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## ABDOMINAL HYPERTENSION AND THE ABDOMINAL COMPARTMENT SYNDROME IN PATIENTS WITH SECONDARY PERITONITIS

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The dynamic of intra-abdominal pressure in the postoperative period was studied in 97 patients with generalized peritonitis. The dependence between the severity of intra-abdominal hypertension, the cause and severity, and the defining the nature of changes in intra-abdominal pressure in relation to clinical manifestations and laboratory studies has been established. The possibility to use indicators of abdominal pressure has been shown as a category of assessment and prediction of postoperative course.

**Keywords:** generalized peritonitis, intra-abdominal hypertension, multiple organ failure syndrome and abdominal compartment syndrome

The treatment of patients with peritonitis remains an urgent problem in surgery despite the development of new surgical technologies and the success of pharmacology. Great attention has been paid lately to intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) in common peritonitis as factors of multiple organ failure syndrome (MOFS) [1-8]. However, there are no data on the performance of intra-abdominal hypertension at different pathology and the frequency of ACS. There are not enough studies on the relationship between the severity of ACS with endogenous intoxication and MODS.

**The purpose:** we have to study the data of intra-abdominal hypertension and the frequency of in ACS patients with acute abdominal pathology.

### Materials and methods of research

We have studied the course of disease in 97 patients with widespread peritonitis who were treated in the Civil Emergency Care Hospital in Krasnodar in 2011. The average patient age was  $55,9 \pm 16,7$  years. The severity of the state of the patients and the dynamics of infectious-toxic process in the abdominal cavity was evaluated on the scale of APACHE II, SAPS II, Mannheim peritonitis index (MPI). The integral scale of SOFA was used to dynamically determine the severity of multiple organ dysfunctions and the effectiveness of therapeutic interventions. The dynamics of intra-abdominal pressure (IAP) was determined indirectly by the change of pressure in the cavity of the bladder through a catheter with apparatus Uno Meter Abdo Pressure® Kit.

### Results of research and their discussion

Perforated duodenal ulcer – 32 (%) and acute intestinal obstruction – 27 (%) are a common cause of diffuse peritonitis. Strangulated hernia with necrosis of entrapment and perforation of the colon, respectively, were identified in 15 and 9 (%) cases. Other causes of diffuse peritonitis were abdominal injuries – 6 (%), perforation of the small intestine – 5 (%), and acute appendicitis – 3 (%). The increasing levels of IAH preoperatively were detected in all the patients. High levels of IAP were reported in patients with acute intestinal

obstruction –  $25,6 \pm 2,4$  mm Hg and the perforation of the colon –  $22,2 \pm 3,9$  mm Hg (Table 1). It can be stipulated by the peculiarities of the disease in a pronounced paresis of the small intestine, and enteric insufficiency in the case of acute intestinal obstruction. In patients with colon perforations the high level of IAP was determined by the severity of peritonitis, with the predominance of fecal forms. This phenomenon is confirmed by the fact that the severity of abdominal hypertension correlates with the indices of the integral scales of APACHE II, SAPS II, as well as the IAP (Table 2). The worst performance of gravity of the infectious-toxic process is obtained in patients with acute intestinal obstruction and perforation of the colon. In other observations, the level of IAP corresponds to the hypertension of moderate severity in the range of  $11,7 \pm 1,6$  to  $19,9 \pm 2,8$  mm Hg.

The symptoms of multiple organ dysfunction before surgery were detected only at 11 (11,3%) patients, 7 (4,1%) of them with acute intestinal obstruction, and 4 with perforations of the colon. At the same time, the data of SOFA proved the development of MOFS in the postoperative period in most patients with generalized peritonitis. The patients were divided in 2 groups in the postoperative period. The first group consisted of 79 (81,4%) patients with uncomplicated postoperative period. The second group included 14 (14,4%) patients with intra-abdominal complications in the form of failure of the intestinal suture and 4 (4,2%) patients with progression of peritonitis in the postoperative period.

