properties of material can be received [1].

In case of using the technology of drying in drying drums the drying of raw cotton is carried out in variable conditions, i. e. moisture content of the drying agent increases at the expense of the moisture evaporated from raw cotton therefore it is impossible to regulate moisture content precisely. Speed and amount of the given drying agent can't be increased as with such increase normal operation of the dryer is interrupted and the dwell time of dryable material in the drying camera decreases. Therefore the speed of the heat transfer agent makes about 1,5 m/s (expenditure of the drying agent is about 20 thousand cub. m.). It follows therefrom that for achievement of desirable drying of raw cotton it is necessary to select the optimum temperature of the heat transfer agent.

At various intensity of heating and drying of raw cotton components in drum driers, and also at the subsequent ginning, the structure of fibers undergoes essential changes that, obviously, have to lead to change of structural and mechanical properties.

Academician of the Academy of Sciences of Uzbekistan M. A. Khadzhinova [2] at experimental studying of influence of temperature of the drying agent in the course of drying has proved that application of the drying agent with the temperature of 200 and 260 °C leads to decrease in durability of fiber respectively by 11 and 27%. It happens because of unevenness of heating and dehydration of components of raw cotton. At the same time the peripheral parts of fiber and hull are overdried, there occurs thermal destruction, and at the subsequent consumption the ends of fiber are broken off, the staple length decreases to 2 mm, and the increased breakage of seeds causes raise of fiber defects (hulls and fiber) and reduces the quality of seeds. Temperature condition of the drying process must be such that raw cotton isn't heated more than 100–110 °C. Heating at temperature higher than this leads to change of color of fiber and decrease in its durability.

According to the data from [3], durability of fiber decreases by 40% at its heating to 100 °C. Other author [4] specifies that heating of fiber at the temperature of 220 °C with an exposition of 30 min. leads to increase in crystallinity of cellulose, and the increase of exposure time leads to destruction of a crystal lattice. In the work [5] it is noted that even short-term influence (7–30 s) of the temperatures of 90, 180 and 200 °C leads to structural changes of fiber of various degree, which is exposed to significant increase in density of cellulose.

Kucherova L. I. [6] has come to a conclusion that application of the drying agent with a temperature of 200 °C increases percentage of short fibers by a factor of 1,3–1,5 and fibrillation of waste — to 60%. It leads to increase in breakage at spinning by factor of 1,5–2.

Inconsistency of the characteristic received by various authors is explained, obviously, by the difference of drying conditions in the experiments (in thermostat, drying oven, special devices, etc.) and discrepancy of these conditions to conditions of the convective drying applied in the industry (considerable fluctuation of temperature and moisture content in the course of drying) that is proved by the large ranges of the revealed limit temperature conditions, and also by the fact that the influence of initial state of raw cotton (moisture, shredded state) on change of structure of fiber wasn't revealed, therefore, the choice of temperature conditions was not of prevailing significance.

Analyzing drying of raw cotton at ginning plants of the USA, the author [7] notes that temperature of the drying agent at the beginning of process of drying didn't exceed 70 °C. Most moisture is removed from raw cotton within the first 3 seconds of the influence of heated air therefore drying of raw cotton at a temperature of drying agent over 180 °C at the point of their mixing can make negative impact on quality of fiber. On the basis thereof the staff of the laboratory of cotton consumption equipment at the Department of Agriculture of the USA recommends that in one zone of drying installation temperature shouldn't exceed 180 °C. In practice the temperature needed is not more than 120 °C. In this regard they recommend applying multistage drying at lower temperatures instead of one-stage drying at high temperature.

Use of higher temperatures (200 °C) causes along with content reduction of impurities in raw cotton formation of such defects as bearded motes, small knots, which are the most harmful from the



standpoint of spinning and technology (transition to fabric). Besides the influence of high temperature leads to decrease in breaking strain to 12%, breaking extension to 11%, increase in short fibers on average by factor of 1,3–1,5, decrease in endurance limit to repeated stretching for 14–20%, increase in breakage at spinning 1,5–2 times. This work has big practical and scientific value. However the received characteristics are acquired only within the limits of moisture of raw cotton less than 16%. Besides, the frequency of drying process and influence of the frequency of drying process on quality of fiber have not been studied thoroughly.

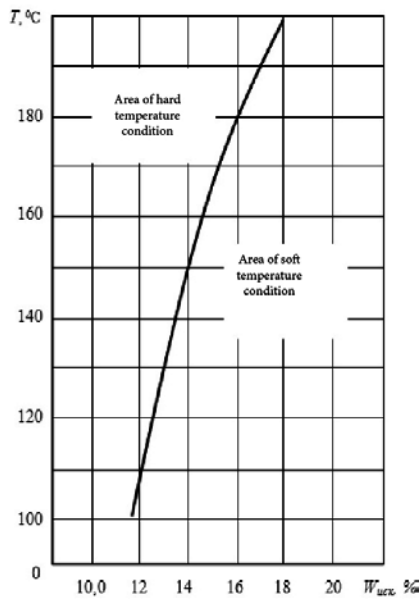
Thus the study and the analysis of researches devoted to establishment of influence of drying on quality of fiber shows that change of quality of fiber caused by thermal impact was considered generally in stationary conditions, i. e. in the conditions which aren't describing raw cotton drying process under production conditions and in drum driers taking into account the subsequent impacts in

course of consumption, cleaning and ginning of raw cotton. Therefore the received characteristics can't really reflect the influence of actual drying on quality of fiber and seeds.

Drum driers operate in the mode of alternate location of raw cotton in suspension under the influence of heat transfer agent and in heap on blades. Drying is carried out in variable parameters and moisture of the heat transfer agent. Therefore the recommended temperature of the drying agent (for example,  $T=200\text{ }^{\circ}\text{C}$ ) in laboratory conditions or layered driers doesn't change until the end of drying process, and in drum driers decreases already in two meters by  $100\text{ }^{\circ}\text{C}$ .

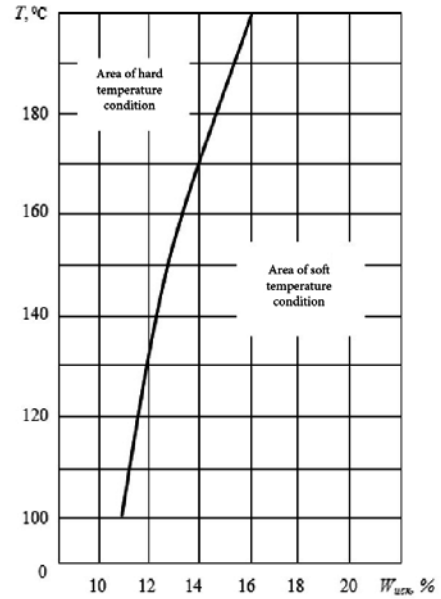
Our researches were conducted on the drier 2 СБ-10 at the temperature of drying agent of  $T=100$  and  $200\text{ }^{\circ}\text{C}$ , performance of 3,5 and 10 t/h on damp raw cotton. The object of our research was raw cotton C 6524, 2nd industrial grade, with initial moisture of  $W=10,5$  and  $22,3\%$ .

One-fold drying of raw cotton



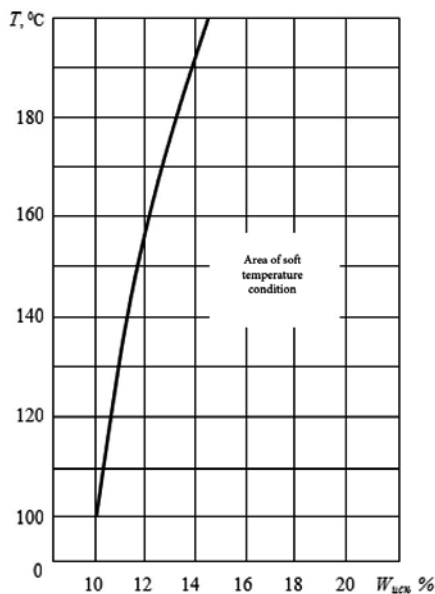
Pic. 1. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 3,5$  t/h

One-fold drying of raw cotton



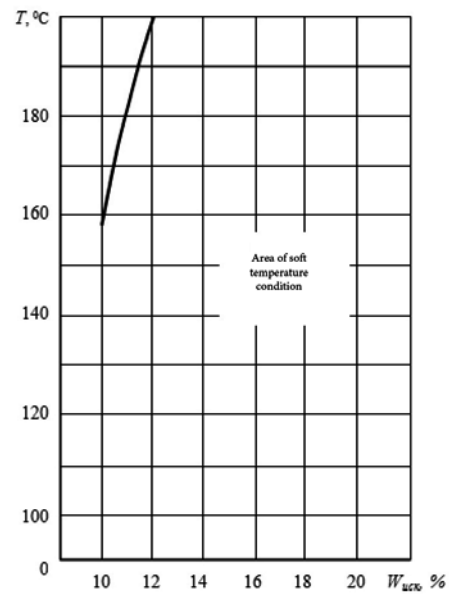
Pic. 2. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 5$  t/h

One-fold drying of raw cotton

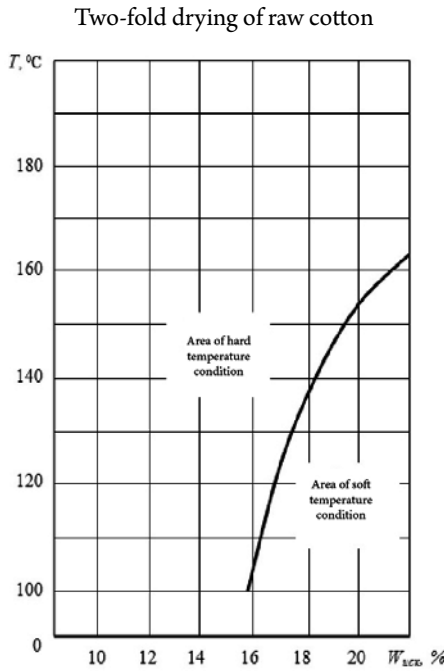


Pic. 3. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 7$  t/h

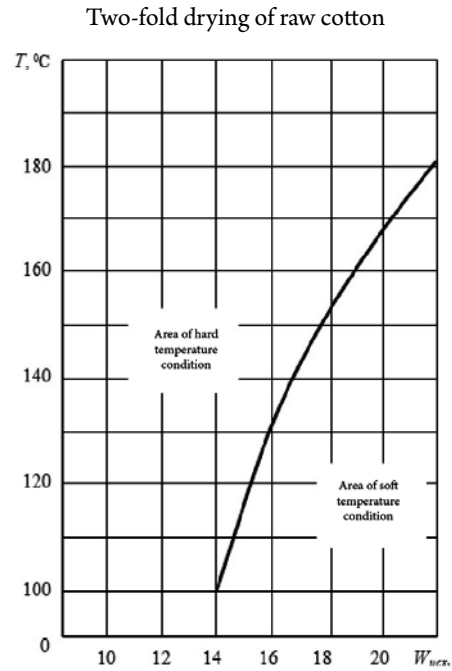
One-fold drying of raw cotton



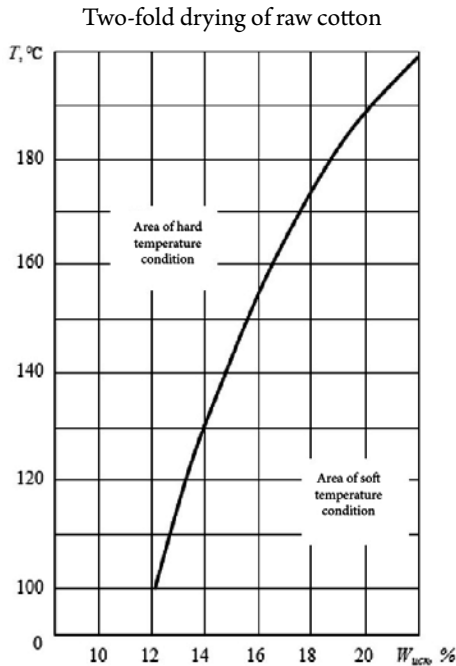
Pic. 4. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 10$  t/h



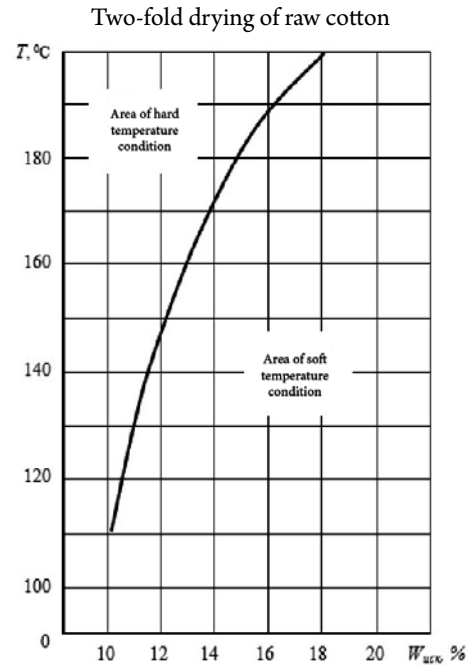
Pic. 5. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 3,5$  t/h



Pic. 6. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 5$  t/h



Pic. 7. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 7$  t/h



Pic. 8. Relation of the area of soft temperature condition to the initial moisture of raw cotton with output  $O = 10$  t/h

Experiments were made at one- and two-fold drying.

Experimental studies have shown that generally the overdried fiber has lower quality, as sorption activity of fibers decreases because of violation of orientation of structural elements. It is known that cotton fiber acquires increased strength while wet, as moisture getting in the inside layers of fiber, promotes formation of additional bonds between structural elements [6]. The overdried fiber (lower than 5,5%) becomes fragile and it breaks at additional mechanical influences (cleaning, ginning), damage and content of short fibers increase and the work of spinning and weaving factories worsen.

The obtained regression equations (at one-fold drying: for moisture of raw cotton —  $E_1 = 12,8 + 4,75x_1 + 0,97x_2 - 1,10x_3 - 0,47x_1x_3$ ; for moisture of fiber —  $E_2 = 7,98 + 3,07x_1 + 1,3x_2 - 1,66x_3 + 0,3x_1x_2 -$

$0,69x_1x_3$ ; at two-fold drying: for moisture of raw cotton —  $E_1 = 9,81 + 3,85x_1 + 1,54x_2 - 1,68x_3 - 0,66x_1x_3$ ; for moisture of fiber —  $E_2 = 5,64 + 2,08x_1 + 1,25x_2 - 1,63x_3 - 0,58x_1x_3$ ) have been processed with ECM and various values of major factors have been defined. By trial method the borders of areas of soft and hard temperature conditions of drying at one- and two-fold drying have been determined depending on temperature of the drying agent and initial moisture of raw cotton with output of 3, 5, 7 and 10 t/h; these borders are presented in the form of curves in pictures 1–8.

The graphs (pic. 1–4) show that at one-fold drying of raw cotton at moisture of less than  $W_{x/c} = 11,6\%$  raw cotton can not be dried with output less than 3,5 t/h, at  $W_{x/c} = 11,0\%$  less than 5 t/h, and at  $W_{x/c} = 10\%$  less than 7 t/h.

At two-fold drying of raw cotton (pic. 5–8) with output  $P=3,5$  t/h and moisture of raw cotton below  $W_{x/c}=15,8\%$ , with output  $P=5$  t/h and moisture of raw cotton below  $W_{x/c}=14\%$ , with output  $P=7$  t/h and moisture of raw cotton below  $W_{x/c}=12,1\%$  it is not recommended to put raw cotton to two-fold drying.

On the basis of the received results it is possible to make practical recommendations on choosing the drying conditions depending on initial moisture of raw cotton, output of the dryable material, which guarantee maximal keeping of natural properties of fiber and seeds.

### References:

1. Boltabaev S. D., Parpiev A. P. Drying of raw cotton. – Tashkent: «Ukituvchi», 1980.
2. Khadzhinova M. A. Research of properties and structure of cotton fiber in the course of drying. – Tashkent: Fan, 1966.
3. Alfei T. Mechanical characteristics of polymers. – M.: Inostrannaya literatura (Foreign literature), 1952. P. 305.
4. Bu m. G. Dobb and m. z. Safain. The effect of thermal treatment on the cruserized cotton. J. of the textile Institute. – V. N 7/8. 1976, P. 229–234.
5. Edith Honold, Frederic R., Ondrers and James N. Crand Heating, Cleaning and mechanical proccessing effect and cotton, Partil; Fiber chages as measured by achali Centuge Test. Text Reas. j. 1963, jannary, – N1, P. 51–60.
6. Kucherova L. I. Assessment of influence of drying on structure and properties of the cotton fiber and produced yarn and fabric: Ph. D. thesis in Engineering Science – M., 1981.
7. The “Cotton gin and oil mill Press” 22.11. 86. P. 8–9.

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## The investigation of invariance of the output of complex electric power system with application system's embedding approach

**Abstract:** In article is considered the problem of providing the invariance of the output of dynamic system to external disturbances. As the dynamic system is considered the model of electric power system (EPS), provided for the small oscillation conditions. If the necessary and sufficient conditions of invariance required on the base of system's embedding approach are provided, then invariance of the exploring system's output to external disturbance is also provided.

**Keywords:** Matrix approach, system's embedding approach, steady-state stability, invariance.

Invariance is one of the most important properties of the dynamic system. The problem of invariance, according to [1, 12], is the problem of identification structures and parameters of controlling system where the impact of spontaneous changes of the external disturbances and the system's own parameters to dynamic performance of the controlling process could be in part or in whole compensated.

This problem was formulated for the first time by G. V. S. C Hipanov [2, 49–66] and the extensive discussions about its application have been going on up to now [3, 43–49; 4, 21–29; 5, 34–41; 6, 61–67 etc.].

It must be noted that the different type of invariance systems are existed. They differ both in terms of functional capability and design concept [7, 23].

Below is considered the application of system's embedding approach to study the invariance of the output of controlled complex EPS at small disturbances as stationary determined multidimensional dynamic system. This is due to the fact that the input-output range of complex EPS are subjected to non-unique changings due to the existence of zero devisors and noncommutative operators [8, 25], put in other words due to the algebraic singularity of the exploring system which is typical only for the multidimensional systems [9, 177].

In the case of representation of the exploring system in the state space [9, 185; 10, 23]:

$$\dot{x} = Ax + Bu + Sw, \quad (1)$$

$$u = -Kx, \quad (2)$$

$$y = Cx, \quad (3)$$

where  $x$ ,  $u$ ,  $y$ , and  $w$  are vectors of state, control, output and disturbance of the system, respectively;  $A$ ,  $B$ ,  $C$ , and  $S$  are matrices with constant digital elements of the respective size;  $K$  is regulator matrix, with constant digital elements. For invariance of the output of controlled system being studied, the transfer matrix from disturbance  $w(p)$  to the system output  $y(p)$  with the model in state space shall identically equal zero:

$$F_y^w(p) = C(pI_n - A_y)^{-1}S = 0, \quad (4)$$

where  $A_y = A + BK$  is matrix of dynamics of the system with the controller. The main problem is to find the controller (synthesis), ensuring the fulfillment of the condition (4). However, as indicated in [10, 25], solving this problem poses certain difficulties, as (4) has the operation of matrix inversion, and, as a rule, it is polynomial.

Necessary and sufficient conditions, under which the equality (4) is just, is ensured, when fulfilled the conditions of the theorem [10, 28], where established that the system (1)–(3) for specified matrices  $A$ ,  $B$ ,  $C$  and  $S$  is invariance to disturbances in the sense of

the fulfillment of theorem (4), if and only if the following condition is fulfilled:

$$\overline{\overline{C^R \pi}}^L S = 0, \quad (5)$$

where  $\pi$  — matrix of maximum column rank, complying to condition:

$$\overline{\overline{C^R \pi}}^L A_y \overline{\overline{C^R \pi}}^R = 0, \quad (6)$$

wherein the following identity is satisfied:

$$\overline{\overline{\overline{C^R \pi}}^L}^L \overline{\overline{C^R \pi}}^L A \overline{\overline{C^R \pi}}^R = 0, \quad (7)$$

and the system is closed by any controller from the set:

$$\{K\}_{\gamma, \chi} = -(\overline{\overline{C^R \pi}}^L B)^{\sim} \overline{\overline{C^R \pi}}^L A \overline{\overline{C^R \pi}}^R (\overline{\overline{C^R \pi}}^R)^{\sim} + \overline{\overline{C^R \pi_{i-1}}}^L B \chi + \gamma \overline{\overline{C^R \pi}}^L, \quad (8)$$

where  $\chi$  and  $\gamma$  are matrices of the set size with arbitrary digital elements;  $\overline{\overline{C^R}}$  is right zero divisor of the matrix C;  $\overline{\overline{C^R \pi}}^L$  is left zero divisor of the matrix  $\overline{\overline{C^R \pi}}^R$ ; matrices with the upper mark ( $\sim$ ) are summed-up canonizers of the respective matrices; double and triple bars above matrices designate the repeated definition of the respective zero divisor of the maximum rank out of the combination of matrices standing under that bar.

Below is given algorithm of generation of maximum rank matrix  $\pi$ , which satisfies the condition (6), in a finite number of steps [10, 27]:

$$A = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ -\omega_{11} & \omega_{12} & \omega_{13} & 0 & 0 & 0 \\ \omega_{21} & -\omega_{22} & \omega_{23} & 0 & 0 & 0 \\ \omega_{31} & \omega_{32} & -\omega_{33} & 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ -57,2 & 27,53 & 33,42 & 0 & 0 & 0 \\ 39,33 & -92,08 & 50,53 & 0 & 0 & 0 \\ 23,61 & 50,53 & -95,15 & 0 & 0 & 0 \end{bmatrix} \quad (12)$$

$$C = [\Delta \delta_1 \ 0 \ 0 \ 0 \ 0 \ 0] = [1 \ 0 \ 0 \ 0 \ 0 \ 0], \quad S = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}. \quad (13)$$

$$B = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ -\frac{dP_1 \omega_0}{dE_{q1} T_{j1}} & 0 & 0 \\ 0 & -\frac{dP_1 \omega_0}{dE_{q1} T_{j1}} & 0 \\ 0 & 0 & -\frac{dP_1 \omega_0}{dE_{q1} T_{j1}} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ -2,0837 & 0 & 0 \\ 0 & -2,0687 & 0 \\ 0 & 0 & 0,9706 \end{bmatrix}. \quad (14)$$

Computation shows that at the adopted operating parameters (on the base case), the system is unstable, what can be seen from the matrix spectrum (12) of own dynamics of EPS being studied:  $0,0000 \mp 11,9757i, -0,0000 \mp 9,7538i, 0,0000 \mp 2,4239i$ .

To verify the required conditions of invariance of the output of EPS and as the result to find the controller's parameter (8) we consistently will find the conformable matrices.

Condition (9) requires determination of the right divisor of matrix C and the left divisor of matrix CB, which could be found by canonization of these matrices:

Step 1. Testing of the condition:

$$\overline{\overline{CB}}^L C A \overline{\overline{C^R}} = 0. \quad (9)$$

If the condition is fulfilled, then assumes  $\pi = \pi_0 = I_{(n-rankC)}$ .

Step 2. If the condition (9) is not fulfilled, then matrix  $\pi_1$  is determines from the formula:

$$\overline{\overline{CB}}^L C A \overline{\overline{C^R}} = 0. \quad (10)$$

If  $\pi_1 = 0$ , then the system is not invariance and algorithm should be stopped. In the contrary case the condition (6) should be tested on the assumption  $\pi = \pi_1$ .

Step 3. Matrix  $\pi_i$  at  $i > 1$  is defined as:

$$\overline{\overline{\overline{\overline{C^R \pi_{i-1}}^L}^L}^L}^L \overline{\overline{C^R \pi_{i-1}}^L} A \overline{\overline{C^R}}^R, \quad (11)$$

and then the fulfillment of condition (7) must be checked.

Step 4. Algorithm will stop at the k-th step on the first fulfillment of the condition (7). Matrix  $\pi$  of maximum rank has value  $\pi_k$ .

Let's apply presented method of determination of invariance of the output of dynamic system by the example of the three-generator system without due regard to damper coefficient of the generator.

The problem of invariance is solved on the basis of the matrix canonization method.

Matrix of own dynamics of the model of EPS being studied is written as:

$$\overline{\overline{C^R}} = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix},$$

$$CB = [0 \ 0 \ 0], \quad \overline{\overline{CB}}^L = \overline{[0 \ 0 \ 0]}^L = 1,$$

$$CA \overline{\overline{C^R}} = [0 \ 0 \ 1 \ 0 \ 0],$$

$$\overline{\overline{CB}}^L CA \overline{\overline{C^R}} = [0 \ 0 \ 1 \ 0 \ 0] \neq 0.$$

Condition (9) is not fulfilled, and then the matrix  $\pi_1$  will be determined by (10):

$$\pi_1 = \overline{CB}^L \overline{CAC}^R = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}.$$

Verification of fulfillment of condition (7) at  $\pi = \pi_1$ :

$$\overline{C}^R \pi_1 = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \quad \overline{C}^R \pi_1 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix},$$

$$\overline{C}^R \pi_1 B = \begin{bmatrix} 0 & 0 & 0 \\ 2,0837 & 0 & 0 \end{bmatrix}, \quad \overline{C}^R \pi_1 B = [1 \ 0],$$

$$\overline{C}^R \pi_1 A \overline{C}^R \pi_1 = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 33,42 & 27,53 & 0 & 0 \end{bmatrix},$$

$$\overline{C}^R \pi_1 B \overline{C}^R \pi_1 A \overline{C}^R \pi_1 = [0 \ 0 \ 0 \ 0]$$

In this way, the condition (7) is fulfilled. Now can verify fulfillment of condition (5):

$$\overline{C}^R \pi_1 S = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}.$$

Hence, the condition (5) is fulfilled, it is possible to form controller's coefficient matrix (8), for which purpose it is necessary to determine matrices in this formula:

$$(\overline{C}^R \pi_1 B)^- = \begin{bmatrix} 0 & 0,4799 \\ 0 & 0 \\ 0 & 0 \end{bmatrix},$$

$$(\overline{C}^R \pi_1)^- = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}, \quad \overline{C}^R \pi_1 B = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}.$$

$$A_y = A + BK = \begin{bmatrix} 0 & 0 & 0 & 1,0000 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1,0000 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1,0000 \\ -78,0370 & 27,5300 & 33,4200 & -4,1674 & 0 & 0 \\ 39,3300 & -108,6224 & 50,5300 & 0 & -2,0678 & 0 \\ 23,6100 & 50,5300 & -95,1500 & 0 & 0 & 0 \end{bmatrix},$$

with the spectrum:  $-1.0790 \pm 4.2951i, -0.6007 \pm 12.2361i, -1.4379 \pm 10.3156i$ . With the selected parameters of controller (17) EPS becomes steady with the one electromechanical frequency 0,6839 Hz and two electromagnetic frequency: 1,6426 and 1,9484 respectively.

It is evident that the presence of  $A_y$  makes possible the comprehensive investigation of dynamical properties of controlled three-generator system by changing the parameters of controller

By substituting the obtained numerical value of matrices into formula (8):

$$\{K\}_{\gamma, \chi} = -(\overline{C}^R \pi_1 B)^- \overline{C}^R \pi_1 A \overline{C}^R \pi_1 (\overline{C}^R \pi_1)^- + \overline{C}^R \pi_1 B \chi + \gamma \overline{C}^R \pi_1 =$$

$$= \begin{bmatrix} \gamma_{11} & -13,2116 & -16,0383 & \gamma_{21} & 0 & 0 \\ (\gamma_{21} + \chi_1) & \chi_2 & \chi_3 & (\gamma_{22} + \chi_4) & \chi_5 & \chi_6 \\ \gamma_{31} & 0 & 0 & \gamma_{32} & 0 & 0 \end{bmatrix}, \quad (15)$$

where  $\chi$  and  $\gamma$  are forming matrices with the random numerical values specified as:

$$\chi = [\chi_1 \ \chi_2 \ \chi_3 \ \chi_4 \ \chi_5 \ \chi_6] \text{ and } \gamma = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \\ \gamma_{31} & \gamma_{32} \end{bmatrix}.$$

Controller for the three-generator system is given by:

$$K = \begin{bmatrix} k_{E_{q1}}^{\Delta \delta_1} & 0 & \dots & 0 & k_{E_{q1}}^{\Delta s_1} & 0 & \dots & 0 \\ 0 & k_{E_{q2}}^{\Delta \delta_2} & \dots & 0 & 0 & k_{E_{q2}}^{\Delta s_2} & \dots & 0 \\ \dots & \dots & \dots & \dots & \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & k_{E_{qp}}^{\Delta \delta_p} & 0 & 0 & \dots & k_{E_{qp}}^{\Delta s_p} \end{bmatrix}. \quad (16)$$

Synthesized controller (16) with the matrices  $\chi$  and  $\gamma$  with random numerical values of elements must be structured in such a way that necessary technical requirements such as stability, damping the low frequency oscillations etc., should be provided in dynamic system.

It should be noted that formula (15) should be fit with formula (16), that is, it is conceivable that  $k_{E_{q1}}^{\Delta \delta_1} = \gamma_{11}$ ,  $k_{E_{q1}}^{\Delta s_1} = \gamma_{12}$ ,  $k_{E_{q2}}^{\Delta \delta_2} = \chi_2$ ,  $k_{E_{q2}}^{\Delta s_2} = \chi_3$ , and the rest of elements are equal to zero. The final matrix of controller's coefficients (15) will be as follows:

$$\{K\}_{\gamma, \chi} = \begin{bmatrix} \gamma_{11} & 0 & 0 & \gamma_{21} & 0 & 0 \\ 0 & \chi_2 & 0 & 0 & \chi_5 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}. \quad (17)$$

It is characteristic that at the selected matrix the output of the exploring system C and matrix of disturbances S, the third controller is not involved in the mode controlling of complex EPS.

Previously it was shown that the matrix of own dynamics of the model of EPS A is equal to (12).

Now we check the impact of the regulator (17) to the spectrum of the matrix of own dynamics of controlled EPS, which has following matrix:

$$A_y = A + BK. \quad (18)$$

At  $k_{E_{q1}}^{\Delta \delta_1} = \gamma_{11} = -10$ ,  $k_{E_{q1}}^{\Delta s_1} = \gamma_{12} = -2$ ,  $k_{E_{q2}}^{\Delta \delta_2} = \chi_2 = 8$ ,  $k_{E_{q2}}^{\Delta s_2} = \chi_3 = 1$  the matrix (18) is equal to:

(17) and also to determine the invariance condition of the output to disturbances that take place in the system being studied.

In Fig. 1, listed are characteristics of the change of deviation of the first generator's angle  $\Delta \delta_1 = f(t)$ , the stable, controlled (18) EPS (Fig. 1, A) at the synthesized parameters of the controller (17) and the stable, uncontrolled EPS (12) (Fig. 1, B). The process attenuates relatively quickly and bears virtually aperiodic character.

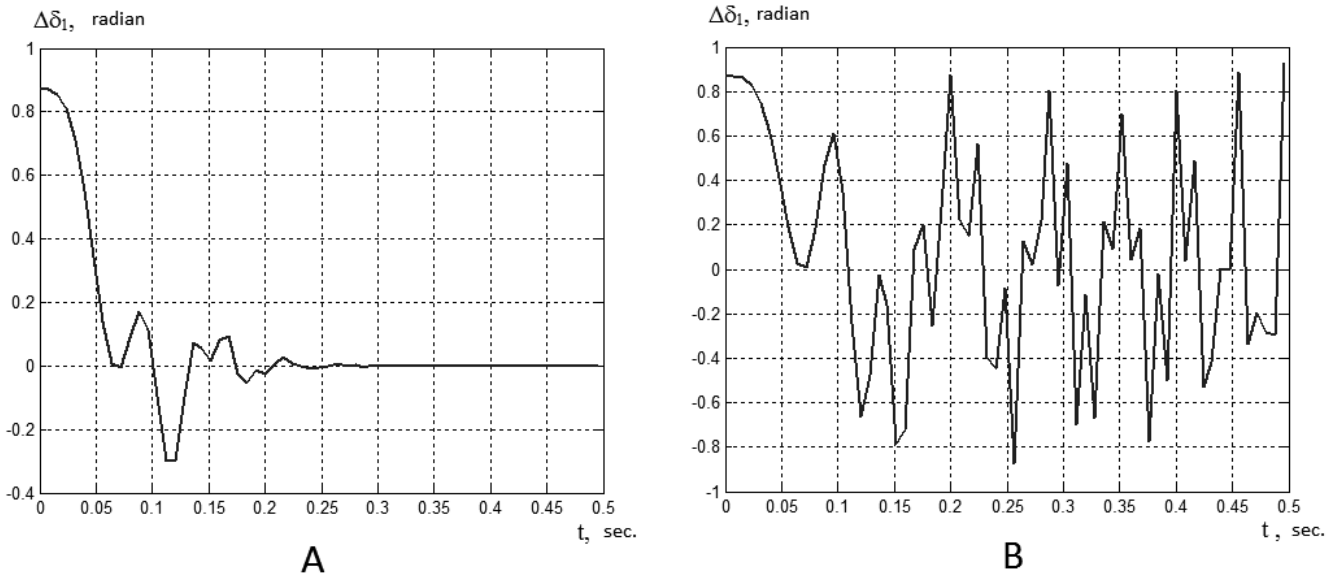


Fig. 1. Change characteristics of the angle of the first generator  $\Delta\delta_1 = f(t)$  of the three-generator electric system at:

$$\text{A: } k_{E_{q1}}^{\Delta\delta_1} = \gamma_{11} = -10; k_{E_{q1}}^{\Delta\delta_1} = \gamma_{21} = -2; k_{E_{q2}}^{\Delta\delta_2} = \chi_2 = 8; k_{E_{q2}}^{\Delta\delta_2} = \chi_3 = 1$$

$$\text{B: } k_{E_{q1}}^{\Delta\delta_1} = k_{E_{q1}}^{\Delta\delta_1} = k_{E_{q2}}^{\Delta\delta_2} = k_{E_{q2}}^{\Delta\delta_2} = 0 \text{ and } P_{d1} = P_{d2} = P_{d3} = 0.$$

Since the provided technology of EPS controller synthesis is based on the modern theory of matrices, which is in its turn adapted for computer processing and therefore has high computational performances, it could be recommended for the analysis of controlled complex EPS.

As the result, it may be noted that on the basis of matrix canonization approach, which provide a basis for the system's embedding approach, the invariance conditions of EPS output to the spontaneous external disturbances were specified. In order to solve this problem the typical controller was synthesized.

The obtained results of determination the impact of controller's and EPS's operating parameters to dynamics of EPS are absolutely same with the all known classic results what also proves the adequate of the mathematical models of controlled complex EPS.

Since the system's embedding approach is based on the matrix analysis then many software applications are available for work with it, for which reason, the principal difference of this method is the decreasing the computational. The analytical descriptions of controllers' type that provide the required dynamics of exploring systems are also important.

#### References:

1. The advanced method of automatic control system's design. Analysis and synthesis/Edited by: B. N. Petrova, V. V. Solodovnikova, YU. I. Topcheev. – Moscow, Mashinostroenie [Machine engineering], – 1967.
2. The theory and methods of automatic control system's design./Avtomatika i telemekhanika [Automatics and telecontrol], 1939, – № 1.
3. Lusin L. L., Kuznetsov P. I. To absolute invariance and invariance through  $\epsilon$  in differential equation theory//Doklady Akademii Nauk SSSR [Proceedings of the Academy of Science of USSR], – 1946. T.51. – № 4, 5.
4. Petrov B. N. About the realizability of invariance conditions/Conference “The invariance theory and its application for automatic control”, – Kiev, 1958.
5. Ivakhnenko A. G. Combine the invariance theory with the theory of deferential equation. – Moscow: Avtomatika [Automatics], 1961, – № 1.
6. Aliev R. A. The invariance principle and its application. – Moscow: Energoizdat, 1985.
7. Novikov M. A. Mathematical modeling and reexpression in the problems of stability of steady-state motion of mechanical and controlled systems./Authors abstract, St. Petersburg, – 2012.
8. Fazilov Kh. F., Nasirov T. Kh. Steady-state modes in electric power systems and their optimization. – Tashkent, “Molniya”, – 1999.
9. Bukov V. N. System's embedding. The analytical approach to analysis and synthesis of matrix sysmtems//Edited by N. F. Bochkareva, – Kaluga, – 2006.
10. Bukov B. N., Bronnikov A. M. The invariance conditions of the output of linier systems. Moscow: Avtomatika i telemekhanika [Automatics and telecontrol], – 2005.

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## Experimental and theoretical approach to the determination of physical and mechanical characteristics of the material of the walls of the low-strength materials

**Abstract:** In the article the experimental and theoretical approach to the definition of the parameters required for the calculation of individual elastic structures of the low-strength materials.

**Keywords:** individual buildings, low-strength materials, seismic resistance, oscillation frequency, waveform, dynamic characteristics, finite element method, a spatial model.

Using the finite element method for determining the strength of structures from local materials requires knowledge of the physical and mechanical characteristics of the material from which the walls are built. Since the calculation is performed in the elastic stage, such a characteristic, particularly,  $E$  is the modulus of elasticity of masonry, i. e. or brick or solution separately, namely clutches, which in the calculations elastically deformable body. This information is for laying of local materials in the regulatory literature. Therefore, in this article the author presents experimental and theoretical approach to the definition of the specified parameter. The essence of this approach is based on a comparison of the experimentally and theoretically derived the main periods of the real building vibrations set out below.

Using the recommendations of [1, 656], we can determine that the modulus of elasticity of unreinforced masonry, defined by the formula  $E_0 = \alpha k R$  ( $\alpha = 200 \div 1000$ ;  $k = 2 \div 2,25$ ;  $R = 0,05 \div 3,3$  MPa) depending on the brand brick and mortar, there is a fairly wide range of values from 200 to 7400 MPa. Experimental studies to determine

the periods of major fluctuations were carried out for the same in terms of buildings and burnt mud bricks, as well as for the construction of monolithic clay. Were built in terms of size  $4 \text{ m} \times 5 \text{ m}$  and a height of 3 m. Proportion wall material is approximately the same and  $\gamma = 15,5 \text{ kN/m}^3$ . Poisson's ratio  $\mu = 0,25$ . The wall thickness was 510 mm for the construction of brick and 380 mm – of 500 mm and raw clay. In all cases, the period of the transverse vibrations is about 0.09 seconds. These experimental values of the basic oscillation periods and were decisive for the choice of modulus of elasticity of the walls in all cases. To do this, using the above-described algorithm, the finite element method were determined periods and shapes of construction vibrations. The resulting shape shown in Figure 1 a) and c) – a top view of the first and second forms (coatings shift in the longitudinal and transverse directions), b) – for the first construction form deformation (front view), and g) on deformation second embodiment (side view). When using burnt bricks coincidence periods was reached at  $E = 300 \text{ MPa}$ , and the use of raw clay and monolithic –  $E = 280$ .

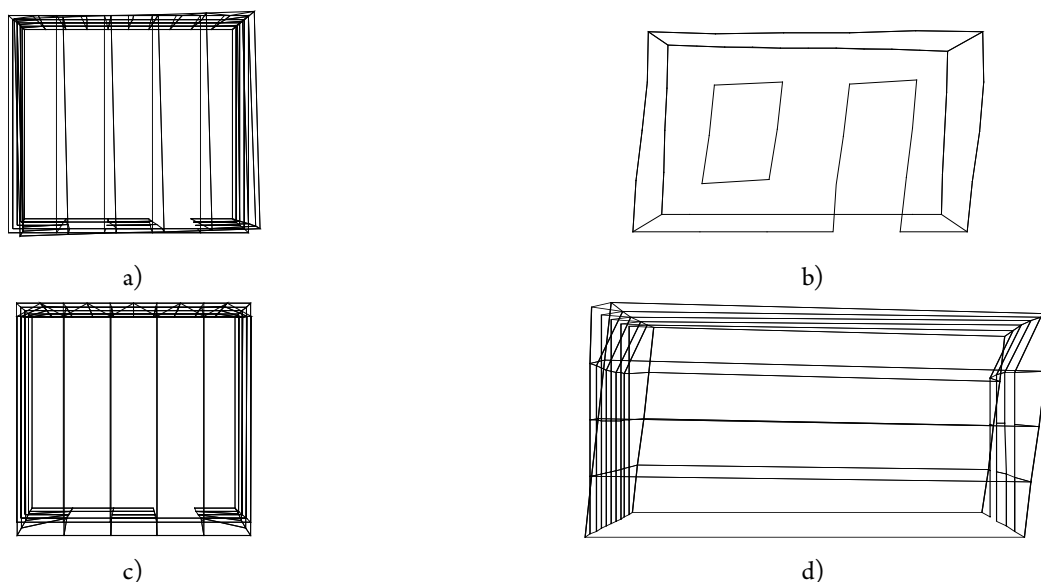


Fig. 1. The main forms of natural oscillations of construction with openings: a longitudinal shift coverage (top view — a, view of the front — b); transverse shift coverage (top view — c, side view — d)

As can be seen from the figure, the first character of the waveform, is accompanied by a small rotation of the shift cover in the longitudinal direction (fig. 1a). Rotate the cover is explained in terms of a small eccentricity between the geometric center of the building ( $X_0 = 2.5$ ;  $Y_0 = 2.0$ ) and the center of mass ( $X_c = 2.49$ ;  $Y_c = 2.14$ ), arising due account openings. The second form of — the shift coating on the transverse direction (fig. 1c).

Theoretically, the resulting primary natural period amounted for buildings of brick walls 0,087 seconds, the second time — 0,07 seconds, and for monolithic earthen construction, respectively, and 0,092 seconds 0,072 seconds. The proximity to the experimental periods (0,09 seconds) indicates a satisfactory choice of the values of physical and mechanical properties of the material of masonry, in particular, the modulus of elasticity needed for fur-

ther strength analysis study of buildings in order to identify their weak areas.

Calculation of the basic structure of the oscillation periods were made of reinforced wooden frame in the corners, on the openings on the facade and in increments of 1 m around the perimeter (fig. 2). The frame is a vertically mounted wooden logs with a diameter  $d = 120$  mm. Moment of inertia in bending was taken by the formula  $J = \pi d^4 / 64$ , and the wood elastic modulus  $E =$

10000 MPa. In this case, the first two periods for the construction of clay reinforced with wooden frame made of  $T_1 = 0,04$  seconds and  $T_2 = 0,038$  seconds, indicating that the doubling of construction rigidity. The corresponding waveforms are shown in fig. 3. From these periods, and forms can be seen that the design has become increasingly fierce, the main forms of steel pronounced longitudinal and transverse vibrations without turning the cover. In this regard, the building has become more earthquake-proof.

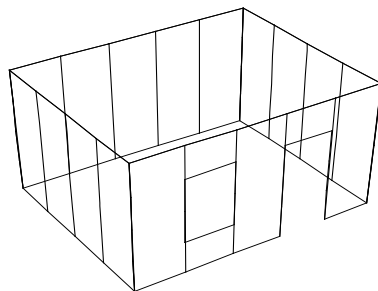


Fig.2. Wooden frame on the perimeter of the building

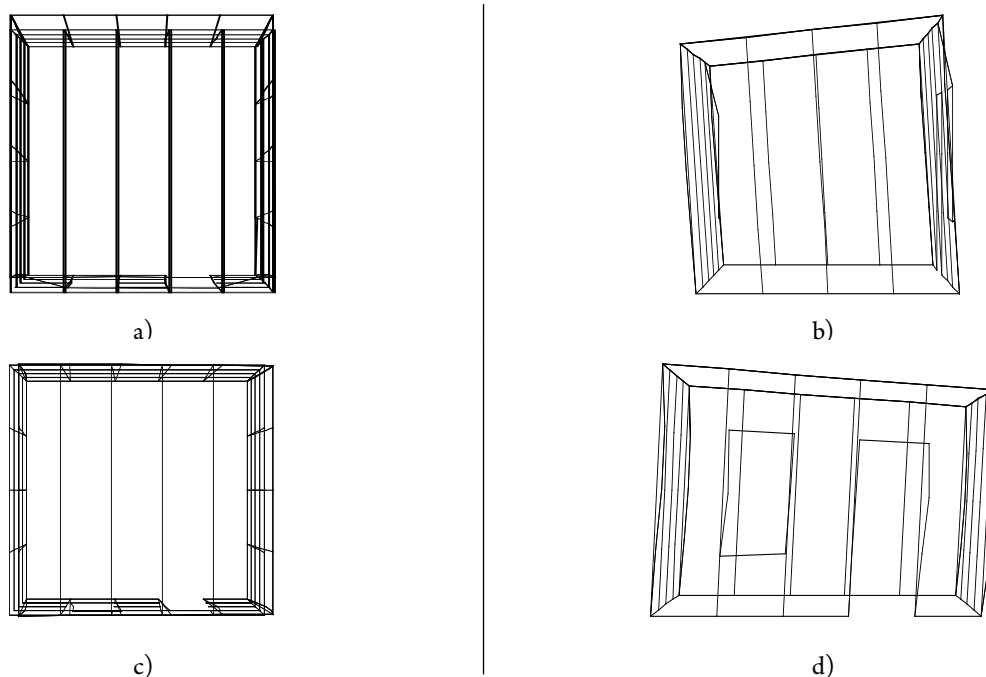


Fig. 3. The main forms of own oscillations of buildings, reinforced wooden frame: the transverse shift coverage (top view — a, and side — b); longitudinal shift coverage (top view — c, and front — d)

Theoretically, a certain period of major fluctuations explain the experimentally obtained a picture of the free damped oscillation as a result of construction of instant relief to delay loading. The initial amplitude of the oscillations depends on the applied load and can be calculated as a result of the calculation of the elastic construction.

Selected on the basis of experimental and theoretical approach the elastic parameters of the masonry used later during strength calculations of buildings of local building materials.

On the basis of the above leads to the following

#### Conclusions and recommendations

1. Using a spatial model in the calculation of clay construction allows for the identification of experimentally and theoretically derived forms of natural oscillations of investigated structures and

choose the values of the elastic parameters of the material masonry (modulus of elasticity), necessary for strength calculations of investigated buildings in order to identify their weak areas.

2. Using a spatial model allows to take into account the existence of a detailed framework for the construction of the perimeter and analyze obtained in this form and frequency of natural oscillations. In particular, the periods and the resulting shape with the presence of the frame on the perimeter of the buildings showed that steel construction is more rigid, the main forms of steel distinct longitudinal and transverse oscillations without turning the coating. This indicates an increase of seismic stability of buildings and can recommend the installation of a wooden frame in the walls of clay buildings.

#### References:

1. Жилые и общественные здания. Краткий справочник инженера-конструктора. Ред. Дыховичного Ю.А. – М.: Стройиздат, 1991, 656 с.



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## The study of seismic stability of a single-storey building with an internal partition with and without taking into account the frame

**Abstract:** The article presents data from a study on the dynamics of the carcass impact (periods and forms the fundamental vibrations) and the stress-strain state of the building with frame and without frame.

**Keywords:** individual buildings, the stress-strain state, the oscillation period, the form of vibrations, dynamic characteristics, finite element method, a spatial model.

We consider the one-storey building with an inner wall, consisting of two rooms, made of burnt bricks, with the masonry modulus  $E = 300$  MPa. Overlap weight is 52 kN. Estimated structure model — spatial box with partition. The method used to determine the stress state of the structure — the finite element method

(FEM). We will explore the carcass impact on the dynamics (periods and forms the fundamental vibrations) and the stress-strain state of the building with frame and without frame under static load. The study was conducted in parallel to the structure without the frame (fig. 1a) and a frame (fig. 1b).

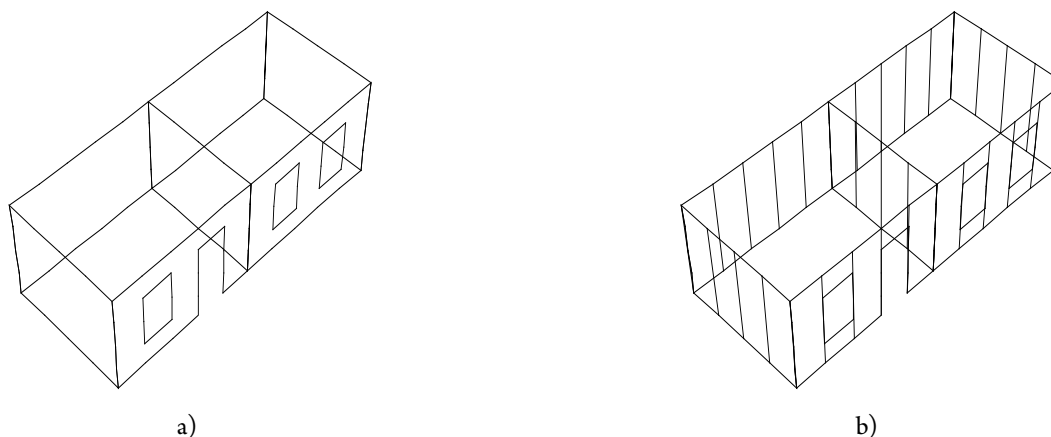


Fig. 1. Model of a single-storey structure with an internal partition: without frame — a) and a frame — b)

Using the finite element method, we obtain a number of tasks for one-storey box with internal baffle with and without taking into account the framework set in increments of 1 m around the perimeter of the exterior walls and internal partition. The framework was considered in two variants: wood, consisting of round logs ( $\varnothing 12$  cm), and the concrete pillar of square section ( $a = 12$  cm) with reinforcement.

The forms and periods of natural oscillations of a single-storey structure with an internal partition. According to the algorithm to solve the problem on their own forms and periods of oscillation. Forms for building vibrations are shown in fig. 2 (without the frame) and fig. 3 (with the frame). Comparison of the respective waveforms shows that the first form, which is the overlap shift for the model without the frame (fig. 2) is accompanied by bending the overlap in their plane. Thus deformed wall portions immediately adjacent to the joints of the walls opposite direction, and an upper layer near ceiling wall. The second form, which represents the torsion of overlap, it is also accompanied by bending and deformation of the wall in its own plane. It can be seen from fig. 2 the deformations rectilinear boundaries of finite elements.

An analysis of the forms of natural oscillations with a skeleton model shows that the vertical and horizontal lines, dividing the model into finite elements do not undergo fracture and overlapping moves like a hard drive, without bending deformations in the plane (fig. 3). I. e. with a skeleton construction works as a spatial system without deformations of each wall separately.