In the first group IAP decreased significantly on the first day after surgery ( $p < 0,05$ ). The positive changes of the postoperative course were characterized by lower estimates of APACHE II and SAPS II. Over the next 2-3 days after surgery, % of patients had a small increase in IAP due to the paresis of the intestine, but these figures do not exceed 15 mm Hg (Figure). In a few patients with the longer postoperative paresis after 2-3 days of IAH there appeared some signs of multiple

organ dysfunction in the form of increased levels of creatinine, urea, AST, ALT. The content of middle weight toxins in the blood has also increased. Within 3-4 days, however, the level of IAP gradually decreased. The level of IAP was close to 0-5 mm by the 6-7 day of the

postoperative period in 73 (92,4%) patients. There wasn't any noticeable development of ACS with MOFS in this group of patients. Any significant decrease of IAP was not registered in the second group of patients with advanced peritonitis.

**Table 1**

Indicators of IAP, depending on the cause of peritonitis and the nature of pleural effusion in the abdominal cavity

The cause of peritonitis	Nature of the effusion				Average IAP, mmHg
	Serous (n = 13)	Fibrinous (n = 40)	Purulent (n = 35)	Fecal (n = 9)	
Perforation of ulcer (n = 32)	-	8,7 ± 1,1	17,4 ± 1,8	-	11,7 ± 1,6
OKH (n = 27)	23,7 ± 2,3	25,2 ± 2,4	28,4 ± 2,5	33,0	25,6 ± 2,4
Strangulated hernia (n = 15)	8,8 ± 1,4	11,4 ± 1,0	17,6 ± 2,5	-	14,7 ± 2,8
Perforation of the colon (n = 9)	11,0	14,0	23,7 ± 2,3	25,5 ± 2,2	22,2 ± 3,9
Injury to abdominal organs (n = 6)	-	12,0	19,5 ± 1,6	22,7 ± 2,4	19,9 ± 2,8
Perforation of small intestine (n = 5)	9,0	11,0	17,3 ± 1,3	-	14,4 ± 2,5
Acute appendicitis (n = 3)	-	-	13,3 ± 1,2	-	13,3 ± 1,2
Average IAP, mmHg	13,1 ± 1,7	13,7 ± 1,7	19,6 ± 1,9	27,0 ± 1,8	17,4 ± 1,6

**Table 2**

The dependence of the severity of the condition on the level of intra-abdominal hypertension and the cause of peritonitis

The cause of peritonitis	The indicators				
	APACHE II (points)	SAPS II (points)	SOFA (points)	MPI (points)	IAP (mmHg)
Perforation of ulcer	7,7 ± 1,8	20,4 ± 2,1	2,4 ± 0,6	16,7 ± 2,2	11,7 ± 1,6
Acute intestinal obstruction	14,2 ± 1,3	40,7 ± 3,5	3,7 ± 0,8	22,6 ± 1,5	25,6 ± 2,4
Strangulated hernia	10,3 ± 1,1	18,8 ± 1,6	3,0 ± 0,7	19,4 ± 1,6	14,7 ± 2,8
Perforation of the colon	13,8 ± 1,2	32,4 ± 2,9	3,4 ± 0,7	24,7 ± 1,8	22,2 ± 3,9
Injury to abdominal organs	-	21,7 ± 2,3	2,1 ± 0,5	20,1 ± 2,2	19,9 ± 2,8
Perforation of small intestine	8,8 ± 0,9	22,5 ± 2,4	2,5 ± 0,6	16,5 ± 1,4	14,4 ± 2,5
Acute appendicitis	8,4 ± 0,9	20,6 ± 2,2	2,6 ± 0,6	16,7 ± 2,0	13,3 ± 1,2
The average estimate	10,5 ± 1,3	25,3 ± 2,3	2,8 ± 0,7	19,5 ± 1,2	17,4 ± 1,6

The increase of the abdominal pressure was being registered from the second day of the postoperative period. Meanwhile, the clinical symptoms of purulent-septic process and the progress of endogenous intoxication were affected 3 days after surgery. Repeated sanitation, made within 48-72 hours after the first operation, in 75 % of the cases resulted in relief of peritonitis and further favorable course of the postoperative period. Mortality in patients with advanced peritonitis reached 25%.