The periods of natural oscillations models without frame for the first two forms, shown in fig. 2, respectively,  $T_1 = 0,075$  seconds and  $T_2 = 0,068$  seconds and for the model with a skeleton (fig. 3) —  $T_{1d} = 0,13$  seconds and  $T_{2d} = 0,1$  seconds (for wooden frame) and  $T_{1b} = 0,1$  seconds and  $T_{2b} = 0,086$  seconds (concrete pillars). Increasing periods of natural oscillations of the building with the frame is also evidence linking the role of a skeleton. As a result, the frame installation box varies as a whole without deformation of its individual faces (walls). A single oscillation system occurs with a longer period than the fluctuation of its individual parts. The relative reduction in oscillation periods built with concrete pillars compared with wooden building explains the increase in stiffness, while the character waveforms remains unchanged irrespective of the carcass.

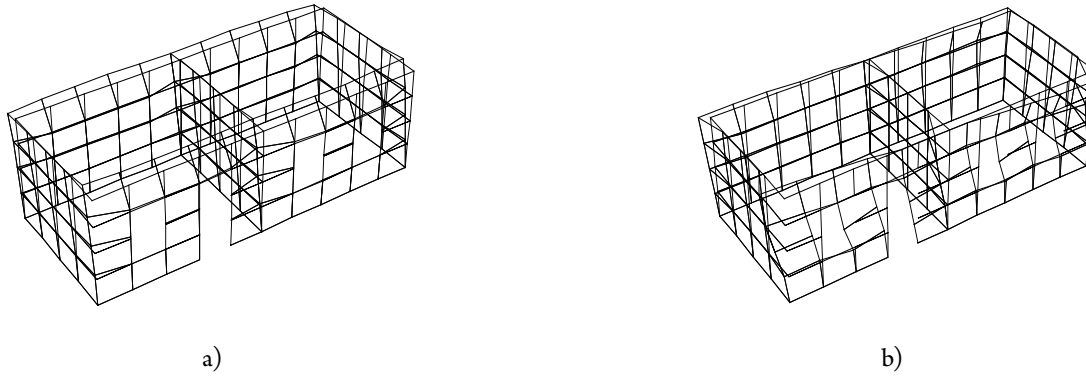


Fig. 2. The first (a) and second (b) forms of natural oscillation model with the internal structure of a single-storey partition

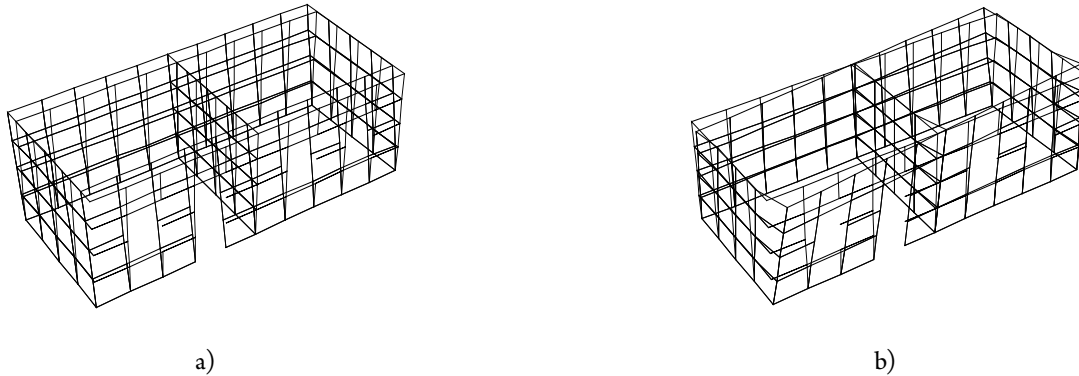


Figure 3. The first (a) and second (b) forms of natural vibration model with one-storey structure with an internal partition frame

Investigation of stress-strain state of one-storey buildings with an inner partition, taking into account the weight of the overlap and the partition. Used for the brickwork, have been found experimentally, the calculation method, the modulus of elasticity  $E = 300 \text{ MPa}$ . Weight overlap in both cases is  $52 \text{ kN}$ . Diagrams vertical displacements are shown in fig. 4, where the maximum displacement is achieved in the upper levels of buildings. For buildings with load-bearing brick walls (fig. 4a) the maximum displacement

under its own weight of overlap and the walls themselves are  $0,3 \text{ mm}$  by almost two orders of magnitude higher than in the construction of a wooden frame (fig. 4b), vertical movement of which, in its turn half superior movement in the construction of a concrete frame. The nature of the distribution diagrams for structures with different frame is the same, quantitative difference reached displacements presented in the tables: with wooden frame – b; with concrete – c.

a)  
 $-3,7 \cdot 10^{-5} \text{ (9)}$ ;  
 $-7,4 \cdot 10^{-5} \text{ (8)}$ ;  
 $-1,1 \cdot 10^{-4} \text{ (7)}$ ;  
 $-1,5 \cdot 10^{-4} \text{ (6)}$ ;  
 $-1,8 \cdot 10^{-4} \text{ (5)}$ ;  
 $-2,2 \cdot 10^{-4} \text{ (4)}$ ;  
 $-2,6 \cdot 10^{-4} \text{ (3)}$ ;  
 $-2,9 \cdot 10^{-4} \text{ (2)}$ ;  
 $-3,3 \cdot 10^{-4} \text{ (1)}$   
 $\max u = 0$   
 $\min u = -3,7 \cdot 10^{-4} \text{ [M]}$

b)  
 $-3,7 \cdot 10^{-7} \text{ (9)}$ ;  
 $-7,4 \cdot 10^{-7} \text{ (8)}$ ;  
 $-1,1 \cdot 10^{-6} \text{ (7)}$ ;  
 $-1,5 \cdot 10^{-6} \text{ (6)}$ ;  
 $-1,9 \cdot 10^{-6} \text{ (5)}$ ;  
 $-2,2 \cdot 10^{-6} \text{ (4)}$ ;  
 $-2,6 \cdot 10^{-6} \text{ (3)}$ ;  
 $-3,0 \cdot 10^{-6} \text{ (2)}$ ;  
 $-3,3 \cdot 10^{-6} \text{ (1)}$   
 $\max u = 0$   
 $\min u = -3,7 \cdot 10^{-6}$

c)  
 $-1,7 \cdot 10^{-7} \text{ (9)}$ ;  
 $-3,5 \cdot 10^{-7} \text{ (8)}$ ;  
 $-5,2 \cdot 10^{-7} \text{ (7)}$ ;  
 $-7,0 \cdot 10^{-7} \text{ (6)}$ ;  
 $-8,7 \cdot 10^{-7} \text{ (5)}$ ;  
 $-1,0 \cdot 10^{-6} \text{ (4)}$ ;  
 $-1,2 \cdot 10^{-6} \text{ (3)}$ ;  
 $-1,4 \cdot 10^{-6} \text{ (2)}$ ;  
 $-1,6 \cdot 10^{-6} \text{ (1)}$   
 $\max u = 0$   
 $\min u = -1,7 \cdot 10^{-6} \text{ [M]}$

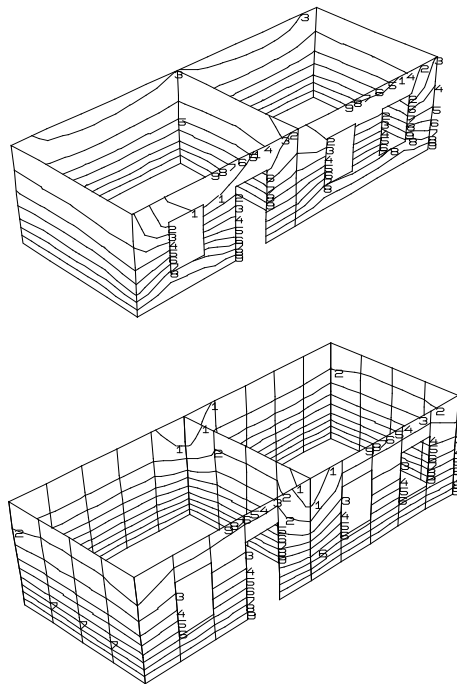


Fig. 4. Diagrams vertical displacements in one-storey building with an internal partition with load bearing brick walls (a) and to the frame (b — wooden, c — concrete) under its own weight

The resulting static loading its own weight and vertical tangents  $\{\sigma_z\}$ ,  $\{\tau_{xz}\}$ ,  $\{\tau_{yz}\}$  stresses in the planes of the walls shown in fig. 5 (for building without a frame) and in fig. 6 (with a frame),

where the first table numeric values refers to the construction of a wooden frame, and the second – with concrete.

- a)  
 $-1 \cdot 10^{-2}$  (6);  
 $-2 \cdot 10^{-2}$  (5);  
 $-3 \cdot 10^{-2}$  (4);  
 $-4 \cdot 10^{-2}$  (3);  
 $-5 \cdot 10^{-2}$  (2);  
 $-6 \cdot 10^{-2}$  (1)  
 $\max \sigma_z = -4 \cdot 10^{-3}$   
 $\min \sigma_z = -6.4 \cdot 10^{-2}$   
 [MPa]
- b)  
 $+2.7 \cdot 10^{-3}$  (5);  
 $+1.4 \cdot 10^{-3}$  (4);  
 $+1.2 \cdot 10^{-4}$  (3);  
 $-1.2 \cdot 10^{-3}$  (2);  
 $-2.5 \cdot 10^{-3}$  (1)  
 $\max \tau_{xz} = +4.2 \cdot 10^{-3}$   
 $\min \tau_{xz} = -3.5 \cdot 10^{-3}$   
 [MPa]
- c)  
 $+1.25 \cdot 10^{-3}$  (4);  
 $+5 \cdot 10^{-4}$  (3);  
 $-2.5 \cdot 10^{-4}$  (2);  
 $-1 \cdot 10^{-3}$  (1)  
 $\max \tau_{yz} = +1.9 \cdot 10^{-3}$   
 $\min \tau_{yz} = -1.7 \cdot 10^{-3}$   
 [MPa]

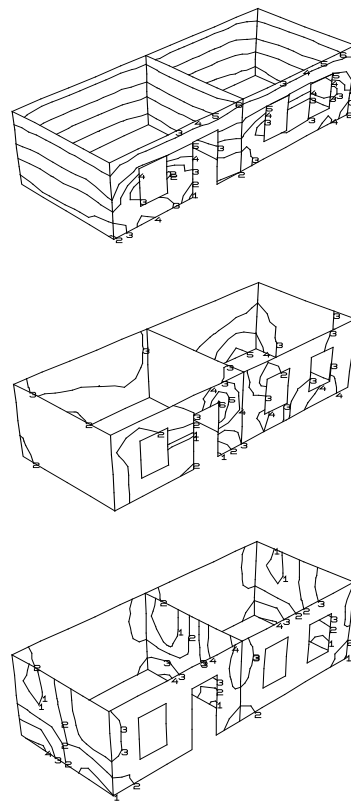


Fig. 5. Diagrams of normal vertical (a) and tangential (b, c) stress in the one-storey building with an internal partition with load bearing brick walls under its own weight

- |                                       |                                       |
|---------------------------------------|---------------------------------------|
| a)                                    |                                       |
| $-5.8 \cdot 10^{-5}$ (5);             | $-1.7 \cdot 10^{-4}$ (5);             |
| $-2 \cdot 10^{-4}$ (4);               | $-2 \cdot 10^{-4}$ (4);               |
| $-3.4 \cdot 10^{-4}$ (3);             | $-2.3 \cdot 10^{-4}$ (3);             |
| $-4.8 \cdot 10^{-4}$ (2);             | $-2.6 \cdot 10^{-4}$ (2);             |
| $-6.2 \cdot 10^{-4}$ (1)              | $-2.9 \cdot 10^{-4}$ (1)              |
| $\max \sigma_z = -5 \cdot 10^{-5}$    | $\max \sigma_z = -2.4 \cdot 10^{-5}$  |
| $\min \sigma_z = -6.8 \cdot 10^{-4}$  | $\min \sigma_z = -3.2 \cdot 10^{-4}$  |
| [MPa]                                 | [MPa]                                 |
| b)                                    |                                       |
| $+2.5 \cdot 10^{-5}$ (6);             | $+7 \cdot 10^{-6}$ (6);               |
| $+1 \cdot 10^{-5}$ (5);               | $-1 \cdot 10^{-6}$ (5);               |
| $-5 \cdot 10^{-6}$ (4);               | $-9 \cdot 10^{-6}$ (4);               |
| $-2 \cdot 10^{-5}$ (3);               | $-1.7 \cdot 10^{-5}$ (3);             |
| $-3.5 \cdot 10^{-5}$ (2);             | $-2.5 \cdot 10^{-5}$ (2);             |
| $-5 \cdot 10^{-5}$ (1)                | $-3.3 \cdot 10^{-5}$ (1)              |
| $\max \tau_{xz} = +5 \cdot 10^{-5}$   | $\max \tau_{xz} = +3.8 \cdot 10^{-5}$ |
| $\min \tau_{xz} = -5.5 \cdot 10^{-5}$ | $\min \tau_{xz} = -4 \cdot 10^{-5}$   |
| [MPa]                                 | [MPa]                                 |
| c)                                    |                                       |
| $3 \cdot 10^{-5}$ (7);                | $9 \cdot 10^{-6}$ (7);                |
| $2 \cdot 10^{-5}$ (6);                | $4.5 \cdot 10^{-6}$ (6);              |
| $1 \cdot 10^{-5}$ (5);                | 0 (5);                                |
| 0 (4);                                | $-4.5 \cdot 10^{-6}$ (4);             |
| $-1 \cdot 10^{-5}$ (3);               | $-9 \cdot 10^{-6}$ (3);               |
| $-2 \cdot 10^{-5}$ (2);               | $-1.3 \cdot 10^{-5}$ (2);             |
| $-3 \cdot 10^{-5}$ (1)                | $-1.8 \cdot 10^{-5}$ (1)              |
| $\max \tau_{yz} = +3.3 \cdot 10^{-5}$ | $\max \tau_{yz} = +2.2 \cdot 10^{-5}$ |
| $\min \tau_{yz} = -3.3 \cdot 10^{-5}$ | $\min \tau_{yz} = -2.2 \cdot 10^{-5}$ |
| [MPa]                                 | [MPa]                                 |

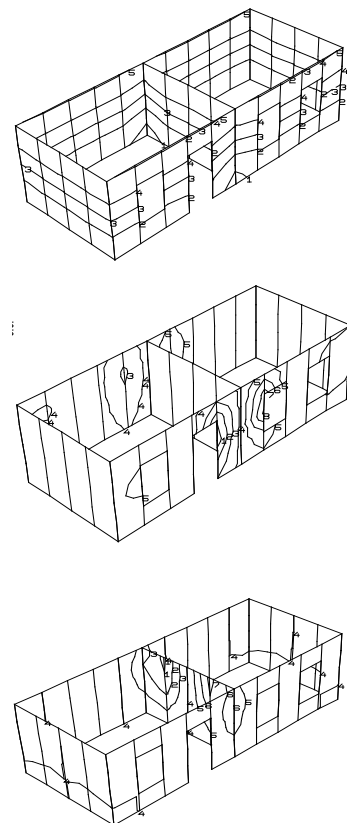


Fig. 6. Diagrams normal vertical (a) and tangential (b, c) stress in the one-storey brick building with an internal partition with a skeleton under its own weight

Comparison of vertical stress values in fig. 5a and fig. 6a shows that the installation of the frame leads to a more uniform distribution of the normal vertical stresses in the plane of the wall even if the wall openings. The maximum compressive stresses in the lower part of the building without a skeleton near the doorway, reaching values of 0,06 MPa (fig. 5a). In the case of a frame, receiving the load from the ceiling, the compressive stresses induced by the action of its own weight only, two orders of magnitude less. Approximately the same quantitative ratio observed in buildings without a frame and with frame and shear stresses in the planes of the longitudinal and transverse walls. At the same time the largest in magnitude shear stresses arise in the front wall in the areas immediately adjacent to the corners of openings (fig. 5b). The presence of the frame not only reduces shear stresses, but also leads to a more even distribution of them on the walls

of the plane (fig. 6b). Concrete frame reduces the stress produced even doubled comparing with the structure having a wooden frame. In general, the vertical static load of its own weight and the weight of the slab does not cause a high tension of the walls of the building, not even a reinforced frame. Of course, this applies to the particular case, when the overlap weight, as stated above, is equal to 52 kN. [1, 158–169].

In general, based on the analysis of the stress-strain state of a single-storey building with an internal partition, you can draw the following conclusion:

Availability carcass unites longitudinal and transverse walls and floor in a single spatial system that has increased resistance applied static load, resulting in movement and level of stresses arising in the walls are greatly reduced in comparison with the same characteristics in the walls are not supported by the frame.

### References:

1. Razzaqov S.J. The earthquake-resistance and stability of buildings and structures built from clay. *Moderner Lehm- und Ziegelbau – 2003. Nachhaltiger Wohnungsbau-Zukunft Ökologisches Bauen*. Fraunhofer IRB Verlag, Auferstehungs-kirche-Berlin, Germany. – S. 158–169.

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## About transfer of effort through cracks in ferro-concrete elements

**Abstract:** The paper discusses new mechanisms of nonlinear behaviour of RC with regard to stress transfer across the cracks. It also gives the results of testing and realization of contact interaction model in cracks.

**Keywords:** ferroconcrete, nonlinear behavior, cracks.

Qualitative change is intense-deformed state ferroconcrete elements after formation of cracks is connected with considerable anisotropy of properties of a material, display of nonlinear deformations, and also variety influence insufficiently known features of teamwork of concrete and armature. Uncertainty these factors bring the greatest at calculations of the ferroconcrete designs having the difficult physical mechanism of destruction as, for example, it takes place at shift or a cross-section bend. For the account of nonlinear properties of ferroconcrete, besides more exact estimation of its fundamental properties, it is necessary to pay attention to creation of models and methods of calculation of the ferroconcrete, reflecting the valid character of their behaviour under loading and a physical essence of problems arising thus.

At calculation of ferroconcrete designs with cracks numerical methods of final differences, the variation — differential and final elements are usually used. As a rule, convergence of iterative process is defined by accuracy of calculations on efforts of values hardly which essentially differ for stages before formation of cracks. In existing programs the account cracks formations is made by various models of the discrete crack which development on border of final elements is represented rupture of communications in knots. Common faults of this approach are restriction of a direction of development of a crack of orientations of knots of a final element and discount contact interaction of coast of a crack. Partially these restrictions are eliminated by «spreading» cracks on element volume in the assumption that directions of the main pressure or are parallel or perpendicular orientations of the cracks which surface is not capable to transfer stretching or shifting efforts. It automatically excludes what or redistribution of efforts after cracks formations, and the module of shift rigidity  $G$  thus is accepted equal to zero.

Other extreme measure, i. e. maximum resistance to a cut after cracks formations, is offered in norms CEB — FIP [3]. Probably, the decision at which decrease in rigidity of an element to certain size depending on width of disclosing of the cracks formed in it would be considered is compromise.

The made observations specify in extreme importance of researches of the mechanism of transfer of pressure through cracks in ferroconcrete elements. Such researches demand studying various mechanical and geometrical parameters in this connection working out of corresponding mathematical models should lean against adequate experimental data. First of all it concerns researches of the mechanism and features of transfer of shift pressure through a crack in the course of contact interaction of its coast. An important step forward in this direction was the deformation theory ferroconcrete with the cracks. In it ferroconcrete considers as physically nonlinear anisotropic material, and receiving on its basis of dependence and the calculation program on the computer are confirmed experimentally and spreading in designing practice. If at compression and a stretching mechanism transfers of pressure through cracks has found a sufficient experimentally-theoretical substantiation at a cut it is investigated obviously insufficiently. Here it is a question of the new factors shown in cracks at mutual shift of their coast: tangents of forces hitches and treenail actions armatures cores. Cracks in concrete, developing, pass through a cement stone, grains of a filler and a contact zone, forming two cooperating rough surfaces of difficult geometry. They also provide transfer of shifting pressure through cracks by mechanical gearing and a friction. Researches have shown [2] that the assumption of full restraint of tangents of displacement in cracks at such gearing does not represent the facts. More over, displacement tangents can serve more exact exponents

presence of shift pressure in cracks, than width of disclosing of a crack. Treenail action of armature is shown in a local bend, a cut and an excess of the cores crossing a crack.

Some underestimation of a role of tangents of forces of gearing in cracks at designing of ferroconcrete designs with short of disperse reinforcing, characteristic for covers, box-shaped beams and plates, retaining walls, beams-walls, pressure vessels etc., is based on a popular belief that the friction in cracks are sizes of a variable and he can be neglected in stock durabilities. However last researches [1; 2] have revealed an inaccuracy of such argument. The matter is that at mutual tangential displacement  $\delta_{cr}$  crack coast happen its normal disclosing  $a_{cr}$  (dilatancy) owing to mutual gearing of roughnesses on crack surfaces (fig. 1a). Therefore the width of its disclosing in a stage exploitation can appear considerably bigger, than it is supposed calculation on effective standards. Typical results of tests of the reinforced samples-disks on shift (fig. 1b) have shown that in armatures the cores crossing such crack, there can be considerable additional pressure.

Revealing of models of display of forces of gearing in a crack at shift for forecasting of rigidity and limit resistance of the mechanism of contact interaction in cracks demands special researches. Such as models should reflect influence structural peculiarity concrete and consider the mechanism axial and tangential rigidity of the armature crossing a crack. Widely used and become classical the concept about width of disclosing of cracks in ferroconcrete is defined as

mutual equal to displacement of its coast in a normal direction. For the general case when crack coast along with the normal test also tangential mutual mixtures, this concept should include dilatancy, defining essential distinction in width cracks on various sites on its length. At practical using models of the mechanism of gearing the knowledge of dependences  $\tau_{cr} = f(\delta_{cr}, a_{cr})$  and  $\sigma_{cr} = f(\delta_{cr}, a_{cr})$  for four variables (fig. 1b) is necessary: Tangents and normal pressure ( $\tau_{cr}, \sigma_{cr}$ ) and displacement corresponding to them ( $\delta_{cr}, a_{cr}$ ). Such dependence will reflect one of fundamental physic-mechanical properties of ferroconcrete as cracking a material, defining its behaviour under loading. It does by its most convenient tool in realisation of the concept of the "smeared" cracks at calculations of ferroconcrete designs by numerical methods.

In work [1, 2] the detailed analysis of researches is carried out according to forces of gearing in cracks which can be divided conditionally on groups with following characteristic test specifications: at external relations (draughts) of constant rigidity; at internal "reinforcing" of variable rigidity; at constant controllable disclosing of a crack ( $a_{cr}$ ); at constant controllable normal pressing  $\sigma_{cr}$ ; at the fixed constant width of disclosing of a crack with the controllable relation  $\tau_{cr}/\sigma_{cr} = const$ . The similar analysis of researches treenail armature actions has allowed to reveal following groups: direct tests for a cut of samples-disks; tests of fragments of beams; tests of full-scale beams with treenail loose leaves; tests of samples-blocks.

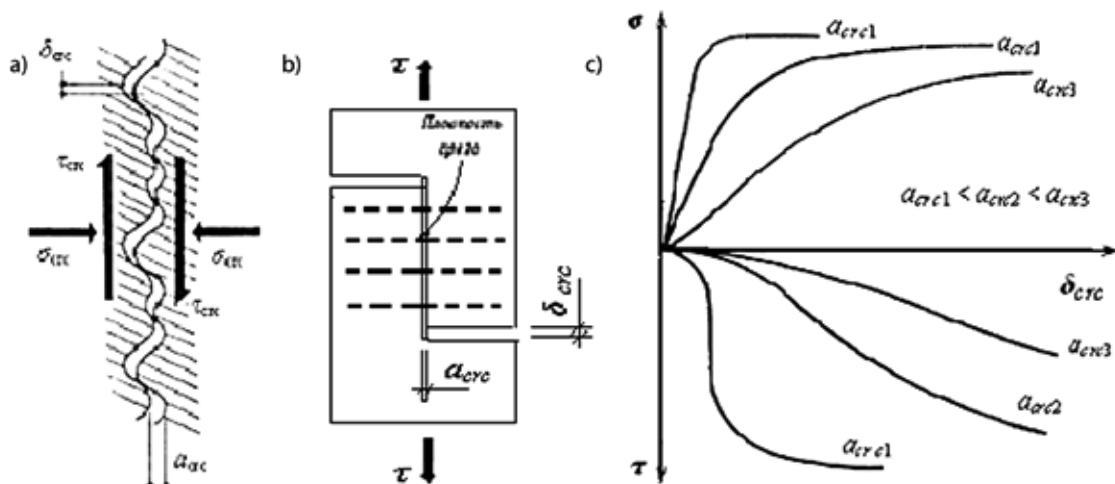


Fig. 1. Contact interaction in cracks at shift (a), typical test pieces on shift (b) and schedules of dependence of displacement in a crack from pressure (c)

The analysis of results of researches has shown that normal disclosing of a crack is the key factor in the mechanism of transfer of tangents of forces of gearing through cracks. Shift rigidity grows in a crack with increase percent of reinforcing and that more than above durability of concrete and is better its coupling with armature. It is thus noticed that behaviour samples at powerful "reinforcing" of a crack or high significance  $\sigma_{cr}$  practically did not differ from behaviour of samples without cracks.

In the spent researches of the mechanism of transfer of pressure through cracks [2] skilled special disks with the initiated crack were made of easy, heavy and high-strength concrete and were tested on shift under the scheme on fig. 1b. Samples concerned the first series without cross-section reinforcing with free normal displacement of coast of a crack. The second series of samples tested at the fixed values of initial width of a crack which was regulated by screws on steel draughts with controllable normal stretching pressure. Thus, besides pressure of shift the normal pressure arising from dilatancy of disclosing of a crack were supervised. Samples of this series have

been intended not only for definition of limiting durability of gearing in the cracks testing action normal closing-up but also also for revealing of character of dependence " $\tau_{cr} - \delta_{cr}$ ". The third series of samples armatured cores of class A-I, A-III and A-IV. On each series of samples the family of skilled curves  $\tau_{cr} = f(\delta_{cr}, a_{cr})$  and  $\sigma_{cr} = f(\delta_{cr}, a_{cr})$  taking into account influence of a kind and durability of concrete, width of disclosing of a crack, size  $\sigma_{cr}$  and percent of cross-section reinforcing (fig. 1b) is received.

Results of tests have shown that the concrete kind influences both limiting resistance to shift, and on deformation behaviour samples. Despite various behaviour under loading, for each kind of concrete the limit of shift durability which at ceramic-concrete has appeared much more low, than at heavy, even at considerable to smaller width of disclosing of a crack is characteristic. At the big disclosing of cracks in samples with a considerable quantity armature cores in these sections shift rigidity was observed less. The average width of disclosing of a crack in ceramic-concrete samples of the second series has appeared almost identical, but in spite of

that the size and has disorder in 55%, rigidity of samples offered almost identical.

For the description of processes contact interaction in cracks at shift has been used the imitating modelling based on the stereologic analysis of surfaces of cracks and structure of a material. As the initial the model of structure of concrete in which dense inclusions of a filler are dispersed in mortar to a matrix in a random way was considered. Development of deformations of shift is shown at the expense of plastic deformation of a material in zones of contact of ledges on all surface of a crack. Projections of the area of mutual contact in orthogonal directions for the given type and the volume maintenance of fillers is function  $\delta_{cr}$  and  $a_{cr}$ . By methods of the statistical analysis it was calculated probable number particles defined short of which were crossed by a crack on individual length. Possible distribution of the sizes of grains full out being continuous function, it was considered on the basis of an experimental curve  $\rho_{cr}$  and for its description function of density of probability was used. The most probable general line of contact interaction received by integration on all interval of change of diameters distribution inclusions. The models of a drawing of dependence received at realisation  $\tau_{cr} = f(\delta_{cr}, a_{cr})$  and  $\sigma_{cr} = f(\delta_{cr}, a_{cr})$  close enough approximated

skilled curves. Integration of the received expressions was made for the area of mutual contact under the special program which easily unites with commercially accessible programs for calculations of ferroconcrete designs by method and others numerical methods.

Further models of development of critical inclined cracks in ferroconcrete beams, rectangular and T sections for experimental and estimations of the basic components of their resistance to a cut have been developed. Proceeding from conditions balance internal efforts analytical expressions, value shift rigidity in cracks of beams by use of skilled sizes dilatation displacement of their coast have been received.

For check of theoretical positions the program of tests ferroconcrete rectangular and T-beams from heavy and ceramic concrete by which results have been revealed is spent: levels of an ultimate load and character of destruction of beams; deformation in concrete on height of section and deflections of beams; comparative deformations in longitudinal and cross-section armature; dilatations and shift displacement of coast of cracks by specially developed technique; compression deformations in inclined concrete strips of edges T-beams. Calculations of bearing ability of beams at a cross-section bend have shown satisfactory conformity with the data of test of skilled beams.

### References:

1. Ашрабов А. А. Лёгкий бетон и железобетон для индустриального строительства. – Ташкент. “Фан”, 1988.
2. Ашрабов А. А. Оценка напряжений, передаваемых через трещины и стыки в железобетонных элементах. Научно-техн. журнал СамГАСИ «Проблемы архитектуры и строительства», – № 3, 2007.
3. Committee Euro-International du Beton. (1990). CEB – FIP Model Code 1990, CEB, Paris, Sept. – 1990. Bulletin d’Information 195.

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## Improving working efficiency and durability of cast parts of tilling machines

**Abstract:** chemical composition of hard alloy metal, microstructure of 35GL steel, phase composition, hardness, microhardness and depth of the hard-face coating were studied on the samples and part, resulting in casting on gasified styrofoam consumable pattern, on the work surface of which the powdered hard alloy metal is applied. There are given results of abrasive wear of cast hard-face coated samples before and after heat treatment with the double phase recrystallization. It is shown that the thermal processing with double phase recrystallization increases abrasive wear resistance in 3.0–3.5 times.

**Keywords:** cavityless casting, hard-coated, 35GL steel, coating thickness, thermal treatment with double phase recrystallization, microstructure, performance and durability of products.

**Introduction.** At present the recommendations for choosing of materials for manufacturing molded parts of machines and equipment subjected abrasive-corrosive wear usually do not consider the influence general corroding processes whose contribution to the overall wear of parts and equipment at relatively low external micro-wear is very substantial [1]. Therefore, study of peculiarities of abrasive-corrosive wear in corrosive environments is of great scientific and practical importance.

The most parts of machines and equipment operate under abrasive corrosive wear conditions when the material of details are required to be at the same time abrasive wear resistance and corrosion resistance. The life of these components is limited due to simultaneous exposure to abrasive and corrosive media. All this requires a constant renewal of technological equipment and spare parts.

*The aim of this work* is developing a production technology of foam model and producing of cast parts of various machines and equipment with wear-resistant hard-alloy coating by casting on gasified models and their subsequent thermal treatment with double phase recrystallization [2]. The aim of the work was also to establish the possibility of effective surface hardening and improving wear resistance of 35GL steel by treating its working surface reliable and powerful hard-alloy coating.

It is known that many of the details of tillage and mining machines, working in direct contact with soil or rock, are exposed to hardfacing [3; 4]. This requires application of quite complex technological equipment associated with high consumption of scarce hard alloys and fluxes.

It is more rational to get these components by casting on gasified cellular polystyrene models with simultaneous applying a wear-

resistant hard-alloy coating on the working surface of a foam model with dressing width of 2.0–3.0 mm [5].

Wear parts include tusks and paws cultivators tines, operating in the soil under the action of the abrasive medium. Therefore, the working surfaces of such parts are subjected to surface hardening by applying a hard-alloy cast of Sormayt PG-C27 type. Applying the hard-alloy coating is carried out by melting the metal coating on the working surface of the cast parts.

In this paper microstructure and abrasive wear of cast parts with hard-alloy coating obtained by casting on gasified models before and after treatment with double phase double recrystallization are investigated.

**The methodology of the study.** The chemical composition of the weld hard alloys such as sormayt PG-C27 (alloy composition: C 2,5–3,0; Si 0,8–1,2; Mn 0,7–1,0; Cr 27–29; Ni 0,6–1,0; P 0,03; S 0,03). Cast specimens were made of 35GL steel so that 2.0–3.0 mm of a hard alloy layer occur on the working surface of items turned 2 (steel composition: C 0,3–0,4; Si 0,2–0,4; Mn 1,2–1,5; Cr to 0,3; Ni up to 0,3; Cu up to 0,3; P 0,03; S 0,03). Melted hard alloy metal of Sormayt PG-C27 type has a melting point of 1200–1280°C with relatively high wear resistance and toughness. Low melting temperature is 270–320 °C lower than temperature of the cast metal promoting to full penetration and good contact with the base metal of 35GL steel. Choice of hard metals as objects of study is due to the need to study the effect additives of alloying elements inputting into the structure on the coating and abrasive wear resistance of steel castings [2; 3].

The technology of manufacturing products by casting based on gasified models includes manufacture of cellular polystyrene models. A liquid suspension is applied on the working surface of the model, consisting Sormayt PG-C27 powder. When manufacturing a suspension as a binder pulverbakelite and a 4% solution of polyvinyl alcohol were used. The layer thickness was 2.0, 2.5 and 3.0 mm. After drying of the coating model was moulded in quartz sand (simultaneous compacting by pneumatic vibration takes place) and filled with liquid metal, with the composition appropriate to the composition of 35GL steel at 1650 °C through the gating system with siphon gating. When pouring there took place burning of a model and saturation of the cast surface by carbon up to 0.7% at the depth of 0.40–0.80 mm. In this way casting of a part with wear-resistant hard alloy coating is produced. Fill-out out with liquid metal is one of the main stages of moulding of casting, which determines many of its quality indicators.

Casting by gasified models polystyrene is increasingly used and recognized in many steel mills and machine shops of our country, intensive research and development of new innovative technologies, expanding the scope of its use for the different nomenclature of castings parts. It is possible to increase the efficiency of production by reducing the complexity of manufacturing penomodels and castings, as well as improve the quality of steel and cast iron castings: to increase their accuracy, to provide a smooth surface and reduce the machining allowance or do without it.

In case of contact of insert of Sormayt powder with liquid metal forming of solid crusted casting, melting of an insert, interaction of the liquid phase inserts with brown material of a crust occur and after crystallization there occurs forming of the structure of high-alloy white cast iron of eutectic or hypereutectic compositions on the surface. The transition from a wear-resistant coating to the base metal is sharp enough, although there are transition zones from hypereutectic of the eutectic, hypoeutectic zone to the zone of hyper-eutectoid steel. The presence and thickness of hypereutectic zone

depend on thickness of the coating on the model, hypereutectic zone is maximum at the coating thickness of 2.5 mm [5].

Macro and micro investigations were carried out by optical metallographic microscope MBS-1, MBS-9, MIM-8 and Neofot-21. Test specimens were round and consisted of four quadrants with dimensions of 12×12, 15×15, 15×20, 20×20 mm, and others.

The microstructure and micro-hardness of hard-alloy coatings after heat treatment vary considerably. If tempering is carried out with heating temperature 900 °C, then pearlite structure component undergoes martensitic transformation. Location of a carbide component is not changed. The coating depth does not change consisting both of hard-alloy layer and high-carbon sublayer. For example, after quenching samples at heating temperature 900 °C and 920 °C obtained by molding with 2.5 mm thick, the structure of eutectic component and arrangement of secondary carbides did not change. Only instead of pearlite component fine-needled martensite is observed.

When heated to the hardening temperature 1050–1100 °C all secondary carbides are dissolved in austenite, only primary carbides remain in the eutectic composition. The samples, carbide coatings of which were obtained when casting on gasified models with 2.5 mm thick the structure consisting of eutectic carbides and martensite is formed on the surface. On the microstructure there can be easily seen martensitic needles, retained austenite, primary carbides and underlayer of high-carbon martensite (fig.1, a, b, c). A similar pattern is observed when considering the coatings microstructures in the samples obtained by lost foam casting with the thickness of 2.5 and 3.0 mm. In these cases, on the surface there are primary carbides and fine martensite observed (fig.1, c) [5].

**Results and discussion.** The hardness of the specimens was determined on Brinell TVB-4 and Rockwell TK-2 devices and micro-hardness was measured on a PMT-3 device at the load of 0.5 N. Abrasive wear of special samples and components were tested on PV-7 friction machine.

Microhardness within the limits of thickness of hard alloy coating varies widely. The highest microhardness are in the samples obtained with dressing layer thickness of 2.5 mm on the model. At the surface hypereutectic structure with a large number of primary chromium carbides with a hardness of  $NV_{100} = 15300$  MPa is formed. At the same time, microhardness of pearlite component of the eutectic is 7300 MPa. At the depth of 0.7–1.4 mm from the surface of coating depending on the dressing thickness the structure of the base metal hardness of 2600 MPa is already observed.

Specimens with hard-alloy coating for X-ray diffraction tests were round and with four quadrants with dimensions of 20x20 and 22x22 mm. Phase composition of hard alloy was determined by X-ray analysis (DRON-2.0), and phase analysis results give a better idea of the composition of the resulting coatings. The width of the X-ray lines was determined at half of a maximum height as the arithmetic mean of the four or five diffraction patterns or curves of distribution of X-ray radiation intensity [6]. Measurement errors calculations showed that they were within 5–10% depending on the study object. According to the research results it was found that on the specimen surface with wear-resistant coating special types of carbides  $Me_{23}C_6$ ,  $Me_7C_3$  and others are formed.

Comparative tests for abrasive wear resistance for a fixed abrasive were carried out in a laboratory unit as described in [7]. The specimens of 70 mm long, 35 mm wide and 15 mm thick were tested on PV-7 machine, for sand were tested on quartz basis. The relative wear resistance was determined by the ratio of relative loss of the cast piece standard weight (steel 35GL) with wear-resistant carbide coating and weighed by the gravimetric method (VLA 200-M) after each test abrasion.

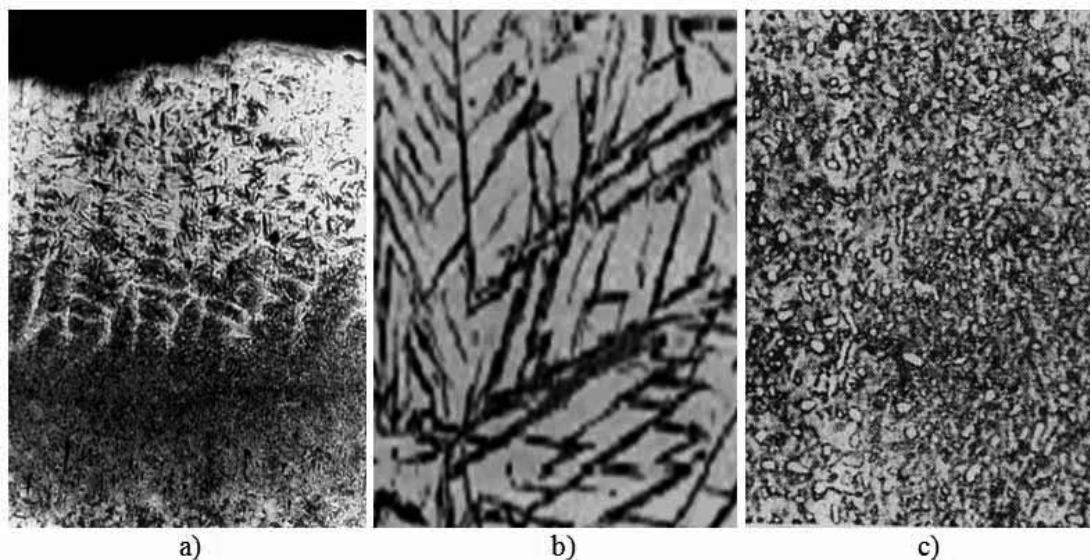


Figure 1. Microstructure of hard-alloy coating and high-carbon sublayer in the specimen obtained with coating thickness of 2.5 mm (a) X200 and 3.0 mm (b, c) X500 after tempering at heating temperature of 1100 ° C, drawback — 300 ° C. The structure of coarse and fine martensite, residual austenite at a depth of 0.6 mm from the surface of the carbide layer.

All specimens with hard coating before and after heat treatment with double phase recrystallization were tested for abrasion wear resistance. Tests for abrasive wear of had alloy coatings in time  $\tau$  were conducted on friction machine PV-7 using abrasive loose material. Hard-alloy coating dramatically increases durability: the thicker the

coating, the smaller the amount of wear. The results of abrasion test of a case specimen № 20 and № 22 with 2.5–3.0 mm thick coating before and after heat treatment with a wear-resistant hard-alloy coating are shown in table 1 and 2 below.

Table 1. – Abrasion wear of cast piece № 20 with coating thickness of 2.5 mm

Item №	Steel grade	Time of testing, min	Wear before testing, mg	Wear after testing, mg	Wear difference before and after the test, mg
<b>before heat treatment</b>					
1.	35GL	30	143,5598	143,5581	0,0017
2.	35GL	60	143,5581	143,5567	0,0014
3.	35GL	90	143,5567	143,5557	0,0010
4.	35GL	120	143,5557	143,5551	0,0006
5.	35GL	150	143,5551	143,5548	0,0003
6.	35GL	180	143,5548	143,5548	0,0000
<b>after heat treatment</b>					
1.	35GL	30	139,6373	139,6367	0,0006
2.	35GL	60	139,6367	139,6364	0,0003
3.	35GL	90	139,6364	139,6362	0,0002
4.	35GL	120	139,6362	139,6362	0,0000

Table 2. – Abrasion wear of cast piece № 22 with coating thickness of 3.0 mm

Item №	Steel grade	Time of testing, min	Wear before testing, mg	Wear after testing, mg	Wear difference before and after the test, mg
<b>before heat treatment</b>					
1.	35GL	30	144,7689	144,7673	0,0016
2.	35GL	60	144,7673	144,7660	0,0013
3.	35GL	90	144,7660	144,7651	0,0009
4.	35GL	120	144,7651	144,7646	0,0005
5.	35GL	150	144,7646	144,7644	0,0002
6.	35GL	180	144,7644	144,7644	0,0000
<b>after heat treatment</b>					
1.	35GL	30	140,2445	140,2440	0,0005
2.	35GL	60	140,2440	140,2437	0,0003
3.	35GL	90	140,2437	140,2436	0,0001
4.	35GL	120	140,2436	140,2436	0,0000



As seen from tables 1 and 2, the tests carried out by us for abrasion wear with samples of coating thickness of 2.5–3.0 mm were completely consistent with the results of field trials, which do increase performance and durability of molded parts of tillers after heat treatment with dual phase recrystallization to two or three times.

Heat treatment affects not only wear resistance of surface, but the subsurface layers of hard-alloy coatings. This is important for a number of parts of tillers, where the wear limit can be about one millimeter. When comparing wear resistance of specimens with hard-alloy coatings before and after heat treatment it can be found that the effect of this treatment on the layer depth is increasing from 7% at the depth of 0.6 mm to 90% at the depth of 1.4 mm.

The technologies of application of hard-alloy coatings in molding based on consumable patterns and subsequent thermal treatment with double phase recrystallization developed by us were used in production of an experimental batch of cast parts and tested under field conditions in different regions of the country. Field

test results have shown that the wear resistance of cast steel parts with hard-alloy coating without heat treatment, compaction stability and increase in wear resistance of 2.2–2.6 times, and after heat treatment with dual phase recrystallization are 3.0–3.5 times higher than that of commercially available products [8; 9].

**Conclusions.** Thus, it can be concluded that the effective way to increase the abrasive wear resistance is to apply wear-resistant hard-alloy coating with molding based on consumable patterns to operating surfaces of the products. Heat treatment hard-alloy coating of high-chromium alloy carried out with double phase recrystallization, is forming optimal structure of high-density dislocation, disperse and secondary coagulated primary carbides. The data submitted show that heat treatment of hard alloy coating with a double phase recrystallization increases the efficiency and durability of finished castings in three or more times. The developed technology was implemented in production of «Metallmexqurilish» HK and «Uzmetkombinat» JSC with a good economic effect.

### References:

1. Mavlyanov N. M. Improving reliability of the working bodies and quality of presowing and sowing machine-tools. – Tashkent: Mehnat, 2000. – 462 p.
2. Tilabov B. K., Mukhamedov A. A., Islamkulov K. M. Getting hard-alloy wear-resistant coatings on operating surfaces of machine parts//Bulletin (Khabarshysy) of the International Kazakh-Turkish University named after K. A. Yassavi. Turkestan. – Kazakhstan. – № 3. 2004. 21–24 p.
3. Mukhamedov A. A. Effect of heat treatment on the wear parts with hard-alloy coatings. Monthly scientific-technical and industrial journal//Physical metallurgy and heat treatment of metals. MiTOM. – Russia. 2003. – № 3. 29–31 p.
4. Tkachev V. N. Depreciation and increase of durability of working organs of tillers. – M.: Engineering, 1996. – 293 p.
5. Tilabov B. K. The wear resistance of melted hard alloy of PG-C27 type with metastable austenite and martensite. Republican Inter-university collection of scientific papers. “Current issues in the field of technical and socio-economic sciences”. – Tashkent: Issue 1, 2011. 359–362 p.
6. Skakov Y. A. Crystallography, X-ray and electron microscopy. – M: Metallurgy, 2010. – 632 p.
7. Tenenbaum M. M. Resistance to abrasion. – M.: Engineering, 1996. – 267 p.
8. Mukhamedov A. A. Heat treatment with double phase recrystallization for improving service properties of machine parts and tools//Heat treatment and technology of surface coating. Materials of the Congress. Vobume v. MOTO. December 11–14. – Moscow, 1998. P. 38–39.
9. Tilabov B. K. Increase the service life of cast parts tillihg machines. International Conference «Global Science and Innovation» March 23–24, 2016. USA. Chicago, 2016. C. 222–225.

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## Results of the done theoretical research for choosing the type of hole of the corn sheller sieve and determining its useful area coefficient

**Abstract:** In the article results of the done theoretical research are illustrated which are about choosing the type of hole of the corn sheller machine sieve and determining its useful area coefficient.

**Keywords:** corn, pith, husk, grain, corn sheller, sieve, types of the hole.

Nowadays, requirement is increasing for grain of the corn in Uzbekistan. However, farmers are coming face to different difficultness

to harvest the corn for grain. According to above written problem, a new type corn sheller machine was created at scientific research In-

stitute for mechanization and electrification of agriculture of Uzbekistan and it is being developed for modern requirement [1].

When an experimental sample of the corn sheller was tested, results were that threshing efficiency was 99.4 per cent, damaging of the grain was 0.9 per cent, cleaning efficiency of the grain was 99.2 per cent, above written indexes answer to the requirement. However, it was known that the amount of the grain which was coming through pith and husk outlet of the corn sheller included 4.7–5 per cent [2].

For the purpose to prevent the defect of the corn sheller machine we researched and found technical solution [3]. According to the done research, the sieve was installed opposite of pith and husk outlet of the corn sheller, every hole's size was 15 mm.

The technological process of the corn sheller sieve is difficult for separating the grain from pith and husk, the grain must be separated from pith and husk by sieve's hole, pith and husk must not be gathered on surface of the sieve and it must be provided that, the grain must be separated also pith and husk must fall down from sieve on time during work process.

According to above written work process, for increasing of work efficiency of the sieve the hole type must be selected correctly and fixed up also it is demanded that, the coefficient of the useful area of sieve should be determined according to the selected holes.

The main constructive parameters of the sieve are width of the sieve  $B_s$ , its length  $L_s$  and the area of the sieve holes  $S_H$ . The number of the holes and their position influence straightly to the work efficiency of the sieve. The quantity of the holes is characterized with coefficient of the useful area of sieve  $\mu$  and it depends on the area of the all holes  $F_0$  also the total area of the sieve  $F$  and it is determined by following formula [4]:

$$\mu = \frac{F_0}{F} \quad (1)$$

here  $F_0$  — an area of the all sieve holes,  $m^2$ ;

$F$  — a total area of the sieve,  $m^2$ ;

$\mu$  — a coefficient of the sieve useful area.

An area of the all sieve holes  $F_0$  is determined by the following formula:

$$F_0 = N_{N.H} \cdot S_{A.H.} \quad (2)$$

here  $N_{N.H}$  — a number of the all sieve holes, piece;

$S_{A.H.}$  — the area of the one hole,  $m^2$ .

For choosing the type of hole of the corn sheller sieve at first we counted by circle form holed sieve (figure 1).

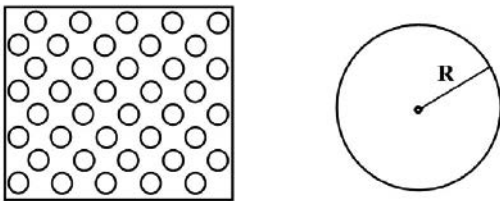


Figure 1. The scheme of the circle formed hole sieve

According to figure 1,  $S_{A.H.}$  in the (2) is equal to following formula for circle holed sieve [5]:

$$S_{A.H.} = \pi R_H^2 = \frac{\pi D_H^2}{4}, \quad (3)$$

here  $R_H$  and  $D_H$  are radius and diameter of the sieve hole respectively, mm.

If we put (3) to the (2), so, formula (2) is seen by following form:

$$F_0 = N_{N.H} \cdot \frac{\pi D_H^2}{4}, \quad (4)$$

When we did the experimental research on corn sheller machine, it was seen that, 4.5–5 per cent grain had been coming out together with pith and husk through pith and husk outlet of the corn sheller machine. Then, we made a decision that it is optimal solution to separate grain from pith and husk by the even surface sieve which is formed rectangle. So, the surface of the sieve is equal to following formula:

$$F = B_s \cdot L_s, \quad (5)$$

here  $B_s$  is width of the sieve and  $L_s$  is length of the sieve.

According to above written (4) and (5) equalities, formula (1) is seen by following manner:

$$\mu = \frac{N_{N.H} \cdot \left( \frac{\pi D_H^2}{4} \right)}{B_s \cdot L_s}. \quad (6)$$

So, the coefficient of the useful area of circle form holed sieve is determined according to formula (6). Now, if we imagine the sieve hole of the corn sheller is equal side triangle (figure 2).