Complications in the form of failure of the intestinal suture were recorded in 14 patients in 4-5 days after surgery (on average). The dynamics of IAP reflected the favorable post-

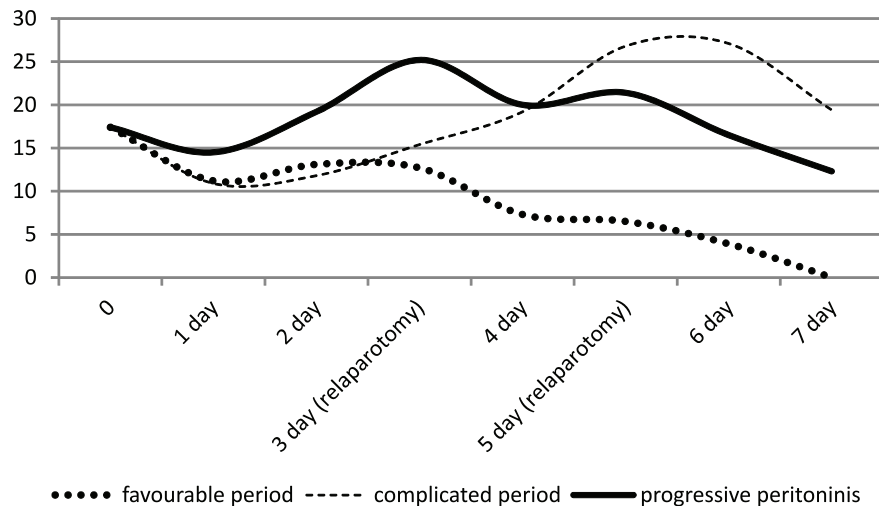
operative course during the first 3 days. However, from the third day the increase of IAP accompanied by vague clinical symptoms was registered in all the patients. Indicators of IAP reached the critical value (> 35 mm Hg) by the time of diagnosing complications and taking the decision on the implementation of relaparotomy «on demand». The development of ACS with severe MOFS was observed in 4 patients in this group. Mortality reached 28,6%.

### Conclusion

The abdominal hypertension is present in most patients. Its severity depends on the na-

ture of primary pathology, the prevalence and severity of peritonitis and other factors. There is the obvious dependence between the severity of abdominal hypertension, the data of integral scales for assessing the severity of the patient and the signs of multiple organ dysfunctions. The increase of IAP is a leading indicator with

respect to clinical symptoms and laboratory indicators of the level of endogenous intoxication. ACS occurs in patients with advanced peritonitis on the background of paresis of the intestine and enteric insufficiency. The dynamics of IAP is one of the significant evaluation criteria of the postoperative period.



The dynamics of IAP in patients with secondary peritonitis in the postoperative period

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## ROLE OF HEART DYSSYNCHRONY IN DEVELOPMENT AND PROGRESSION OF CHRONIC HEART FAILURE. SURGICAL METHODS AND TREATMENT OF HEART DYSSYNCHRONY

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Chronic heart failure is a widespread disease with a progressive course and poor prognosis. Remodeling of a left ventricle (LV) myocardium, insufficient formation and the use of power substrata and heart dyssynchrony (HD) are the main causes of chronic heart failure (CHF) in patients with coronary heart disease. The actual problem is the treatment of patients with impaired intraventricular conduction, left ventricular systolic dysfunction and severe stenosis of coronary atherosclerosis. Revascularization for a myocardium can be one of the most effective methods of restoration of contractile abilities of a myocardium at the expense of influence on the basic pathogenetic mechanisms of CHF. This review examines the role of myocardial dyssynchrony in development of CHF, diagnostic criteria, as well as the possibility of surgical treatment.

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**Keywords:** chronic heart failure, heart dyssynchrony, echocardiography, coronary revascularization

According to the statistics the prevalence of CHF in the population is 7% [18], the prevalence of CHF functional class (FC) I-IV in the European part of Russia – 12,3%, severe CHF, corresponding to FC III-IV, occurs in 2,3% of cases [12]. The annual mortality in patients with symptomatic heart failure is 12% that is up to 612 thousand patients with CHF die in the Russian Federation a year [6]. Meanwhile, sudden cardiac death (SCD) reaches 50% of the total [4].

Heart dyssynchrony (DS) is one of the main causes of CHF [15]. DS is the dissociation rate of its chambers and/or segments of the myocardium, due to violations of the pulse, which leads to the decrease of the pump function of the heart and increase of myocardial energy consumption. Thus, DC promotes the development and progression of heart failure [5]. In 15% of the patients with CHF [17], the pathological process causes a decrease in myocardial contractility and impaired cardiac conduction system [10].