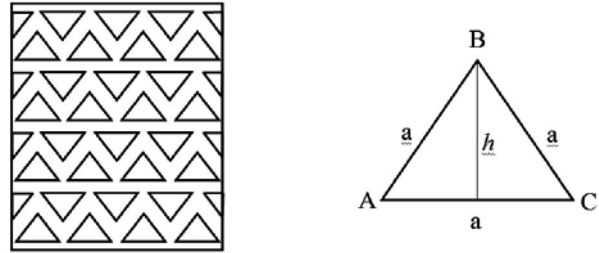


Figure 2. The scheme of the equal side triangle formed hole sieve

According to figure 2,  $S_{A.H.}$  in the (2) is equal to following formula for equal side triangle form holed sieve [5]:

$$S_{H.A} = \frac{a^2 \sqrt{3}}{4}, \quad (7)$$

here  $a$  — length of the one side the equal side triangle,  $h$  in the figure 2 is equal to the following formula:

$$h = \frac{a\sqrt{3}}{2}, \quad (8)$$

However,  $h$  has to be equal to the following formula for easy going down of the grain through sieve hole:

$$l_s \leq h = \frac{a\sqrt{3}}{2}, \quad (9)$$

here  $l_s$  — length of the grain, mm.  $a$  in the formula (7) may be determined by the bellow formula:

$$\cos \alpha = \frac{h}{a}, \quad (10)$$

If we determine  $a$  by the formula (10), it is seen by following manner:

$$a = \frac{h}{\cos \alpha}, \quad (11)$$

So, formula (7) is seen by next formula:

$$S_{H.A} = \frac{\left( \frac{h}{\cos \alpha} \right)^2 \cdot \sqrt{3}}{4}, \quad (12)$$

If we put (12) to the (2), so, next formula is appeared:

$$F_0 = N_{N.H} \cdot \frac{\left( \frac{h}{\cos \alpha} \right)^2 \cdot \sqrt{3}}{4}, \quad (13)$$

According to above written (5) and (13) formulas, the coefficient of the useful area of equal side triangle hole sieve is determined by the following manner:

$$\mu = \frac{N_{N.H} \cdot \left(\frac{h}{\cos \alpha}\right)^2 \cdot \sqrt{3}}{B_s \cdot L_s} \quad (14)$$

Then, if we imagine the sieve hole of the corn sheller is rhomb form (figure 3).

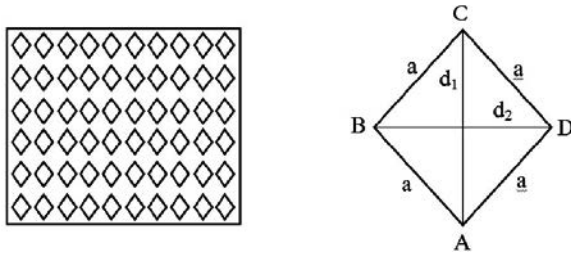


Figure 3. The scheme of the rhomb formed hole sieve

So, according to figure 3,  $S_{A.H}$  in the (2) is equal to following formula for rhomb form holed sieve [5]:

$$S_{A.H} = a^2 \sin \alpha, \quad (15)$$

According to scheme of the figure 3,  $d_1$  and  $d_2$  must be that  $d_1 \geq l_g$  and  $d_2 \geq l_g$  respectively. So,  $a$  in (15) can be determined by the following formula:

$$\cos \alpha = \frac{d_1}{a}, \quad (16)$$

$a$  can be found by the above written (16) and it is equal to following formula:

$$a = \frac{d_1}{\cos \alpha}, \quad (17)$$

Thus, if we put (17) to the (15), it is appeared by following manner:

$$S_{A.H} = \left(\frac{d_1}{\cos \alpha}\right)^2 \cdot \sin \alpha, \quad (18)$$

Then, when we put (18) to the (2) next formula is appeared:

$$F_0 = N_{N.H} \cdot \left(\frac{d_1}{\cos \alpha}\right)^2 \cdot \sin \alpha, \quad (19)$$

According to above written (5) and (19) formulas, when the holes of the sieve are rhomb form, the coefficient of the useful area of sieve is determined by the following formula:

$$\mu = \frac{N_{N.H} \cdot \left(\frac{d_1}{\cos \alpha}\right)^2 \cdot \sin \alpha}{B_s \cdot L_s} \quad (20)$$

Next counting work is done by the square hole of the corn sheller sieve (figure 4).

So, according to figure 4,  $S_{A.H}$  in the (2) is equal to following formula for square form holed sieve [5]:

$$S_{A.H} = a^2, \quad (21)$$

here  $a$  is size one of the side of hole, mm. And it must be equal to that  $a \geq l_g$ . So, if we put (21) to the (2), formula (2) is seen by following form:

$$F_0 = N_{N.H} \cdot a^2, \quad (22)$$

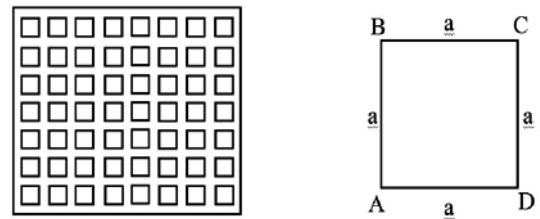


Figure 4. The scheme of the square form holed sieve

According to above written (5) and (22) formulas, when the holes of the sieve are square form the coefficient of the useful area of sieve is determined by the following formula:

$$\mu = \frac{N_{N.H} \cdot a^2}{B_s \cdot L_s} \quad (23)$$

Then, if we imagine the sieve hole of the corn sheller is rectangle form (figure 5).

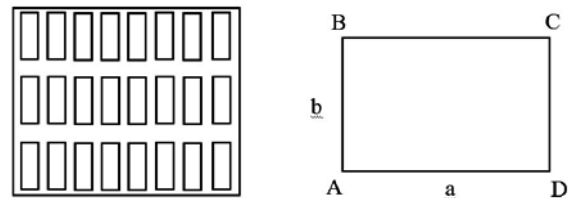


Figure 5. The scheme of the rectangle form holed sieve

So, according to figure 5,  $S_{A.H}$  in the (2) is equal to following formula for rectangle form holed sieve [5]:

$$S_{A.H} = ab, \quad (24)$$

here  $a$  and  $b$  are width and length of the hole of sieve respectively, according to size of grain  $a \geq l_g$  and  $b \geq l_g$ . So, formula (2) is written by following manner:

$$F_0 = N_{N.H} \cdot (ab), \quad (25)$$

According to formulas (5) and (25), if the hole of the sieve is rectangle form the coefficient of the useful area of sieve is determined by the following formula:

$$\mu = \frac{N_{N.H} \cdot (a \cdot b)}{B_s \cdot L_s} \quad (26)$$

In conclusion, it is seen that by above written formulas (6), (14), (20), (23) and (26) the coefficient of the useful area of corn sheller sieve depends on numbers of holes, their size, total area of the holes, also sieve's width and length. When values were counted according to formulas (6), (14), (20), (23) and (26)  $N_{N.H} = 273$  pieces;  $D_H = 15$  mm;  $\pi = 3.14$ ;  $B_s = 350$  mm;  $L_s = 460$  mm;  $h = 15$  mm;  $d_1 = 15$  mm;  $a = 15$  mm;  $b = 8.7$  mm.  $\mu$  was determined 0.59, 0.20, 0.12, 0.38 and 0.22 respectively.

So, it is required that, the coefficient must be  $\geq 0.5$  for being high work efficiency of the corn sheller sieve. For preparing the sieve of the corn sheller machine we must pay attention to above written requirement and the holes of the corn sheller sieve must be made in optimal distance. According to theoretical research, circle form hole is optimal for corn sheller machine's sieve to separate the grain from husk and pith.

## References:

1. Astonakulov K. D., Fozilov G. G., Kodirov B. X., Ochildiyev O. Sh., Khatamov B. A. Patent No. FAP 00776. Corn sheller for shelling the pod corn//Official information paper. – 2012. – No. 12.

2. Fozilov G. G. Determination description of the mixture which is coming through pith and husk outlet of the corn sheller machine//perspective of development private business of agriculture: Devoted for 20 years of independence Republic scientific-applied conference's articles collection. –Andijan: – 2011. – P. 260–262.
3. Astanakulov K. D., Fozilov G. G. and others. “Development of early harvesting technological process of the ear cereal plants and corn also creating the high effective new technical implements for crop harvesting as well redevelopment the existent implements” account of the scientific-research work. – Gulbakhor, 2010. – P. 76–77.
4. Fozilov G. determination the coefficient of the useful area of corn sheller sieve according to circle holes. Journal Agro ilm. – No. 1 (39), 2016. – P. 71–72.
5. Mathematics: collection of formulas. – Moscow, Astrel, 2013. – P. 51–56.

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## Floodplain correction by varying build-up combined dikes

**Abstract:** In the article the relationships for determination of flow dynamic axes deflection, specific discharges in unobstructed flow section has been obtained and carrying capacity has been evaluated for varying build-up combined dike perforated section asymmetrically obstructing flow.

**Keywords:** dam, dam combination, deaf dam, dam-through variable construction, waterworks, tightness flow hydraulics, the degree of tightness, spreading.

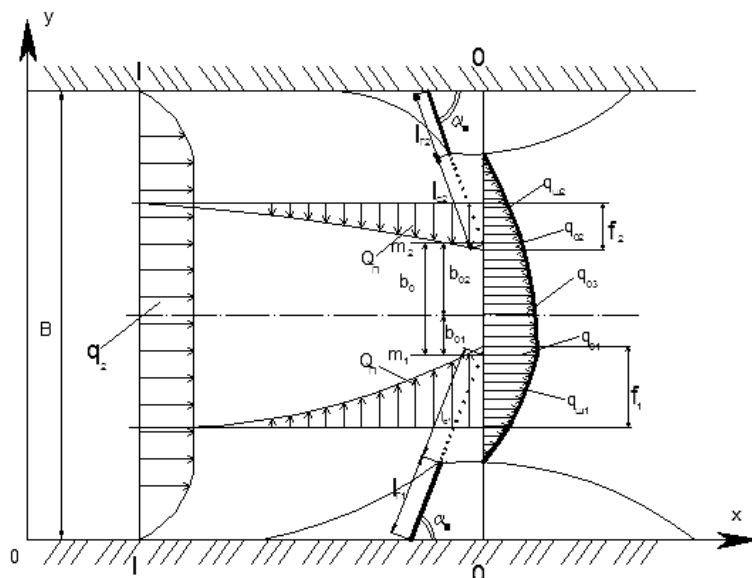
In spite of the fact that the idea of combined dike construction has been known long ago [1], combined dikes has been built relatively recently in Amudarya river at Takhiatash water structure complex.

Floodplain correction project in Amudarya river at Karshi main canal water intake structure has been also executed with the use of combined dikes. They asymmetrically obstruct flow in order to direct flow into water intake point.

Operation of combined dikes with constant build-up perforated part has been discussed in works [2; 3; 4].

The main principles of varying build-up perforated spur dike construction and theoretical bases for their design has been reviewed in work [5] for the first time.

The scheme for asymmetrically obstructed flow by constant build-up combined dikes is illustrated in the picture.



Picture 1. Flow asymmetrical obstruction by varying build-up combined dams.

Specific discharge uniform plot reforms in section line I–I under dike action and in section 0–0 its shape looks like what is shown in the picture.

The discharge approaching the blank dike fully declines from the protected bank only when one part of the discharge approaching the perforated dike declines to unobstructed area of floodplain and the other part passes through perforated dike to tail-water on account of gradual decrease of build-up coefficient.

Obstruction dissymmetry provides more intense deflection of flow dynamic axes in the direction of shorter length dike.

The goal of the research within the scope of this article consists of:

- determining the dynamic axes deflection for left and right section of flow;
- determining the specifics discharges in unobstructed section.

Considering the varying build-up along the length we accept the velocity and specific discharge distribution behind beyond per-

forated dike sections according to Shlixting — Abramovich relationship [6]

$$\frac{U_{ui}}{U_{oi}} = (1 - \eta^{1.5})^2 \quad (1)$$

or

$$\frac{q_{ui}}{q_{oi}} = (1 - \eta^{1.5})^2 \quad (2)$$

where  $U_{ui}, q_{ui}$  — velocities and specific discharges beyond perforated dike sections;  $U_{oi}, q_{oi}$  — velocities and specific discharges in unobstructed flow section;  $q_{o2} = q_{o1}$  — for right section of flow,  $q_{oi} = q_{o1}$  — for left section of flow;  $\eta = \frac{l_{o1} \sin \alpha_{\delta} - Y}{l_{o1} \sin \alpha_{\delta} - l_{c1} \sin \alpha_{\delta}}$  — for right section;  $\eta = \frac{l_{o2} \sin \alpha_{\delta} - Y}{l_{o2} \sin \alpha_{\delta} - l_{c2} \sin \alpha_{\delta}}$  — for left section.

We use Varignon theorem to determine flow dynamic axes deflection for section line I-I (with original flow condition) and section line 0-0 (obstructed section line) and write it as follows:

– for right section of floodplain

$$q_2 \frac{B}{2} \left( \frac{B}{4} + f_1 \right) = 0,5 q_{o1} l_{c1} \sin \alpha_{\delta} \left( l_{c1} \sin \alpha_{\delta} + \frac{2 l_{c1} \sin \alpha_{\delta}}{2} \right) + \frac{(q_{o3} + q_{o1})}{2} b_{o1} \left[ l_{o1} \sin \alpha_{\delta} + \frac{2 q_{o3} + q_{o1}}{3(q_{o1} + q_{o3})} \left( \frac{B}{2} - l_{o1} \sin \alpha_{\delta} \right) \right] \quad (3)$$

– for left section of floodplain

$$q_2 \frac{B}{2} \left( \frac{B}{4} + f_2 \right) = q_{o2} l_{c2} \sin \alpha_{\delta} \left( l_{c2} \sin \alpha_{\delta} + \frac{2 l_{c2} \sin \alpha_{\delta}}{2} \right) + 0,5(q_{o3} + q_{o2}) b_{o2} \left[ l_{o2} \sin \alpha_{\delta} + \frac{2 q_{o2} + q_{o3}}{3(q_{o2} + q_{o3})} \left( \frac{B}{2} - l_{o2} \sin \alpha_{\delta} \right) \right] \quad (4)$$

From the first equation we determine right side flow dynamic axes deflection

$$f_1 = \frac{q_{o1} l_{c1} \sin \alpha_{\delta}}{q_2 B} \left( l_{c1} \sin \alpha_{\delta} + \frac{2 l_{c1} \sin \alpha_{\delta}}{2} \right) + \frac{(q_{o3} + q_{o1}) b_{o1}}{q_2 B} \left[ l_{o1} \sin \alpha_{\delta} + \frac{2 q_{o3} + q_{o1}}{3(q_{o1} + q_{o3})} (0,5B - l_{o1} \sin \alpha_{\delta}) \right] - 0,25B \quad (5)$$

From the second equation we determine left side flow dynamic axes deflection

$$f_2 = \frac{q_{o2} l_{c2} \sin \alpha_{\delta}}{q_2} \left( l_{c2} \sin \alpha_{\delta} + \frac{2 l_{c2} \sin \alpha_{\delta}}{2} \right) + \frac{(q_{o3} + q_{o2}) b_{o2}}{q_2 B} \left[ l_{o2} \sin \alpha_{\delta} + \frac{2 q_{o2} + q_{o3}}{3(q_{o2} + q_{o3})} (0,5B - l_{o2} \sin \alpha_{\delta}) \right] - 0,25B \quad (6)$$

By dividing the left and the right sides of both equations (5, 6) by  $B$  and after certain transformations we determine relative deflections of flow dynamic axes:

– for right section

$$\lambda_{f_1} = 2 \overline{q_{o1}} n_{c1} \left( n_{c1} + \frac{2}{3} n_{c1} \right) + (\overline{q_{o3}} + \overline{q_{o1}}) (1 - n_1) \left[ n_1 + \frac{2 \overline{q_{o3}} + \overline{q_{o1}}}{3(\overline{q_{o1}} + \overline{q_{o3}})} (0,5 - n_1) \right] - 0,25 \quad (7)$$

– for left section

$$\lambda_{f_2} = 2 \overline{q_{o2}} n_{c2} \left( n_{c2} + \frac{2}{3} n_{c2} \right) + (\overline{q_{o3}} + \overline{q_{o2}}) (1 - n_2) \left[ n_2 + \frac{2 \overline{q_{o2}} + \overline{q_{o3}}}{3(\overline{q_{o3}} + \overline{q_{o2}})} (0,5 - n_2) \right] - 0,25 \quad (8)$$

where

$\lambda_{f_1} = f_1 / B$ ;  $\lambda_{f_2} = f_2 / B$  — relative deflections of right side and left side flow dynamic axes;

$\overline{q_{o1}} = q_{o1} / q_2$ ;  $\overline{q_{o2}} = q_{o2} / q_2$ ;  $\overline{q_{o3}} = q_{o3} / q_2$  — relative specific discharges at free flow section;

$n_{c1} = l_{c1} \sin \alpha_{\delta} / B$ ;  $n_{c2} = l_{c2} \sin \alpha_{\delta} / B$  — extent of flow obstruction by right and left dams;

$n_{c1} = l_{c1} \sin \alpha_{\delta} / B$ ;  $n_{c2} = l_{c2} \sin \alpha_{\delta} / B$  — extent of flow obstruction by perforated dike sections, right and left respectively;

$n_{c1} = l_{c1} \sin \alpha_{\delta} / B$ ;  $n_{c2} = l_{c2} \sin \alpha_{\delta} / B$  — extent of flow obstruction by blank dike sections, right and left respectively;

It is obvious that the total deflection of flow dynamic axes is equal to:

$$f = f_1 - f_2 \quad (9)$$

The research results show that the relative deficit of specific discharges in unobstructed flow section for this case can be described by linear relationship:

$$\frac{q_x - q_{o1}}{q_{o2} - q_{o1}} = (1 - \eta) \quad (10)$$

where  $\eta = \frac{Y - Y_1}{b_0}$  — relative ordinate for point, where  $q_x$  is determined.

Obviously for this case, the plot area for specific discharges in unobstructed section is equal to the sum of areas for its separate parts:

$$\int_{Y_1}^{Y_2} q_x dy = \int_{Y_1}^{Y_1 - b_{o1}} q_x dy + \int_{Y_1 - b_{o1}}^{Y_2} q_x dy \quad (11)$$

By executing integration in (11) with the account of (10)

$$0,5 b_0 (q_{o1} + q_{o2}) = 0,5 b_{o1} (q_{o1} + q_{o3}) + 0,5 b_{o2} (q_{o3} + q_{o2})$$

we find the relationship between the values for specific discharges  $q_{o1}$ ,  $q_{o2}$ ,  $q_{o3}$  and express  $q_{o3}$  through the other two

$$\overline{q_{o3}} = \overline{b_{o1}} \overline{q_{o2}} + \overline{b_{o2}} \overline{q_{o1}} \quad (12)$$

where  $\overline{b_{o1}} = b_{o1} / b_0$ ;  $\overline{b_{o2}} = b_{o2} / b_0$

Using (12) significantly eases the solution of the system of equations (7) and (8).

Specific discharges in unobstructed section of flow are determined from the equation of discharge conservation written for section lines I-I and 0-0

$$q_2 B = \int_{l_{c1} \sin \alpha_{\delta}}^{l_{o1} \sin \alpha_{\delta}} q_x dy + \int_{l_{o1} \sin \alpha_{\delta}}^{l_{o1} \sin \alpha_{\delta} + b_{o1}} q_x dy + \int_{l_{o1} \sin \alpha_{\delta} + b_{o1}}^{l_{o1} \sin \alpha_{\delta} + b_{o1} + l_{c2} \sin \alpha_{\delta}} q_x dy \quad (13)$$

after executing integration with the account of (2) and (10) we obtain

$$q_2 B = 0,45 q_{o1} l_{c1} \sin \alpha_{\delta} + 0,5 (q_{o1} + q_{o2}) b_0 + 0,45 q_{o2} l_{c2} \sin \alpha_{\delta}$$

and dividing by  $q_2 B$

$$1 = 0,45 \overline{q_{o1}} n_{c1} + 0,5 (\overline{q_{o1}} + \overline{q_{o2}}) (1 - n_1 - n_2) + 0,45 \overline{q_{o2}} n_{c2} \quad (14)$$

It is clear from (14), that there are two unknowns in one equation. To solve the task we use the discharge equality condition, determined by mean specific and real discharges

$$q_0 b_0 = \int_0^b q_x dx \quad (15)$$

taking into account (10) we determine

$$q_{o1} = 2 q_0 - q_{o2} \quad (16)$$

substituting (16) in (14) we get

$$1 = (2 \overline{q_0} - \overline{q_{o2}}) (0,5 - 0,05 n_1 - 0,5 n_2 - 0,45 n_{c1}) + \overline{q_{o2}} (0,5 - 0,5 n_1 - 0,05 n_2 - 0,45 n_{c2}) \quad (17)$$

and

$$\overline{q_0} = \frac{1 - 2 \overline{q_{o2}} (0,5 - 0,05 n_1 - 0,5 n_2 - 0,45 n_{c1})}{0,45 n_{c2} + 0,45 n_{c1} - 0,45 n_1 - 0,45 n_{c2}} \quad (18)$$

In order to determine the carrying capacity of the combined dike with constant build-up perforated section we use the concept of streamline, which is the ratio of the discharge passing through perforated dike section  $Q_{ui}$  to the oncoming discharge  $Q_2$

$$K_0 = \frac{Q_{ui}}{Q_2} \quad (19)$$

We compose an equation of discharge for section lines I–I and II–II with border flows  $m_1, m_2$ , passing through dike heads [3]:

– for right section

$$K_{01} V_0 h_0 l_0 \sin \alpha_0 = h_{u1} \sin(\alpha_0 + \beta_0) (1 - P_{31}) \int_{l_{11}}^{l_0} U dy \quad (20)$$

– for left section

$$K_{02} V_0 h_0 l_0 \sin \alpha_0 = h_{u2} \sin(\alpha_0 + \beta_0) (1 - P_{32}) \int_{l_{21}}^{l_0} U dy \quad (21)$$

By executing integration in (20, 21) with the account of (1) after certain transformations we obtain

– for right section

$$K_{01} = \psi q_{u1} \left( 1 - \frac{l_{21}}{l_{01}} \right) (1 - P_{31}) a \quad (22)$$

– for left section

$$K_{02} = \psi q_{u2} \left( 1 - \frac{l_{22}}{l_{02}} \right) (1 - P_{32}) a \quad (23)$$

where  $\alpha, \beta_0$  and mean specific discharges  $q_{u1}, q_{u2}$  are determined by recommendations [3];  $\psi=0,55$  — relative deficit velocity in Shlihting-Abramovich equation.

#### Conclusion

Thus, the solution of the equation has been brought to end, the calculation is carried out in the following order:

– mean specific discharges  $q_{u1}, q_{u2}$  are determined according to recommendations [3, 7];

– using (22) and (23) we calculate streamline coefficients for right and left dikes and discharges passing through perforated sections  $Q_{u1}, Q_{u2}$ , respectively;

– we calculate mean specific discharges  $\bar{q}_0$ , and  $q_{01}, q_{02}$  by (18) and (16), and  $\bar{q}_{03}$  by (12);

– we determine dynamic axes deflection by (7) and (8) and total deflection by (9).

#### References:

1. Altunin S. T. Регулирование русел. Сельхозиздат, – М., – 1962, 351 p.
2. Bakiev M. R. River bed regulation by cross combined dikes. XXIV Jahr congress Madrid a study of streams and water sheds of high hydraulic irregularity, 9–13 september, – 1991, MADRID/ESPANA.
3. Kodirov O. Совершенствование конструкций и разработка метода гидравлического расчета комбинированных дамб, author's abstract for Ph. D. dissertation, – Tashkent, – 1991.
4. Muradov R. A. Совершенствование конструкций и методов расчетного обоснования частично затопленных комбинированных дамб, author's abstract for Ph. D. dissertation, – Tashkent, – 1993.
5. Bakiev M. R., Togunova N. P. Гидравлический расчет сквозных шпор с переменной застройкой. Гидротехническое строительство – № 12, – 1989.
6. Abramovich G. N. Теория турбулентных струй, – М., – 1960, 716 p.
7. Urkinbaev R. K. Некоторые вопросы гидравлики сквозных шпор в условиях р. Амударья, author's abstract for Ph. D. dissertation, – Tashkent, – 1969, 24 p.

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## Some objectives for constructing a model of intelligent control systems of dynamic objects

**Abstract:** Within conceptual modeling performed formalization of mathematical description of the intelligent control system in the dynamic objects and a priori incompleteness fuzzy initial information. The dynamic properties of the object are described by the apparatus of the state space, and intelligent operators realizing the perception, representation, the formation of concepts, judgments and inferences in the learning process are the formal means of the processing of data and knowledge, as well as the decision-making process in terms of interaction of intellectual system with the environment.

**Keywords:** intelligent control systems, intelligent transducer, decision support, interaction with the environment, a priori incompleteness and vagueness of the initial information.

Artificial intelligence technology adopted attributed information technologies that provide the ability to handle knowledge and provide the following operations [1]:

- internal interpretability, which ensures identification of each information unit;
- structure, enabling recurring embeddability individual information units in each other;
- the establishment of a functional, explanatory, etc. types of relationships between information units;
- scalability, which implements the possibility of introducing different metrics for determining the quantitative, ordinal and other relations information;
- activity implements the ability to initiate action when new information becomes available;

- realization of classifying relations, generalizing patterns existing in this substantive area.

Intelligent system is a targeted system choosing the dominant task from a valid for this class system; the search for a solution to the problem; its decisions and that experience if it is necessary to change a valid class of tasks.

Application of intelligent control systems ensures the successful solution of tasks when a priori incompleteness and ambiguity of the original information, variability and inaccuracy of the studied characteristics of dynamic object, more effective decision-making in different situations of risk and possible conflicts.

General view of the automatic control system presented in Fig. 1.