The most common disorders of impulse conduction in the cardiac conduction system are the blockade of the left bundle branch block (LBBB) – from 25 to 36%, and less – due to the blockade of the right bundle branch block (4-6%) violations of inter- and intraventricular conduction, that causes in its turn the extension of the QRS complex on the ECG [14].

According to C. Wiggers [24], the abnormal ventricular apex activation during the right ventricle (RV) stimulation, as during LBBB leads to depressed left ventricular (LV) function and to its structural changes as well. The modified sequence of electrical activation of the ventricles during LBBB leads to mechanical dyssynchrony of ventricular and cardiac cycle with negative effect on hemodynamics. Due to the fact that the electrical impulse spreads from the right to the left (eccentric ventricles activation), directly on the myocardium, and not ac-

cording to His-Purkinje system, it reaches the left ventricle later, and its propagation velocity is less than normal. As a result, mechanical left ventricular systole significantly lags behind the RV systole and becomes more prolonged. Excitation of the posterolateral wall of the left ventricle occurs later than the interventricular septum (IVS), which significantly reduces left ventricular systolic hemodynamic performance because of asynchrony of left ventricular wall contraction. So, the phase of pre-exile of izovolumic left ventricular contraction and relaxation takes place. As a result, left ventricular diastolic pressure significantly reduces, which interferes normal left ventricular filling. The phase of fast and slow (atrial systole) LV filling superimpose on each other, thus reducing the contribution of atrial systole. Disunited activation of the mitral valve papillary muscles leads to late diastolic or presystolic regurgitation, which is not related to the anatomical substrate and is reversible [23].

The extension of QRS interval  $\geq 120$  ms is one of ECG signs of DS [5]. Evaluation of this parameter according to the electrical mechanical DC marker shows its presence in 15% of all the patients with CHF [17]. For the patients with severe CHF, the incidence of widened QRS complex increases by more than twice and is revealed in more than 30% of all the patients [10].

DS is subdivided into atrioventricular, interventricular, intraventricular, and atrial [2]. Mechanical heart DS cannot exist without its visualization on ECG. In such cases, echocardiography is the primary method of dyssynchrony identification [16].

The main DS indicators on the Echocardiography are the following: the presence of presystolic mitral regurgitation, delayed activation of the poster lateral left ventricle wall in comparison with the interventricular septum (normally less than 30 ms), interventricular



mechanical delay (the difference in the duration of asynchronous and isometric phase of LV contraction in combination with the time of induction and isometric contraction of the pulmonary artery (normally no more than 40 ms)), delay of pre-exile from the aorta (the beginning of  $Q$  wave on ECG till aortic valve opening (normally less than 140 ms)) [11].

Coronary revascularization, particularly coronary artery bypass grafting (CABG), is one of the most appropriate methods of contractile synchrony recovery and infarction functionality [3].

The indications for revascularization in patients with heart failure of ischemic etiology are unstable angina pectoris and severe stenosis of the coronary arteries [9]. The risk of death is increased, ranging from 5 to 30%. Treatment of heart failure of ischemic genesis without unstable angina pectoris is a problem, taking into account the lack of randomized controlled investigations in this sample of patients. It is necessary to include the assessment of viable myocardium in the plan of survey of patients with heart failure and coronary artery disease. The improvement of LV function and survival of patients with ischemic but viable myocardium who underwent revascularization were revealed during several prospective and retrospective studies, as well as Meta-analyzes [1]. In the absence of viable myocardium revascularization is ineffective, and it is necessary to exclude surgical treatment, associated with high risk. In patients with severe left ventricular dilatation the probability of ejection fraction improvement is low, even in the presence of viable myocardium. The effectiveness of myocardial revascularization in combination with surgical ventricular reconstruction in order to reverse the development of its remodeling has been examined in several randomized studies [13]. The aim of surgical reconstruction is the removal of scar tissue and the restoration of physiological LV volume and shape. The STICH study compared the efficacy of CABG separately and in combination with surgical ventricular reconstruction in the patients with ejection fraction  $\leq 35\%$ . The frequency of the primary endpoint (death from any cause or hospitalization because of heart disease) did not differ between groups. However, the combined intervention resulted in the reduction of end systolic volume index of the left ventricle to 16 ml/m<sup>2</sup> (19%), which was more than after CABG, but less than in previous observational studies. The latter fact allows us to express concern about the prevalence of surgical procedures for reconstruction, which took place in this randomized study [7]. The feasibility of this intervention is necessary to evaluate individually on the basis of symptoms

(signs of heart failure should be more severe than unstable angina pectoris), measurement of LV volumes, and the extent of scarring in the myocardium.