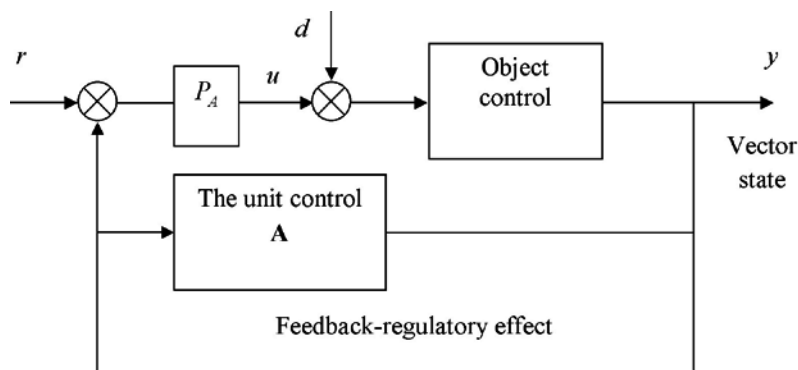


Fig. 1. Block diagram of the control system: UC A – control unit;  $P_A$  – controller; CO – controlling object;  $r$  – input signal;  $u$  – control object and input;  $d$  – front outrage;  $y$  – output signal control object

An object can be thought of as a black box on the entry vector of parameters which controls actions  $\bar{C}$ . Decision maker, expects to get some result-vector of states  $\bar{Y}$ . Optimal control problem is determining using mathematical models of objects and systems of management  $\bar{D}$  of such a control action to come as close to the desired result (vector  $\bar{Y}$ ).

Formally, the intelligent system describes the following six:

$$T \times X \times S \xrightarrow{\alpha_1} M \times T, \quad (1)$$

$$T \times M \times S \xrightarrow{\alpha_2} C \times T, \quad (2)$$

$$C \times T \times X \times S \xrightarrow{\alpha_3} R \times T, \quad (3)$$

$$T \times X = \{\bar{A} \times \bar{T}\} X \times T + \{\bar{B} \times \bar{T}\} U \times T, \quad (4)$$

$$T \times Y = \{\bar{D} \times T\} X \times T, \quad (5)$$

$$T \times R \times Y \xrightarrow{\alpha_4} C \times T, \quad (6)$$

where T-many points in time; X, S, M, C, R and Y-respectively a multitude of system States, environment, motivation, purpose of the projected and actual results;  $\bar{A}, \bar{B}, \bar{D}$  matrix parameters;  $\alpha_1, \alpha_2, \alpha_3$  and  $\alpha_4$  consequently intellectual conversion operators.

In the description (1) (6) may be combined represent objects of the system in the form of a set of values or multiple statements, or any of the other forms.

The dynamic properties of the system are described in using state-space matrices parameters. Smart operators implement perception, representation, formation of concepts, judgments and inferences in the process of cognition are formal means of processing knowledge and information, as well as the decision-making process.

The process of interaction with the environment of intellectual system can be thought of as a process that involves the following input and output parameters (fig. 2.):

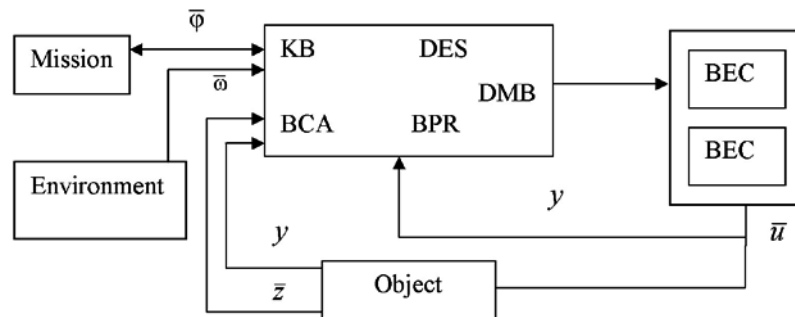


Fig. 2. System structure  $\bar{\omega}$  –  $r \times 1$  vector file of resentment;  $\bar{z}$  – signal model of the object;  $\bar{\phi}$  – signal goal;  $\bar{u}$  – signal control;  $\bar{Y}$  – vector output effects on an object (a vector of intellectual status of the converter)

In General, under the intelligent transducer refers to some device, which is based on input signals  $\phi, \omega, \gamma, z, u$  and signal that identifies the type of block extradiation synthesized control (BEC) of regulation and bearing information that allows you to create free-

form enough regulation law [2]. Smart converter-some advanced block intellectual system that includes a dynamic expert system (DES) and decision-making block (DMB). In turn, the DES includes a knowledge base (KB), block peer review (BPR) and block

condition assessment (BCA) system, block execution control (BEC).

Signal control object model  $z$  contains information about the current condition of the structure and parameters for the system. Signal  $\phi$  contains information about the current state of the target.

In General, the control object are described by equations of the form [3]:

$$\begin{cases} \dot{x} = f(\bar{x}, \bar{u}, \bar{\omega}, \bar{z}, t), \\ \bar{y} = \bar{c}(\bar{x}), \bar{x}(t_0) = \bar{x}_0, t \geq t_0, \end{cases} \quad (7)$$

Here:  $\bar{x} - (n \times 1)$  vector status;  $\bar{u} - (m \times 1)$  vector control;  $\bar{y} - (l \times 1)$  exit vector (dimension);  $\bar{c}(\cdot) - (l \times 1)$  the specified vector function;  $f(\cdot) - (n \times 1)$  vector function that provides the existence and uniqueness of the solution of the Koshi problem;  $\bar{z} - (N \times 1)$  the vector object's parameters.

When this

$$\bar{z} = \bar{z}^0 + \bar{z}, \quad (8)$$

where is  $\bar{z}^0$  controlled (given) component of the vector object's parameters (in the General case  $\bar{z}^0 = \bar{z}^0(t)$ ) and  $\bar{z}$  not a controlled respectively (unknown) component, which is defined on the basis of those or other identification methods and allows to form the signal models ( $z$ ).

If the uncertainty of the object model can be reduced to parametric uncertainties in the model object is a vector  $\tilde{z} = \bar{z}^0 + \tilde{z}$  (where the vector  $\tilde{z}$  characterizes the uncertainty on parameters and structure).

In general, the transmitter represent a logic-dynamic device that processes incoming information on a current and generates a signal  $Y$  at a pace with the occurring processes. In smart transducer is implemented.

$$\bar{Y} = F(\bar{x}, \bar{u}, \bar{\omega}, \bar{\phi}, \bar{z}) \quad (9)$$

where is  $F(\cdot)$  some operator, operating from space  $\mathfrak{R}$  in a  $p$  dimensional space ( $Y \in \mathfrak{R}^p$ ) to characterize the structure and algorithm of intelligent converter.

Compliance with this statement generates  $p \times 1$  vector  $Y$ , that determines, depending on the intended target, the environment, system state, actions on the object control, aimed at fulfilling this purpose.

We assume that an intelligent converter at each moment of time forms the current control goal in front of the object, whereby concrete is put the current task, and block generates the desired control algorithm that provides the current goals and is solution of the problem.

Thus, every time  $t \geq t_0$  the status vector converter provides information that can help you deliver and meet the challenge of controlling the object.

Outrage is an element of some specified in sets, i. e.:

$$\omega \in W(t), t \geq t_0. \quad (10)$$

Uncontrolled elements, as well as management also satisfy the conditions

$$z \in L(t), t \geq t_0, \quad (11)$$

$$u \in U(t), t \geq t_0, \quad (12)$$

where is some given many, respectively.

The purpose of the control object (1) in General, can be represented as the following restrictions:

$$\bar{\Psi}(x, t) \in \bar{Q}_\varepsilon(t), t \geq t_0, \quad (13)$$

where the vector status; -a neighborhood of some set, set in space (respectively); -specified vector function is continuously differentiable on all of the variables (the more common case where the operator is acting out), i. e., is some linear normed space.

**Definition 1.** Under the value of removing the element from the set in a sense measures proximity refers to the amount calculated according to the expression

$$\rho(\beta, \hat{Q}) = \min_{\beta \in \hat{Q}} \rho(\beta, \tilde{\beta}) \quad (14)$$

**Definition 2.** surroundings set in space there are so many elements that each item has been deleted from a myriad of not more than the amount (in the sense of the measures defined in the vicinity).

**Definition 3.** Measure proximity arbitrary elements represents some positively defined inand unlimited top functionality or scalar function.

In particular:

$$\bar{\rho}(\beta^1, \beta^2) = \|\beta^1 - \beta^2\|, \quad (15)$$

where is the norm in space;

or

$$\rho(\beta^1, \beta^2) = \Theta(\|\beta^1 - \beta^2\|). \quad (16)$$

Here is a scalar function, positive positive values of the argument.

Given the magnitude of the define symbols entered removal of an arbitrary element from the set in accordance with a measure of proximity.

Given the ratio definitions entered for the purpose of control can be converted to an equivalent expression.

$$\tilde{\rho}(\bar{\Psi}(x, t), \hat{Q}) \leq \varepsilon, t \geq t_0. \quad (17)$$

Then the management objective in enough general case can be formulated as follows: for the initial state of a control object, which may be an arbitrary element from the set, that is, you want to ensure the implementation ratio (17) for each if there are restrictions (10) (12).

Block management formulation in a fairly general case given the task implements ratio.

$$u = \bar{K}(Y), \quad (18)$$

where is some operator develop scoped control in space and in the values pane.

While the information contained in the vector must be sufficient for the synthesis of block management develop the required impact assessment in accordance with the current target generated intellectual converter.

### References:

1. Ohtilev M. Y., Sosolov B. V., Yusupov R. M. Intelligent technologies monitoring and management of structural dynamics of complex technological objects-IZD-Vo, science; - M: 2006. - 410 p.
2. Pupkov K. A. Intelligent systems: problems of theory and practice//Izvestiya vuzov "Instrumentation", - № 9-10, 1994. - P. 5-7.
3. Malomuzh T. I. Optimal control based on intelligent systems, AAEES, - № 1 (13), 2014. - P. 132-139.



## Section 14. Transport

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### Estimation of efficiency of the road train used in mountain conditions

**Abstract:** The method represented in this paper allows analyzing dependence of the specific efficiency on specifications of the vehicle and allows estimating the efficiency of the train used in mountain conditions.

Results of this scientific work are useful in elaboration of the method to choose the vehicle model to certain using condition.

**Keywords:** specific efficiency, road train, mountain conditions, power usage grade, longitudinal slope.

Exploitation of the road train in mountain conditions leads to increasing the efficiency and reduces the cartage. In choosing and forming the composition of the road train for special using conditions at first comes up a problem defining its parameters of maximum adaptation to mentioned conditions. Main using parameters of any truck are gross weight and average speed on which depends its efficiency.

Speed and carrying capacity influence not only the operating factors of the vehicle but the road capacity level too. Demand to vehicles, trailers and semi trailers, depends on not only potential performances of the trains but on their adaptation to different using conditions too.

In spite of that trains correspond to modern standard specifications the efficiency of trains with different compositions are different in mountain conditions. Therefore, the necessity of comparative estimation of efficiency of the trains in mountain conditions is arisen.

Generalized factor — conditionally specific efficiency is offered that can be used for united amount estimation of the technical level and quantity and to estimate the adaptation of construction to specific using condition [2, 63–66].

$$W_Q = \frac{(G_{Tr} - G_{0Tr}) \cdot V_{as}}{Q_s}, \quad (1)$$

Here,  $W_Q$  – specific efficiency,  $G_{Tr}$  – gross weight of the train, t;  $G_{0Tr}$  – curb weight of the train, t;  $V_{as}$  – average speed of the train, km/h;  $Q_s$  – road fuel consumption, l.p.100 km

Nowadays, in carrying of the cargo through mountain pass the trains with different composition are used. Results of researches conducted with different vehicle models (a, b, c) are comparative analyzed to base their adaptation to using condition that influences to efficiency (Fig. 1).

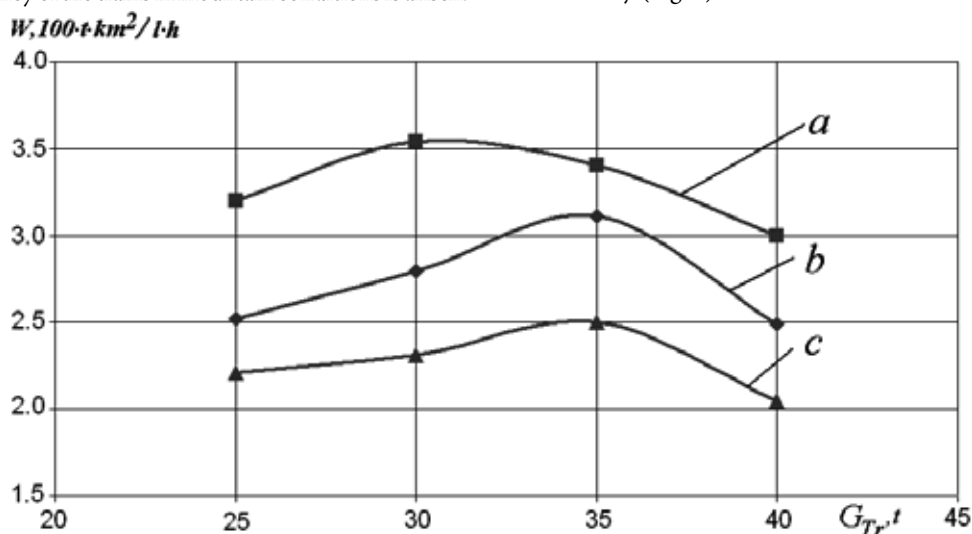


Figure 1. Specific efficiency of the trains on road by longitudinal slope 6%

Table 1. – Comparative table of train specifications of specific efficiency

Object	longitudinal slope 6%							
	$G_{tr}, t$	$W_0$	$U_{gr}$ (gear ratio of transmission)	$V_{as}, km/h$	$Q_s, l$	$Ne, kW$	$n, r. p. m.$	$U$
<i>a</i>	35	3,4	$U_{VII} = 1,7$	26,92	14,49	216	1244	0,88
<i>b</i>	35	3,11	$U_V = 3,02$	18,82	10,61	150	1542	0,64
<i>c</i>	35	2,5	$U_V = 2,78$	22,59	15,49	181	1613	0,66

The graph and the table show that object *a* has an advantage on the mountain road with longitudinal slope 6% by criterion specific efficiency. This is can be described that the engine runs in favorable mode in this area and transmission parameters are conformed to engine parameters of the vehicle (Fig. 2).

It is known that fuel consumption of the engine in the first approximation can by defined depending on angle velocity of the crankshaft and the power usage grade of the engine [1, 102–105]:

$$G_{tr} = \frac{N_k g_{eN} K_U K_\omega}{1000 \eta_{Tr}}, \quad (2)$$

$$K_\omega = a_\omega + b_\omega \bar{\omega}_e + c_\omega \bar{\omega}_e^2, \quad (3)$$

$$K_U = a_U + b_U U + c_U U^2, \quad (4)$$

Here,  $N_k$  — the power at drive wheels of the vehicle, kW;  $K_\omega, K_U$  - coefficients that define the relationship  $g_e = f(\bar{\omega}_e, U)$ ;

$U = N_k / N_e \eta_{Tr}$  — Power usage grade of the engine at current angle velocity of the crankshaft by part from the one.

With the help of expressions for coefficients  $K_\omega$  and  $K_U$  the next operating mode of the engine with minimum specific fuel consumption is can be determined by differentiate of the coefficients by  $\bar{\omega}_e, U$  and researching the extremes.

$$\frac{dK_\omega}{d\bar{\omega}_e} = b_\omega + 2c_\omega \bar{\omega}_e = 0, \quad (5)$$

$$\frac{dK_U}{dU} = b_U + 2c_U U = 0. \quad (6)$$

According to design researches the engine operating *C* does not correspond to minimal fuel consumption area and characterizes by big engine speed (see points in Fig. 2). That is why the object has big fuel consumption than others. Power usage grade is  $U = 0,66$ . The engine *B* runs in minimal fuel consumption area. Power usage grade is  $U = 0,64$ . The engine *A* runs in minimal fuel consumption area. Power usage grade is  $U = 0,88$ . The engine of the object *A* is operating in mode that provides high specific efficiency.

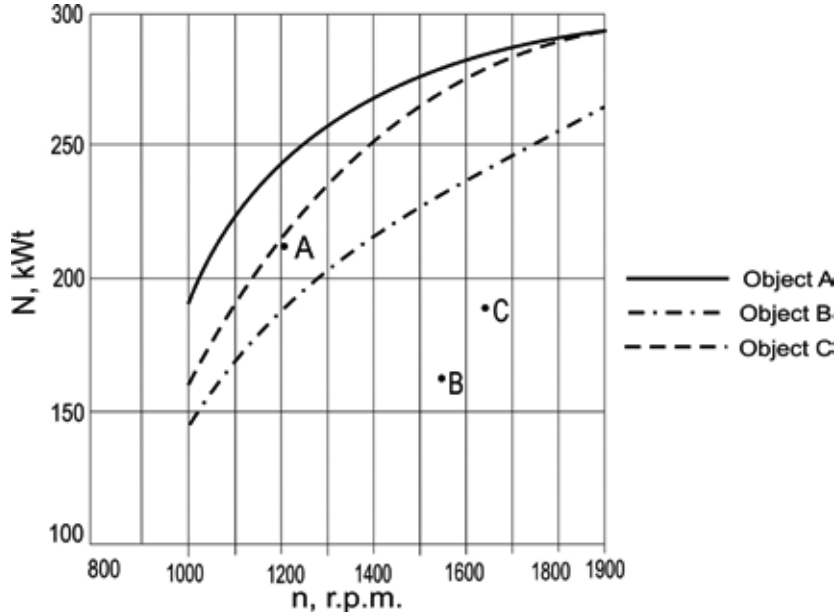


Figure 2. Operating modes of the engines of objects A, B, C

Specific efficiency of objects is defined for different road conditions: for level road, for the road with constant longitudinal slopes 2; 4; 6 and 8% that characteristic for mountain conditions (Fig. 3).

Results show that when the longitudinal slope of the road is increased the specific efficiency of the object is decreased and gross weight that corresponds to maximal value of specific efficiency is decreased too. For instance, in level road gross weight that corresponds to maximal value of specific efficiency is 40 t, on the road by constant longitudinal slope 8% is 30 t, it is shown for object *a* (fig. 4) but results for objects *b* and *c* are similar to *a*.

Difference between values of specific efficiency on the level road and on the road by longitudinal slope 2–3% is a big. After the longitudinal slope has increased the specific efficiency of objects becomes closer to each other.

Design results of specific efficiency of objects by varying the gross weight in roads with different longitudinal slopes show that

when the longitudinal slope of the road is increased the specific efficiency of the object is decreased. That is linked with increasing of the road resistance, with decreasing the speed and increasing the fuel consumption.

Difference between values of specific efficiency for three gross weights is a big when the longitudinal slope is within 0–3% (see Fig. 4) Then a difference has been decreasing. A big difference between values of specific efficiency is provided by means of gross weights and power usage grade of the engine.

The loss in mass of carrying cargo is compensated by fuel economy. That is why the values of specific efficiency of the object become closer between when the longitudinal slope of the road has been increasing.

This method allows analyzing dependence of the specific efficiency on specifications of the vehicle and allows estimating the efficiency of the road train used in mountain conditions.

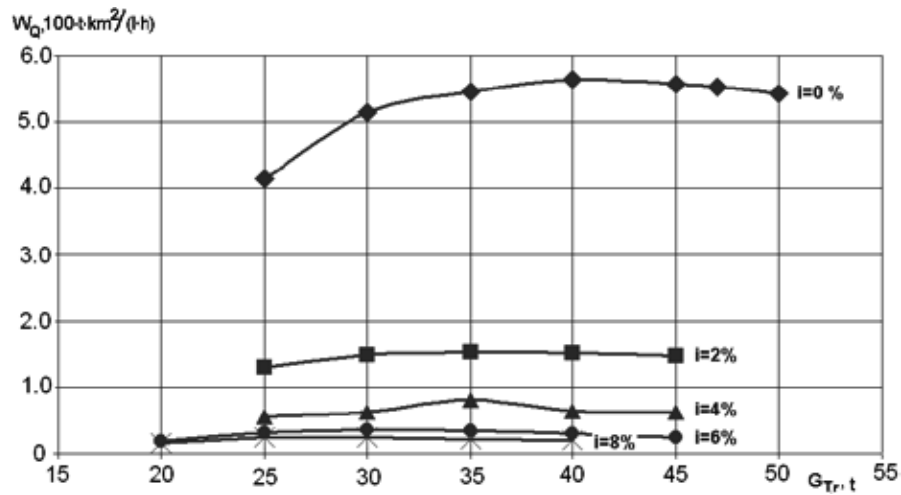


Figure 3. Dependence of the specific efficiency of the object a on longitudinal slope of the road

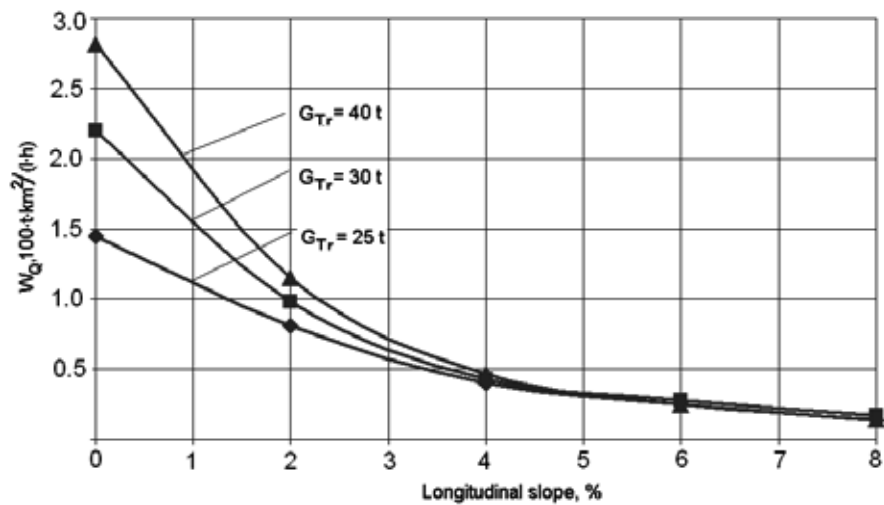


Figure 4. Dependence of the specific efficiency of objects a on longitudinal slope of the road for different gross weights

#### References:

1. Mukhitdinov A. A. "Scientific bases of choosing the parameters and modes to manage the engine and transmission of the vehicle": Diss... doct. techn. sciences. – Tashkent, – 2004. – 300 p.
2. Khakimov Sh. K. "Base of using parameters of the train for mountain conditions (in example of "Kamchik" pass)": Diss... cand. techn. sciences. – Tashkent, – 2011. – 140 p.

## Section 15. Chemistry

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### Influence of bioglass composition on interaction with polyacrylic acid

**Abstract:** The composition effect on interaction between polyacrylic acid and bioglass synthesized in the system  $RO-CaF_2-P_2O_5-Al_2O_3-SiO_2$  ( $R = Ca, Zn$ ) were studied by Fourier Transformed Infrared Spectroscopy (FTIR). The influence of glass structure on intermolecular interactions was established. It was determined that critical factor for polyacrylic acid adhesion to glass surface is content of zinc oxide. Composition of bioglasses affects both the strength of adhesion of polyacrylic acid to glass, and the intermolecular interactions in the system. The process of acid-base interaction between polyacrylic acid and glass components has been completed in 24 hours and three-dimensional structure is formed via strong intermolecular bonds providing hardening material.

**Keywords:** bioglass, polyacrylic acid, adhesion, FTIR spectroscopy.

Glass polykenate cement is a class of modern dental materials designed by combination of properties of silicate and polyacrylic systems. Originating as a result of development for replacement of silicate cements used in dentistry more than 100 years, glass polyacrylate cements have become an important component of the modern dentistry.

Glass polyalkenate cements are powder-liquid systems. The aluminafluoresilicate glasses with certain particle sizes are used as a powder, and an aqueous solution of polyacrylic acid or copolymers are used as a liquid.

We have investigated influence of the composition of bioglasses synthesized in the system  $RO-CaF_2-P_2O_5-Al_2O_3-SiO_2$  ( $R = Ca, Zn$ ) on interaction with polyacrylic acid.

The powdered polyacrylic acid (~0.1% cross-linked, average  $M_v \sim 450,000$ ) produced by SIGMA-ALDRICH CHEMIE GmbH used in experiments. Different glass compositions were used for preparation of composites with polyacrylic acid solution at room temperature. FTIR spectra were registered at different time period. Fig. 1–2 shows FTIR spectra observed at 30 minutes and 24 hours after mixing of glass powder with polyacrylic acid solution. The selected glass compositions were:

C-1-4,32SiO<sub>2</sub>; 3,67Al<sub>2</sub>O<sub>3</sub>; 6,30ZnO; 42,05CaO; 37,47P<sub>2</sub>O<sub>5</sub>;  
6,19CaF<sub>2</sub>

C-5-8,64SiO<sub>2</sub>; 7,33Al<sub>2</sub>O<sub>3</sub>; 12,60ZnO; 34,05CaO; 32,74P<sub>2</sub>O<sub>5</sub>;  
4,64CaF<sub>2</sub>

C-7-4,32SiO<sub>2</sub>; 3,67Al<sub>2</sub>O<sub>3</sub>; 25,20ZnO; 27,04CaO; 35,90P<sub>2</sub>O<sub>5</sub>;  
3,87CaF<sub>2</sub>

The infrared spectra were recorded in KBr pellets using FTIR instruments (IRAffinity-1, Shimadzu, Japan) and IRSolution software. The wavelength range was set between 4000 cm<sup>-1</sup> and 400 cm<sup>-1</sup>.

FTIR spectra of initial polyacrylic acid is shown in Fig. 1a and characterized by a number of characteristic absorption bands. The group of frequencies in the range of 1696–1738 cm<sup>-1</sup>, indicating the presence of internal and intermolecular hydrogen bonds in structure of polyacrylic acid. Stretching vibrations OH associated with carboxyl-group are attributed to frequency in range of 2668 cm<sup>-1</sup>, and OH bending vibrations correspond frequency in range of 925 cm<sup>-1</sup> [1, 183–200].

Result of interaction between the 40% polyacrylic acid solutions with selected bioglasses of different composition (C1, C5, C7 samples) at 0.5 hours after mixing is shown in Fig. 1 b-d.

Main characteristic vibration frequency of polyacrylic acid has a slightly different intensity and more blurred. Vibration frequency of carbonyl group is shifted and observed in typical range at 1710 cm<sup>-1</sup>.

The acid-base interaction of polyacrylic acid components with bioglass leads to possible resonance between two C-O bonds. The absorption vibration bands appeared in the region 1610–1550 and 1400–1300 cm<sup>-1</sup>, which are corresponded to symmetric and asymmetric vibrations of COO groups [1, 183–200]. There are intense characteristic absorption bands of silicates and phosphates at 400–650 and 1000–1100 cm<sup>-1</sup> [2, 118]. The region of characteristic hydroxyl groups of water molecules vibrations expanded to broad band at 3600 cm<sup>-1</sup>.

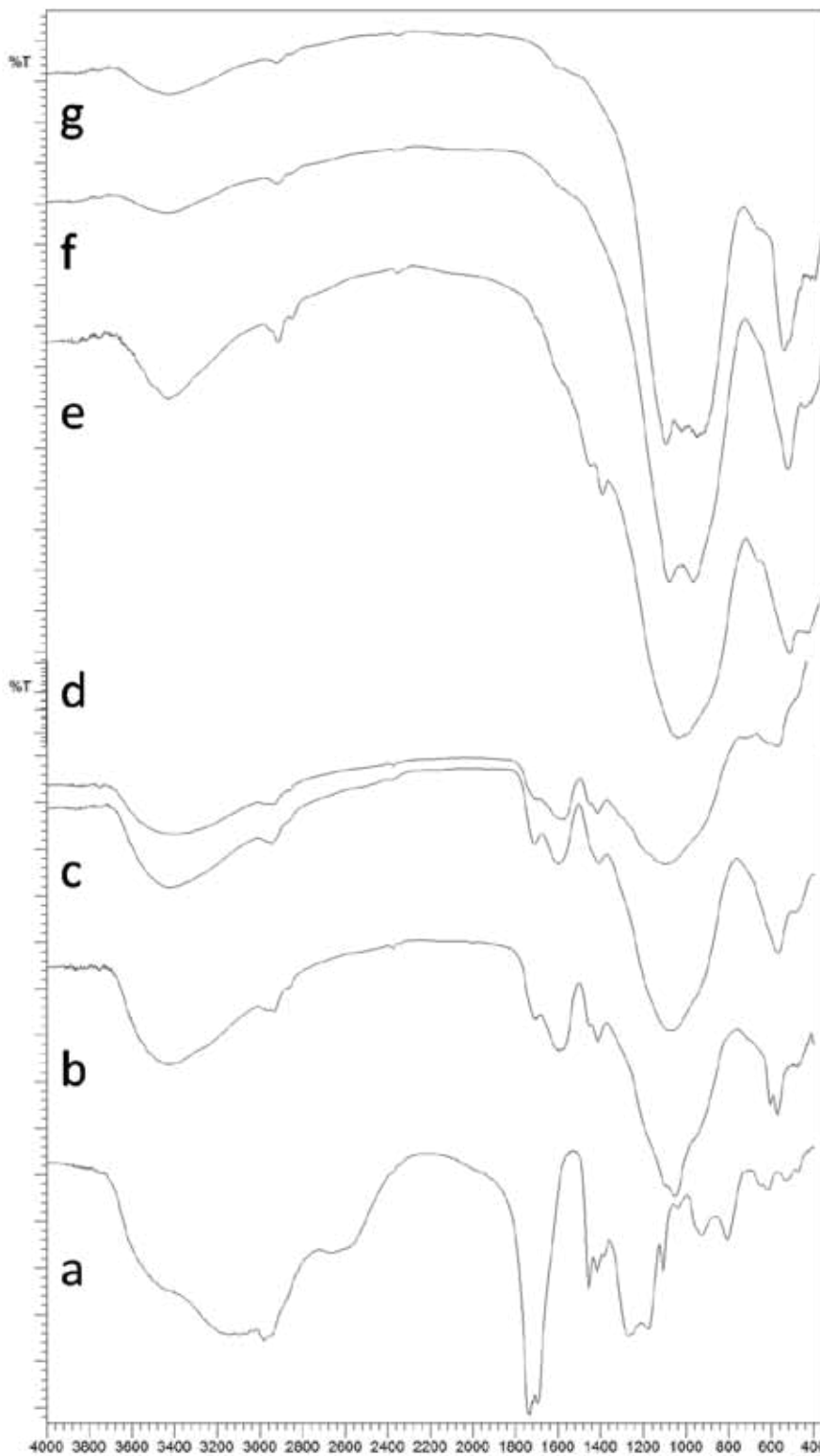


Figure 1. FTIR spectra of samples (a – polyacrylic acid, b – C5-polyacrylic acid, c – C1-polyacrylic acid, d – C7-polyacrylic acid, e – C7, f – C1, g – C5)

It is well known [1, 183–200], that  $\nu$  (C = O) absorption frequency depends on the electron-donor and acceptor properties of the carbonyl group substituent. The carboxylate anion absorption frequencies are equal to 1580, 1565 and 1560  $\text{cm}^{-1}$  for the C-1, C-5 and C-7 glass composition, correspondingly. This change can be attributed to different content of zinc oxide inside glass composition. The acid-base interaction of polyacrylic acids with alkaline-earth metals of bioglasses can lower carbonyl group absorption. Previously, the strongest interaction of polyacrylic acid with zinc oxide was determined by molecular dynamics computer simulation

method [3, 199–201]. Changing the zinc content in the glass affects the interaction force between polyacrylic acid and glass, and it is manifested in corresponding decrease of the carbonyl group absorption frequency.

The band at 2668  $\text{cm}^{-1}$  is disappeared which indicates the absence of hydroxyl groups bonded via strong hydrogen bonds.

The value of difference between asymmetric and symmetric carboxylate-ion vibration frequencies ( $\Delta\nu$ ) is calculated to determine the bond type of the polydentate carboxylate ion with bioglass metals (Table. 1) [4, 64–65].

Table 1. Characteristic carboxylate ion vibration frequency in FTIR spectra in composite samples of polyacrylic acid-bioglass synthesized in the system RO-CaF<sub>2</sub>-P<sub>2</sub>O<sub>5</sub>-Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> (R = Ca, Zn)

Bioglass index	$\nu_s(\text{CO}_2^-)$	$\nu_a(\text{CO}_2^-)$	$\Delta\nu$	Structure
C-1	1580	1400	180	chelating
		1451	129	bridging
C-5	1565	1412	153	chelating
C-7	1560	1413	147	chelating
		1451	109	bridging

The monodentate complexes are not existed which is confirmed by lack of characteristic bands in the range of 920–720 and 540 cm<sup>-1</sup> [4, 64–65]. It is known that number of bands in chelate complexes are less, and spectra of the C-5 glass — polyacrylic acid sample is characterized by a smaller number of absorption bands.

Analysis of obtained experimental data suggests the presence of chelating and bridging structures of materials prepared by interaction between polyacrylic acid with C-1 and C-7 glasses, as well as,

chelate structure of C-5 bioglass compositions. It can be explained due to the C-5 composition sample has increased content of silicon and aluminum oxides in two times, and apparently high levels of these oxides does not promote the formation of bridge bonds.

The spectra of the materials obtained after 24 hours after mixing of polyacrylic acid and bioglasses have no corresponded to carbonyl groups (Fig. 2).

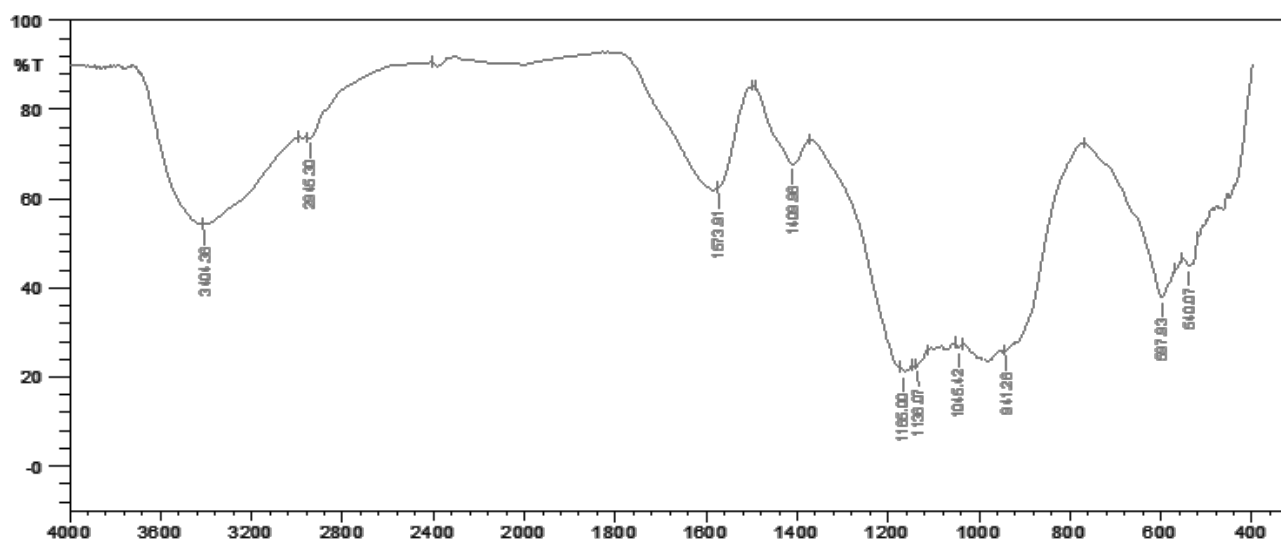


Figure 2. FTIR spectra of C1-polyacrylic acid composition after 24 hours

Thus, it is possible to conclude that the process of acid-base interaction between polyacrylic acid and glass components has been completed because three-dimensional structure is formed via strong intermolecular bonds providing hardening material. Composition of bioglasses obtained in the system RO-

CaF<sub>2</sub>-P<sub>2</sub>O<sub>5</sub>-Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> (R = Ca, Zn) affects both the strength of adhesion of polyacrylic acid to glass, and the intermolecular interactions in the system. Determining factors are the contents of zinc oxide, silicon oxide and aluminum oxide in the glass composition.

#### References:

1. Bellamy L.J. Infrared spectra of complex molecules. Springer, – 2013. – 433 p.
2. Plyusnina I. I. Infrared spectra of minerals. – M.: Moscow State University, 1977. – 182 p.
3. Aripova M. H., Mkrtychyan R. V., Kadirova Z. C. Assessing the interaction of acrylic acid with a biocompatible glass molecular dynamics//IV Int. Conf. of Chemistry and Chemical Technology. Yerevan, September 14–18, – 2015. – P. 199–201.
4. Nakamoto K. Infrared and Raman Spectra of Inorganic and Coordination Compounds: Part A: Theory and Applications in Inorganic Chemistry, Sixth Edition, John Wiley & Sons, – 2009. – 400 p.

## Section 16. Economics and management

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### Quality, risk and acceptance plan of the project, significant factors in its success

**Abstract:** "Quality" can be defined as the extent to which the final result matches the customer's requirements. Quality generally is considered from two different perspectives: the quality of each result produced for the client and quality of management processes undertaken to produce each result. For this reason a quality plan does not only define the approach taken to ensure the level of quality for each result, but also the management processes required to influence the quality of the outcome, such as change, risk and management of problems.

A risk plan lists all the anticipated risks of the project and presents some of the actions required to prevent any risk from happening and to reduce its impact if it happens. "Acceptance" is defined as getting approval from the client that the results produced from the project, meet the criteria set by the client. These criteria relate to the quality and cost of results and also the deadlines within which they are produced and can relate to the entire range of projects in industry, agriculture, services, infrastructure etc.

**Keywords:** project, quality, risk, acceptance, acceptance, client, analysis, impact, target.

#### Quality plan

To create a quality plan, the following steps are taken:

- Determine the term «quality» in relation to the project undertaken;
- Identify the quality objectives to be met;
- Describe the quality assurance and control techniques that must be undertaken;
- Define the processes required to achieve specified quality targets.

A quality plan is established during the planning phase of the project after the identification of the project plan, resource plan and financial plan. Since quality plan summarizes the quality objectives to be met and management processes to be undertaken, it is a reference throughout the whole project.

The first step towards the development of a comprehensive quality plan is to identify and control the quality of the results within the project. To do this, we need to define the term «quality», to determine quality objectives and to list quality assurance and quality control activities.

To ensure that there is a continuing sense of the term «quality» within the project, the term quality should be formally defined as follows:

**Quality is the extent to which the final result matches the customer's requirements.**

#### Quality objectives

For each requirement and result of the project, quality objectives are identified, so that, once completed will ensure that the outcome meets the customer's requirements. See table 1 as an example.

Table 1. – Quality Objectives

Project requirements	Project results	Quality criteria	Quality standards
The new settlement of financial management with collectable accounts and structured processes payable.	Implementation of Oracle financial books, payable accounts and collectable accounts and system modules.	The functionality of the system: <ul style="list-style-type: none"> <li>• Oracle tested and installed</li> <li>• Tested and installed equipment</li> <li>• tested and installed equipment and</li> </ul> System performance: <ul style="list-style-type: none"> <li>• development of the system</li> <li>• time response of the system</li> <li>• migrate data from the old system.</li> </ul>	Functionality of the system: <ul style="list-style-type: none"> <li>• operational Oracle with no errors</li> <li>• Equipment operating without any error</li> <li>• Equipment operating without any error</li> </ul> System performance: <ul style="list-style-type: none"> <li>• 99.9% the system with good performance</li> <li>• 5 seconds response time</li> <li>• 100% data accuracy.</li> </ul>

#### Quality assurance plan

To ensure the client that quality objectives specified above will be met, quality assurance techniques (QA) must be defined.

Quality assurance techniques are preventive steps taken to eliminate any deviation from the quality of the results produced by the established quality objectives. Quality assurance is often undertaken in a project summary level by an external source of the

project. Examples of techniques used to ensure the quality of the results include:

- **Review of historical data:** the meaning of other projects related to the project (or that are being carried out or have been completed recently) and quality issues encountered by these projects will make it possible for the quality manager to identify potential quality issues within the project;

• **Definition of requirements:** by documenting a comprehensive range of customer requirements, a greater understanding of the level of required quality of results will be gained in order to achieve total customer satisfaction;

• **Definition of standards:** by defining a set of criteria and specific quality standards, the project team will clearly understand the level of quality which will be achieved;

• **Recruitment of qualified staff:** using qualified staff will directly influence the quality of produced results. Properly qualified staff will have the knowledge, skills and experience required to undertake given tasks in the project plan with minimal training, to achieve the desired level of quality;

• **Conduct of quality reviews:** independent reviews to assess the overall quality of each result can give the client confidence that the project is on track and is likely to produce a result that meets the requirement;

• **Implementation of change control:** changes in the subject often have an effect on the level of quality provided. Through the identification of a clear process of change control, only the changes that are absolutely necessary will be approved by the project for implementation.

Table 2 identifies the techniques required to ensure the customer that quality objectives will be met.

Table 2. – Quality Assurance plan

Technique	Description	Frequency
Recruit qualified staff	We will recruit qualified staff to ensure the quality of results by means of: <ul style="list-style-type: none"> <li>• Ensuring that staff allocated to the project has at least 3 months of trading experience in similar projects within this field of business;</li> <li>• Appointment of two major managers from existing businesses who understand the business requirements in details;</li> <li>• Appointment of two technical consultants to ensure that the results of this project technology meet the quality objectives.</li> </ul>	Throughout the whole project
Conduct quality reviews	We will review the quality of results through: <ul style="list-style-type: none"> <li>• Appointment of an independent specialist to conduct monthly quality reviews for all key results of the project;</li> <li>• Appointment of quality project manager who is responsible for the quality of results produced by the project.</li> </ul>	Each month.

### Quality control plan

Besides undertaking quality assurance to improve the quality of the result, several techniques of quality control (QC) can be implemented. QC techniques are often undertaken at a detailed level of the project from an internal source of the project. Types of techniques used to “control” the quality of the results are:

• **Reviews of everyone’s work:** the process of requiring by members of the project team to review the work of each is known to increase the level of quality of the results. It will also make it possible to identify quality problems earlier in the execution phase of the project and therefore will increase the likelihood of quality problems to be solved earlier;

• **Reviews of the result:** internal staff of the project can undertake formal planned reviews of the results, to ensure that they meet customer requirements;

• **Reviews of documentation:** Similar with reviews of the result, this process involves a review of all project documentation at regularly scheduled intervals planned in the project;

• **Phase reviews:** these are formal reviews at the end of each major phase of the project to evaluate the activities and results completed by this time and to get approval from the project sponsor to continue with the next phase of the project.

Table 3 provides an example of identifying the QC techniques that will be implemented to control the quality of each result in the project.

Table 3. – Quality Control Plan

Technique	Description	Frequency
Review of everyone’s work	Implement the following policy to review the work of each member of staff: <ul style="list-style-type: none"> <li>• A team leader will be responsible for each project result.</li> <li>• To each team leader will be given a “counterpart” for the leadership of the team for counterpartss reviews.</li> <li>• Team leaders will formally review each week the results of his counterpart.</li> <li>• Team leaders will document the results of each review of the counterparts using a quality review form.</li> <li>• The Quality Manager will review the process of reviewing counterparts regularly to ensure that reviews of counterparts are undertaken regularly.</li> </ul>	Every week, throughout the project
Phase reviews.	Implement stage reviews: <ul style="list-style-type: none"> <li>• At the end of each of phase of the project a formal phase review will be undertaken. This review will bring receipt of acceptance from the project sponsor that the project has reached its objectives by that time and can progress towards the next phase of the project.</li> <li>• To start a phase review, the project manager will complete a phase review form and submit it to the project review council for evaluation and approval.</li> </ul>	At the end of each important phase of the project.

Besides describing how to ensure quality of each result produced for the client, we must also describe how to ensure quality of management processes undertaken to produce each result. For each

of the following processes, the steps involved in the undertaking of the process and the responsibilities of the source responsible for process managing are described:



- Time management process;
- Cost management process;
- Quality management process;
- Change management process;
- Risk management Process;
- Problems management process;
- Procurement management process;
- Acceptance management proces;s
- Communication management process.

#### Risk plan of the project

A comprehensive risk plan includes:

- A list of anticipated project risks;
- Assessing the possibility for each risk to occur;
- A description of the impact on the project if a risk actually occurs;
- Estimates of the overall importance of each risk;
- Some preventive actions to be taken in order to reduce the possibility of a risk to occur;
- Several contingency actions to be taken in order to reduce the impact if the risk if it occurs;
- Risk management process throughout the project.

The risk plan should be documented in the planning phase of the project to ensure that risks are mitigated before the project execution. Shortly after the risk plan is documented, the risk management process begins to be monitored and risks of control are identified within the project. Risk management process is interrupted only when the execution phase of the project is completed.

The first step toward creating a risk plan is to identify any risk that might otherwise affect the ability of the project to achieve its set objectives. Some risk categories are listed and for each category, several potential risks are identified. A seminar on risk planning can

be undertaken to help key shareholders of the project to identify project risks. This could include the project sponsor, the project manager, project team, suppliers and in some cases the client. Each risk identified is defined and documented in detail in the risk plan.

To ensure that there is a constant meaning of the term «risk» in the project, it will be necessary to formally define the term as follows:

**A risk is an event that is likely to negatively affect the project's ability to achieve the established objectives.**

Possible categories of risk for this project are identified. A risk category is a particular aspect of the project that is likely to experience a risk during the course of the project. Typical risk categories are:

- Requirements of the project;
- Potential benefits of the project;
- Deadline for the project completion;
- The budget for the project implementation;
- Expected results of the project;
- Scope of the project, its precise definition;
- Identified problems and their solution;
- The supplier or suppliers to be contracted for the provision of goods and services;
- Acceptance of goods and services;
- Communication between the project implementation participants, sponsors, suppliers etc;
- Available resources, mainly human resources, equipment, etc.

For some of the major risk categories identified above, the potential risks were described, by completing Table 4. Where, for each of the listed risk, a unique identification number (ID/No.) should be established for future reference.

Table 4. – Risk List

Risk Category	Description of risk	Nr./ID of risk
1	2	3
Requirements	• Requirements are not clearly specified.	1.1
	• Specified requirements do not match the client's needs.	1.2
	• Specified requirements are not measurable.	1.3
Benefits	• The business benefits are not identified.	2.1
	• The business benefits are not expressed in quantity.	2.2
	• The final solution provided fails to reach the required benefits.	2.3
Deadlines	• The deadline does not give enough time to complete the project.	3.1
	• The deadline does not list all the activities and tasks required.	3.2
	• The deadline does not correct dependencies.	3.3
Budget	• The project exceeds the budget allocated	4.1
	• There is an expense in the project not included in the accounts.	4.2
	• There are not responsible sources for the registration of project expenses.	4.3
Results	• Requested results from the project are not clearly defined.	5.1
	• Quality criteria for each result are not clearly defined	5.2
	• Produced results don't meet the defined quality criteria.	5.3
Scope	• The scope of project is not clearly defined.	6.1
	• The project has not been undertaken within the scope of which has been agreed.	6.2
	• Changes to the project adversely affect the project.	6.3
Problems	• Project Problems are not solved within a convenient time.	7.1
	• Similar problems continually reappear throughout the project	7.2
	• Unresolved problems become new risks in the project.	7.3
Suppliers	• Expectations for the delivery from the supplier have not been determined.	8.1
	• Suppliers do not meet the set expectations.	8.2
	• Procurement delays affect the timeliness of the project delivery.	8.3

1	2	3
Acceptance	• Criteria for acceptance of the project results are not clearly defined.	9.1
	• Clients do not accept the final results of the project.	9.2
	• The acceptance process leaves the client unsatisfied.	9.3
Communication	• Lack of controlled communication causes problems to the project.	10.1
	• Key shareholders of the project are not informed of the progress.	10.2
Resources.	• Staff allocated to the project is not appropriately qualified.	11.1
	• There is insufficient equipment to undertake the project.	11.2
	• There is a lack of available materials when required.	11.3
...	...	...

The next step is to assess the possibility of any impact of each risk if it occurs. For this reason a quantitative expression of risks must be accomplished. To our help comes table 5 used to measure the possibility of occurrence for each risk.

Table 5. – Probability of risk

Title	Points	Description
Very low	20	There is no possibility of occurrence based on current information, because the circumstances that could cause risks are unlikely to occur.
Low	40	Unlikely to happen. However it should be monitored as certain circumstances could lead to the risk of becoming a potential occurrence during the project.
Medium	60	Likely to happen since it is clear that the risk can occur.
High	80	More likely to occur, based on the circumstances of the project.
Very High	100	Most likely to happen because the circumstances that would make this risk to occur, is also most likely to occur.

It is important that in addition to the possibilities of occurrence, the impact that each risk will have in the project is also measured. Table 6 creates a rating system used to measure the “impact” of each risk if it occurs.

Table 6. – Impact of Risk

Title	Points	Description
Very Low	20	Insignificant impacts on the project. It is not possible to measure the impact on the project because it is so minimal.
Low	40	Small impact on the project. It results in less than 5 percent of the deviations in the object, the completion deadline of the project or budget.
Medium	60	Measurable impact on the project. Results in 5–10 percent deviation of the results in the object, the completion deadline or project budget.
High	80	Significant impact on the project. 10–25 percent deviation of the results in the object, deadlines or project budget.
Very High	100	Great impact on the project, resulting in a deviation of more than 25 percent to the object, a deadline or in the project budget.

For the risk assessment of the project, after we have calculated the possibility and impact we estimate the priority for each risk, by indicating the points of priority based on the number of risk.

Priority pointss can be calculated as the average of possibility of occurrence with the impact scores, divided by 2.

$$\text{Priority points} = (\text{possibility} + \text{Impact}) / 2.$$

Table 7 presents the calculation of points and assessment under the pointss resulted. For nearly 50 points, the evaluation is medium, over 50 points high, over 80 points very high, less than 50 points low.

Table 7. – Risk Priority

Nr./Id of Risk	Possibility	Impact	Priority	Assesment
1.1	20	80	50	Medium
1.2	80	60	70	High
1.3	100	40	70	High
2.1	40	20	30	Low
2.2	90	100	95	Very High
2.3	20	80	50	Medium

After performing the priority assessment, Table 8 is used to determine the assessment and to assign an appropriate color code to each assesment:

Table 8. – Assessment of risk priority

Priority points	Priority assessment	Priority colour
0–20	Very Low	White
21–40	Low	Green
41–60	Medium	Yellow
61–80	High	Orange
81–100	Very High	Red

For each identified risk, we list the preventive actions required to reduce the possibility of occurrence of risk and contingent actions needed to reduce operations in the project, if the risk occurs..Against each action, we assign a resource that is responsible for taking ac-

tion and the date within which action must be completed. Table 9 is used to merge this information. This table should be completed for each identified risk. To risks of highest priority should be given the most comprehensive actions where possible.