The choice between CABG and (Percutaneous coronary revascularization) PCI should be based on careful analysis of the anatomy of coronary arteries, the expected completeness of revascularization, accompanying diseases, and lesions of the heart valves [22]. The results of some studies have shown that CABG is superior to PCI [21]. The risk of SCD, despite revascularization remains high in many patients with coronary artery disease and reduced LV function, so it is necessary to assess carefully the feasibility of cardioverter defibrillator implantation [8].

The investigations of Research Institute of Cardiology named after A.L. Myasnikov convincingly show that successful revascularization in patients with CHF and the presence of viable myocardium can significantly improve the course of the disease [20]. In patients with myocardial revascularization a reduction in the frequency of the complex QRS expansion  $\geq 120$  ms is revealed to 31%, presystolic mitral regurgitation to 16,5%, interventricular mechanical delay – 14,5%, delayed activation of the posterolateral wall to 20,1% and the delay of pre-exile from the aorta to 19,3%. These changes signify the improvement of myocardial synchrony provided improved myocardial blood flow because of revascularization. It is possible by reducing the mass of stunned myocardium and energy and conductivity improvement, because other positive changes associated with revascularization usually develop later [11, 19].

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## CLINICAL CONDITION OF PERIODONTIUM IN THE DYNAMICS OF CONVENTIONAL AND COMPLEX THERAPY WITH USE OF MEXIDOL AND BLOOD LASER EXPOSURE IN CASE OF CHRONIC PERIODONTITIS

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Isolated examinations of the local processes determining progression of periodontitis as well as local medical measures do not comply with up-to-date medical practice requirements. Complex clinical evaluation showed positive treatment results within all groups of patients. System approach to the treatment of patients suffering from periodontitis with application of system and local correction means within the boundaries of this research resulted in improvement of clinical results in comparison with conventional treatment method.

**Keywords:** periodontium, Mexidol, blood laser, chronic periodontitis

**Topicality.** The periodontium diseases represent one of the most complicated problems of stomatology and regardless improvement of stomatological treatment the number of the patients remains rather considerable. As of today it has been ascertained that 5 to 15% of the population alone suffers from generalized severe periodontitis while moderately severe periodontitis affects the most of adults [5, 6]. According to the data of WHO (report of scientific group of WHO issued in 1990 based on examination of population in 53 countries) level of development of the periodontium diseases is very high at the age of 35-44 years old (65 to 98%) and at the age of 15-19 years old (55 to 99%) [1]. The results given below show no decline tendency of the periodontitis development within last 15 years in spite of considerable success in revelation of aetiology and pathogenesis of this pathology. Three principal hypotheses explaining development of inflammatory periodontium diseases prevail in the foreign literature: [2, 3, 7, 4].

1. Nonspecific inflammation caused by microflora within the oral cavity in the setting of immunodeficiency.

2. Specific inflammation caused by one or several bacterial species in the setting of normal organism resistance.

3. Combination of first and second hypotheses that is decline of the organism resistance and specific inflammation.

Actually the principal essence integrating these hypotheses is represented by presence of inflammation. Considering all mentioned above, the **purpose** of our research has been represented by selection of the optimal complex treatment.

### Materials and methods of research

Before the therapy all patients were subjected to required oral cavity sanitization, supra-gingival and sub-gingival scaling, removal of occlusion traumatic nodes, and curettage of pathologic recesses. All pathologic recesses were irrigated by 0,1 % solution of chlorophyllipt. Metragil Denta Professional gel was applied to the areas of affected recesses. After removal of the effects of acute inflammation and at the absence of serous-purulent discharge the pathogenetic therapy had been performed as per methodology of such type of treatment. Depending on the type of treatment applied 4 groups of the patients have been defined.

Group 1 (control) – proceeding of antibacterial therapy – 25 patients;

Group 2 (main) – antibacterial treatment in combination with PBLE (percutaneous blood laser exposure) – 26 patients;

Group 3 (main) – antimicrobial treatment in combination with IBLE (intravascular blood laser exposure) and PBLE – 26 patients.