Table 9. – Table of risk

Estima- tion	No. Of risk	preventive actions	Source of Action	Action Date	Source of Action
Very High	2.2	Clearly identify the expected business benefits	Project sponsor	Contingency actions. Measure the actual business benefits achieved by the project	Project Man- ager
High	1.2	Clearly specify client require- ments in terms of quality	Project Manager	We asses the requirements after they produce results, measure any deviation and increase results to meet the require- ments.	Project Man- ager
High	1.3	Clearly specify the quality criteria used to determine whether the stated require- ments for each result are met.	Quality Man- ager	Estimate the quality criteria after the re- sult is produced, measure any deviation and increase results to meet the estab- lished quality criteria.	Quality Man- ager

Table 10.

Risks analysis focuses on the analysis of key stakeholders and the environment in which the project takes place.

It is important to analyze one by one the stakeholders partici-  
pating directly and indirectly in the projects and that may be:

- Customers, Executive Board, project manager, project team, Controllers, end-users, employees, heads of departments, Media, interested persons, activists, authorities, suppliers, sponsors etc.

It is also important the analysis and evaluation of and social and factual environment, which might be:

Social environment	Factual environment
Client	The technology
Owner	Knowledge
Directory	Budget
The project team	Strategy
Project leader	Market Development
Employees	Weather
Suppliers	Environment
Partners	parallel activities
The public	Laws
Competitors	Status of resources
Family	

The analysis can take place as following in a tabular order

Table 11. – Analysis of the Social environment

No.	Pressure group	The attitude towards the project (-/0/+)	Force of influence (1/2/3)	What interest groups expect	Fear of groups	Measures

Table 12. – Analysis of the actual environment

No.	Influencing factors	Influence to project (-/0/+)	Force of influence (1/2/3)	Impact on the project	Measures

A method of managing risks is FMEA (Failure mode and effects analysis). Schematically this method may appear:

Table 13. – FMEA

Work package	Risk	Consequences	Probability of occurrence (1–10) a	The effect on the project (1–10) b	Change of Impact (1–10) c	Risk Index (Axbxc)	Measures

**Draughting of the acceptance plan.**

The acceptance plan includes:

- A list of key milestones to be achieved and results to be produced;
- Some criteria and standards for acceptance of the results by the client;
- A plan that describes how the results will be reviewed to determine whether or not they meet the criteria and standards set by the client;
- The process of obtaining customer approval, after the results are produced.

The acceptance Plan is an important document in the project. Usually it is built towards the end of the planning phase of the project after the project plan, resource plan, financial plan, qual-

ity plan and risk management plan are documented. Acceptance Plan is identified throughout the execution phase since it is used to confirm that each produced result is complete and ready for acceptance by the customer. It is also addressed during the closing phase of the project as part of the project closure report and post-implementation review.

To ensure that there is a constant sense of the term «acceptance» within the project, we should normally define the term of acceptance. We define acceptance as following:

Acceptance is defined as getting approval from the client that the results produced by the project meet the criteria set by the client.

According to the main stages of the project, the results of which the client's acceptance is required are listed in the example of Table 14. As follows:

Table 14. – Main stages of acceptance

Name	Description	Result	Name
Update of the financial system	Implementation of the software package on the new hardware	Software packages installed	Description, implementation of the ledger (Oracle), accounts payable (equipment) and software of collectable accounts

It is important at this stage to identify the criteria and standards that must be met to achieve customer acceptance for each result. For

this purpose we can rely in table 15 as follows:

Table 15. – Acceptance Criteria:

Result	Criteria	Standards
Software packages installed	Functionality of the system: Oracle tested and installed Tested and installed Equipment tested and installed, Software tested and installed. System performance: The system in operation System reaction time	Functionality of the system: Oracle operating without errors Operational equipment without errors Software operating without errors System performance: 99.9% system working Less than 1 second from response time Data transferred 100%, data accuracy.

Criteria and standards listed above have to convince the client that the results produced can be measured adequately and that all requirements are met. Although the criteria listed mostly explain quality of “results”, other types of criteria can be used, such as:

- Quality of new processes allocated by the project;

- Timely conduct of results and processes;

- The ability of the project to produce results within the budget.

Create a board of review needed to ensure that the results produced by the project meet the criteria and standards already established. An example is shown in Table 16.

Table 16. – Acceptance Table

Main stages of completion	Result	Date	Review Method	Reviewers
The financial system updated.	Software package installed.		physical inspection. Software Testing. Review of accuracy.	Systems tester Project Manager Manager of Data Quality Customer's lawyer. Independent Consultant.

• Completion date is the scheduled date on which the result will be 100% complete and ready for customer acceptance.

• Review method is the technique used to assess whether the quality criteria are met or not.

• Reviewers are people who in collaboration with each other try to conduct the review.

• Acceptance date is the date set for the acceptance of results from the client, after completing the acceptance review.

Possible assumptions made during acceptance planning exercise could be:

- There will be no changes in project requirements during the project;
- Acceptance criteria will not change during this project;
- The reviewers will be available to conduct reviews as required.

Risks identified during this planning exercise can be listed:

- acceptance criteria can not be directly compatible with the requirements of the client;
- Acceptance reviews carried out may not provide adequate confidence that the results meet the acceptance criteria listed above;
- Resource assigned to conduct the acceptance review can be not properly qualified to carry out each review as required.

#### References:

1. Project Management –Dynact Management Consulting -Aleksander Kagi.
2. Project Management –Manfred Strohmaier.
3. Quality Management –Matthias Zacharnik.
4. Alston, J. M., M. C. Marra, P. G. Pardey, and T. J. Wyatt. 1999. “Research Returns Redux: A Meta-Analysis of the Returns to Agricultural R&D.” EPTD Discussion Paper No. 38. International Food Policy Research Institute, Washington, DC.
5. Alston, J. M., G. W. Norton, and P. G. Pardey. 1995. *Science Under Scarcity: Principles and Practice for Agricultural Research Evaluation and Priority Setting*. Ithaca, NY: Cornell University Press.
6. Belli, P., J. Anderson, H. Barnum, J. Dixon, and J. P. Tan. 1998. *Handbook on Economic Analysis of Investment Operations*. Operations Core Services Network, Learning and Leadership Center, The World Bank, Washington, DC.
7. Byerlee, D., and G. Alex. 1998. “Strengthening National Agricultural Research Systems: Policy Issues and Good Practice.” ESSD, The World Bank, Washington, DC.
8. Horton, D., P. Bellantyne, W. Peterson, B. Uribe, D. Gapasin, and K. Sheridan. 1993. *Monitoring and Evaluating Agricultural Research: A Sourcebook*. CAB International, Wallingford.

# Contents

<b>Section 1. Biology</b> .....	<b>3</b>
<i>Abdurakhimov Mingjigit Kattabekovich, Urokov Sirojiddin Xudayberdiyevich</i> The effect of fertilizing buckwheat on the growth and fertility of the plant .....	3
<i>Avutkhonov Burkhon Sobirovich, Safarov Alisher Karimdjonovich, Safarov Karimdjon Safarovich</i> Physiological peculiarities of Columbus grass ( <i>sorghum almum</i> Parodi) in Samarkand region conditions of Uzbekistan .....	5
<i>Jabbarov Zafarjon Abdukarimovich</i> Substantiation of the change of chemical content of the soils polluted by oil and oil production .....	7
<i>Isagaliyev Murodjon Tuychiboyevich</i> Biogeochemistry of mercury in mountain-brown soils .....	10
<b>Section 2. Geography</b> .....	<b>12</b>
<i>Berdiev Khayriddin Abdullayevich</i> The historical and natural-geographical aspects of Nurota .....	12
<b>Section 3. History and archaeology</b> .....	<b>14</b>
<i>Kandaxarov Anvar Hasanovich</i> Education system and great sufi in central Asia Xvi Century .....	14
<i>Mozgovoi Sergej Grigorievitch</i> Makhnovism as a historical tradition expression .....	16
<i>Shavlokhova Elena Sergeevna</i> Historical background of completing the joining the North Caucasus to Russia .....	18
<b>Section 4. Information technology</b> .....	<b>20</b>
<i>Muminov Bahodir.Boltayeich</i> The calculating rating of electronic resources .....	20
<b>Section 5. Mathematics</b> .....	<b>22</b>
<i>Druzhinin Victor Vladimirovich</i> Quantitatively Exact proof of the Euler-Goldbach hypothesis.....	22
<b>Section 6. Materials Science</b> .....	<b>24</b>
<i>Bakhadirov Kudratkhon Gayratovich, Rasulov Alisher Khakimovich,</i> <i>Rosulov Ro'zimurad Khasanovich, Umarov Erkin Adilovich,</i> <i>Ziyamukhamedova Umida Alijanovna, Nazarov Javokhir Sobirjon o'g'li</i> Features of sheet metals' symmetric and asymmetric rolling .....	24
<b>Section 7. Medical science</b> .....	<b>26</b>
<i>Abdirimova Aziza Dushamovna, Matnazarova Gulbahor Sultanovna</i> Diagnostic value of definition of antibodies to antigens of microorganisms in women with inflammatory diseases of the pelvic organs .....	26
<i>Avezov Davlat Kurbanbaevich</i> Disorders of neurohumoral factors in patients with chronic heart failure.....	28
<i>Adilov Utkir Khalilovich</i> Assessment of professional risk of employees of fuel and energy complex at production and use of coal .....	29
<i>Akilov Khabibulla Ataulaevich, Saidov Farkhod Khamidovich</i> Comparative evaluation of the colon microbiocenosis in children with chronic colostasis on the background of surgical treatment .....	31

<i>Akramhodzhaeva Dilfuza Shakarimovna, Kamalov Zaynitdin Sayfutdinovich, Khegai Tatiana Rudolfovna, Zakhidova Nadira Erkinovna</i>	
The role of genes of the folate cycle in the development of antiphospholipid syndrome in the Uzbek population .....	35
<i>Alimukhamedov Dilshod</i>	
Medical-biological evaluation of the safety of soy protein isolate .....	38
<i>Alimoukhamedova Gulrukh Aybekovna, Khalimova Zamira Yusufovna</i>	
Metabolic disorders in patients with adrenal incidentalomas.....	40
<i>Aminova Dildora</i>	
Genealogical characteristics of children with epileptic encephalopathy and symptomatic epilepsy.....	44
<i>Almatov Bahrom Ibrahimovich, Nuraliyev Nekkadam Abdullaevich, Kurbanova Sanobar Yuldashevna</i>	
Season dynamics of changes in water microb structure in some water storage reservoirs of Uzbekistan.....	46
<i>Artykova Mavlyuda Abdurahmanovna</i>	
Morphological changes in children with cerebral palsy With symptomatic epilepsy .....	49
<i>Artykova Mavlyuda Abdurahmanovna</i>	
Morphological and morphometric features of the brain in children with cerebral palsy complicated by epilepsy .....	51
<i>Ashurov Azimjon Mirzajanovich, Boymuradov Shukhrat Abdujalilovich, Khayruddinova Zulfiya Rafikovna</i>	
Monitoring of frequency of sinusitis in diagrams.....	55
<i>Bakhritdinova Fazilat Arifovna, Khera Akshey, Arnopolskaya Dina Isifovna</i>	
The results of phaco-vitrectomy in patients with proliferative diabetic retinopathy.....	59
<i>Grigoriyants Karina Eduardovna, Khakimova Gulshana Bahtiyorovna, Aripova Tamara Uktamovna</i>	
Morphometric changes in the central body of immune system after effect of automobile exhaust gases .....	61
<i>Gulyamov Surat S., Gaybullaev Elbek A., Sadykov R.R.</i>	
Smokeless tobacco-associated lesions of the oral cavity.....	63
<i>Juraeva Zuhra Yorievna</i>	
Comparative analysis of the immune system at often and chronically patients preschool children.....	67
<i>Ismailov Saidganihodja Ibragimovich, Abdurazakova Dilbar Sodikovna</i>	
The quality of life of women with subclinical hypothyroidism, depending on the level of thyroid stimulating hormone .....	69
<i>Indiaminov Sayit</i>	
Damages to hypothalamus vessels in various types of blood loss on the background of acute alcohol intoxication .....	72
<i>Isakova Lola Isakovna</i>	
Characteristic of physical activity of young athletes of the Syrdarya region of Uzbekistan .....	74
<i>Isanova Dilfuza Tursunovna, Azizov Yuriy Dalievich</i>	
The estimation of the variability of the taxonomic characteristics of pathogens of urinary tract infections in women .....	76
<i>Israilov Radjab Israilovich, Isoev Golib, Eshbaev Erkin Abdukhalimovich</i>	
Morphological condition of the thymus in neonatal sepsis .....	78
<i>Kadyrov Shavkat Nomonovich, Jalilov Muhammadjan Alijanivich</i>	
Prevention of paralytic ileus in acute diffuse peritonitis.....	80
<i>Kadyrov Shavkat Nomonovich, Jalilov Muhammadjan Alijanivich</i>	
Prevention of complications following operating Adhesive Peritonitis.....	82

<i>Kaipbekova Gulbaxar Konisbaevna</i> Immunological markers of juvenile Rheumatoid Arthritis in children .....	83
<i>Kamalov Zaynitdin Sayfutdinovich, Akramhodzhaeva Dilfuza Shakarimovna, Khegai Tatiana Rudolfovna, Zakhidova Nadira Erkinovna</i> Association of MTHFR and MTRR genes with the development of antiphospholipid syndrome in pregnant women of Uzbek population.....	85
<i>Karimov Khamid Yakubovich, Boboev Kadir Tuxtabayevich</i> Analysis of association of polymorphism rs1045642 of mdr1 gene with development of myeloproliferative diseases.....	88
<i>Kahhorov, Jamoliddin, Atakhanova Nigora, Shayusupov Nariman, Kakhkharov Alisher</i> Tumor-to-breast ratio in forecast of breast cancer.....	90
<i>Kuldashev Kahramon Abduhalilovich</i> Surgical treatment of secondary brain injury combined with cranial trauma.....	92
<i>Khera Akshey, Arnopolskaya Dina Iosifovna</i> Development of ocular hypertension in the eyes with proliferative diabetic retinopathy after vitreoretinal interference.....	94
<i>Lipartia Mary Givievna</i> Morbidity of children with non-hodgkin lymphoma from them in Uzbekistan.....	96
<i>Matlubov Mansur Muratovich, Semenihin Arseniy Arsenevich</i> Assessment of the effectiveness and safety of epidural-sacral anesthesia during cesarean section.....	98
<i>Arzikulov Abdurayim Shamshiyevich, Makhsumov Murodillo Kudratillayevich</i> Comparative age features of clinic and pathogenetic aspects of school disadaptation .....	101
<i>Mirzaakhmedova Kamola Tokhirovna, Aminov Salakhitdin Djurayevich</i> Pharmacological effect of Trinatrium salt of Glycyrrhizic acid .....	103
<i>Muratova Shakhlo Tahirjanovna</i> The anxious state in the adolescents with Graves' disease under conditions of Iodine deficit .....	104
<i>Mirzakarimova Malokhat Abduvakhidovna</i> The combined effect of complex mixes of poisons on the organism of white rats in 30-day round-the-clock inhalation and measures of biological prevention .....	107
<i>Akhmedov Ulugbek Bahodirovich, Murtazaev Saidorifkhon Saidaloevich, Baybekov Iskander Mukhamedovich, Mirzaakhmedov Sohob Djomaliddinovich</i> Structural features of the radial artery at the different ways in their harvesting for use in coronary artery bypass.....	110
<i>Rabbimova Gulnora</i> Efficiency in phytotherapy endogenous intoxication syndrome in pregnant women with infectious risk.....	113
<i>Ravashanov Shavkat</i> Callus distraction for congenital fourth brachymetatarsia .....	115
<i>Rasulov Ulugbek Abdugafurovich</i> Conservative treatment and rehabilitation of the patients with occlusive disease of femoropopliteal segment .....	118
<i>Rakhmatullayev Akmal Abadbekovich</i> Differential diagnostics of the abnormalities of ureter-vesical segment development in children .....	119
<i>Rustamova Umida Mukhtarovna</i> Ultrasonography research of knee joint injury .....	121
<i>Rustamov Bakhtiyor Baysariyevich, Irmatov Nizom Zhumakulovich</i> Toxicological evaluation of medical and biological safety of the red palm oil «Premium caratino» .....	123



<i>Saatov Botir Talatovich, Ibragimova Elvira Akhmedovna</i> Microelement composition of the skin and scalp hair in healthy subjects and patients with vitiligo . . . . .	124
<i>Sattarov Alisher Rakhimovich, Kobilov Azizjon Orziqulovich, Saidov Sokhib Saidmurodovich, Aziz Rakhmatov Mirzakulovich</i> The priority of Vertebroplasty for treatment of symptomatic vertebral hemangiomas . . . . .	128
<i>Saidkhodjayeva Saida Nabiyevna</i> Headaches in children with attention deficit hyperactivity disorder: clinical manifestations and specific progressing . . . . .	130
<i>Salakhiddinov Kamoliddin</i> Modern view in treatment of burn wounds . . . . .	132
<i>Navruzova Shakar Istamovna, Sa'dulloeva Iroda Kurbonovna</i> State of neuro-humoral regulation in congenital heart defects in children . . . . .	133
<i>Sviatlitskaya Volha Ivanovna</i> Correction of respiratory disorders in patients with ARDS on the background of having obesity . . . . .	135
<i>Suwonov Qayim Jahonovich</i> Landscape of transition of microorganisms to internal organs during the experimental bacterial translocation . . . . .	137
<i>Suleymanov Suleyman Fayzullaevich</i> Using immunocorrection therapy in patients with chronic pancreatitis . . . . .	141
<i>Umarova Lola Nabiyevna</i> Etiology intrauterine growth retardation . . . . .	143
<i>Umarchodjayev Fathulla Rikhsikhodjayevich</i> Instrumental correction of scoliotic disease in children and teenagers in the Republic of Uzbekistan . . . . .	144
<i>Khakimov Mirazim Alimovich</i> Assessment of genetic factors in patients with various forms of Nephrotuberculosis . . . . .	145
<i>Khashirbaeva Dinora Makkambaevna</i> Industrial traumatism among «Ferganaazot» workers and systematic analysis methods for determination of priority measures for its prevention . . . . .	147
<i>Khudaybergenov Shukhrat Nurmatovich, Irisov Ortikali Tulaevich, Tursunov Nasriddin Toshtemirovich, Mustafaev Azizjon Toshmuhammadovich</i> Algorithm of diagnosis and surgical treatment of postoperative chylothorax . . . . .	148
<i>Khurshidakhon Abduboriyevna Rasulova, Botir Turgunpulatovich Damirov, Marina Ilyinichna Chiniyeva</i> Morphological changes in kidneys after experimental acute brain ischemia in rats . . . . .	150
<i>Shamsutdinova Elvira Faridovna</i> Sexual development and biochemical values of hepatic function in dynamics with background various methods of hormonal therapy in adolescent girls with congenital estrogen deficit . . . . .	154
<i>Shirinova Inobat Anvarovna</i> Influence of catacyan and benzonalum on Ca <sup>2+</sup> – accumulation capacity of mitochondrion of a liver of the rats poisoning with toxic of a cobra naja naja pxina Echwald . . . . .	156
<i>Shomuradova Shakhnoza Shavkatovna</i> The state of hepatobiliary system in juvenile rheumatoid arthritis . . . . .	158
<i>Shukurov Esondavlat</i> Ultrasound diagnosis of the lower extremity deep vein thrombosis in the patients with multiple fractures of the bones of the lower extremities . . . . .	162

<i>Yugay Igor Aleksandrovich, Mamadjanova Risolat Abduvahabovna, Akhmediev Makhmud Mansurovich</i>	
The method of determination of intracranial pressure in patients with crania bifida associated with hydrocephalus .....	164
<i>Yuldashev Nabijon Primovich</i>	
Immediate and medium-long-term clinical and angiographic results of the use of bioresorbable vascular scaffold ABSORB .....	166
<i>Yuldashev Ravshan Muslimovich</i>	
Open Vertebroplasty in surgical treatment of metastatic tumors of the spine.....	169
<i>Yakubov Erkin Amongeldievich, Ergashev Nasriddin Shamsiddinovich</i>	
Mistakes, dangers and complications in surgery of the cysts of biliary ducts in children .....	172
<b>Section 8. Mechanics .....</b>	<b>174</b>
<i>Norkhodjaev Fayzulla Ramazanovich</i>	
Actual prospects of application of metal layered composition of type “Fss-an intermediate alloy-solid working element” in manufacture of drill tools .....	174
<b>Section 9. Pedagogy .....</b>	<b>177</b>
<i>Nabiev Valery Sharifyanovich</i>	
Pedagogical support of competence formation: methodological bases and experimental context .....	177
<b>Section 10. Psychology .....</b>	<b>179</b>
<i>Abdullayeva Shafahat</i>	
The culture and attitudes .....	179
<b>Section 11. Regional studies and socio-economic geography .....</b>	<b>179</b>
<i>Volkova Tatiana Aleksandrovna, Ryzhivolova Ella Aleksandrovna, Antiptseva Yulia Olegovna, Khodykina Anna Fedorovna, Okonishnikova Yulia Evgenyevna</i>	
Prospects of development of ecological tourism in Tuapse district of Krasnodar region.....	181
<i>Volkova Tatiana Aleksandrovna, Punko Inga Merabovna, Zhulikov Anton Andreevich, Khodykina Maria Fedorovna, Ponomarenko Anastasia Andreevna</i>	
Rural tourism on the territory of Krasnodar region .....	183
<i>Volkova Tatiana Aleksandrovna, Filobok Anatoly Anatolyevich, Belikov Mikhail Yuryevich, Minenkova Vera Vladimirovna</i>	
Coastal geosystems of Azov-Black sea coast of Krasnodar region: vulnerability sustainable development. ....	185
<i>Volkova Tatiana Aleksandrovna, Belikov Mikhail Yuryevich, Minenkova Vera Vladimirovna, Maksimov Dmitry Vasilyevich, Komarevtseva Natalia Aleksandrovna</i>	
Tourist-recreational complex of the region: structure and management.....	188
<i>Volkova Tatiana Aleksandrovna, Sidorova Darya Vitalyevna, Fokin Dmitry Nikolayevich, Kalustova Irina Sergeevna</i>	
Simulation modelling as a tool of study of geosystems of tourist-recreational type.....	191
<b>Section 12. Agricultural sciences .....</b>	<b>194</b>
<i>Andronova Marina Michailovna</i>	
Maple ash ( <i>Acer negundo</i> L.) in gardening in small north towns .....	194
<i>Grabovec Nina Viktorovna, Rafieva Feruza Umidullaevna, Shodmonova Gulnoza Erkinovna</i>	
The study of morphological traits of seeds and ovaries in wild forms of cotton .....	195
<b>Section 13. Technical sciences .....</b>	<b>199</b>
<i>Ikramova Malika</i>	
Estimation of sediment loads: the Tuyamuyun reservoir on Amudarya river .....	199

<i>Yusubov Faxraddin Vali, Shixaliyev Karam Seyfi, Abdullayeva Maya Yadigar</i> Determination of optimal parameters of purification water surface from oil and oil products by sorbent on the basis of worn automobile tires .....	202
<i>Parpiyev Azimjan, Kayumov Abdul-malik, Pardayev Hanimkul</i> Effect of temperature of steady heating components of cotton-seed at drying process.....	205
<i>Parpiev Azimdzhan, Kaiumov Abdul-malik, Akhmatov Nozimzhon</i> Definition of area of soft temperature drying condition .....	208
<i>Mirzabaev Akram Makhkamovich, Makhkamov Temur Akramovich</i> The investigation of invariance of the output of complex electric power system with application system's embedding approach.....	211
<i>Razzakov Sobirjon Juraevich</i> Experimental and theoretical approach to the determination of physical and mechanical characteristics of the material of the walls of the low-strength materials.....	215
<i>Razzakov Sobirjon Juraevich, Holmirzaev Sattar Abdujabbarovich, Juraev Bahtiyor Gulomovich</i> The study of seismic stability of a single-storey building with an internal partition with and without taking into account the frame .....	217
<i>Sagatov Bahodir Uktamovich</i> About transfer of effort through cracks in ferro-concrete elements .....	220
<i>Tilabov Bahodur Kurbonovich</i> Improving working efficiency and durability of cast parts of tilling machines.....	222
<i>Baymetov Rustam Isayevich, Astanakulov Komil Dullievich, Fozilov Golibjon Gulomjonovich</i> Results of the done theoretical research for choosing the type of hole of the corn sheller sieve and determining its useful area coefficient.....	225
<i>Shukurova Sevara Egamkulovna, Bakiev Masfarif Ruzmetovich</i> Floodplain correction by varying build-up combined dikes.....	228
<i>Yusupbekov Nadirbek Rustambekovich, Gulyamov Shukhrat Manapovich, Ergashev Farkhod Arifjanovich, Kabulov Nozimjon Abdukarimovich</i> Some objectives for constructing a model of intelligent control systems of dynamic objects.....	230
<b>Section 14. Transport .....</b>	<b>233</b>
<i>Khakimov Shaukat Khudayberganovich, Mukhitdinov Abbos Akmalovich, Abdurazzoqov Umidulla Abdurazzoqovich</i> Estimation of efficiency of the road train used in mountain conditions .....	233
<b>Section 15. Chemistry.....</b>	<b>236</b>
<i>Aripova Mastura Khikmatovna, Kadirova Zuhra Chingizovna, Mkrtchyan Ripsime Vachaganovna</i> Influence of bioglass composition on interaction with polyacrylic acid .....	236
<b>Section 16. Economics and management.....</b>	<b>239</b>
<i>Kopani Xhevdet</i> Quality, risk and acceptance plan of the project, significant factors in its success.....	239