Group 4 (main) – 25 patients who along with IBLE and PBLE had been subjected to local application of Mexidol saturated turunda to the area of affected pathologic recesses under protective fixed bandage after PBLE procedure, and systematic administration of Mexidol in the form of 0,56-2,0 intramuscular injections as per the treatment course providing for 14 injections.

IBLE procedure (output power – 2MV, exposure duration – 15 minutes) had been applied on daily basis. The treatment course provided for 15 sessions. IBLE was performed by means of «Matrix-IBLE» apparatus, radiating head KL-IBLE, wavelength – 0,63 micrometer, light conduit output power – 1,5-2 mV, equipped with special Teflon coated needles.

Local exposure to radiation of nidus (PBLE) by means of «Mustang 017 – MCS-PC» apparatus with magnet head generating intensity of magnetic field equal to 50 mT, exposure – per 5 minutes, frequency – 1000 Hz. Treatment course – 15 sessions as a rule along with IBLE.

### Results of research and their discussion

Stomatological examination of patients has revealed the changes of periodontal complex tissues corresponding to GMSP (generalized moderately severe periodontitis). In order to evaluate the intensity of clinical symptoms and general severity of clinical course of pathologic process in periodontium the evaluation of clinical symptoms by points and integral index of general severity of periodontium affection have been applied – IGS [Kamilov H.P., Bekjanova O.E. 2008].

It should be noted that before the treatment the intensity of patients' complaints, independent research data, indexes of hygiene, inflammation and destruction of periodontium in compared groups didn't have statistically significant differences (table). Preliminary research of stomatological status allowed performing of comparative clinical evaluation of various treatment methods.

As a result of treatment applied the general state of the patients in the groups improved, the

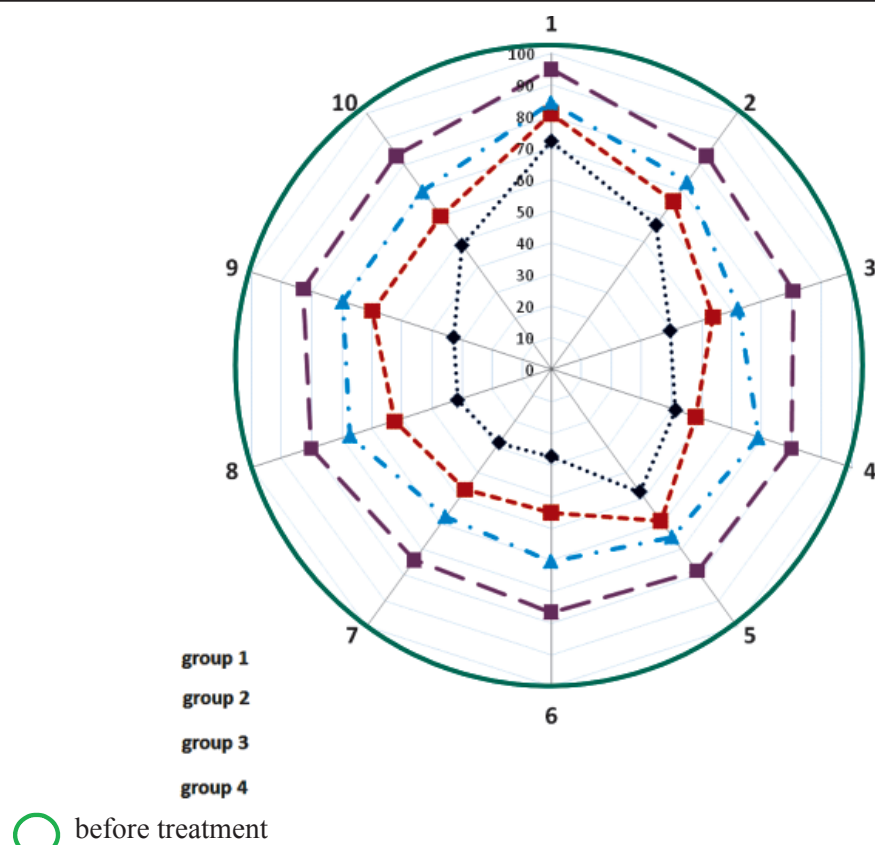
intensity of patients' complaints diminished, and the stomatological indexes decreased. The teeth mobility and induration of marginal gingiva had impartially reduced, and the periodontal recesses abated and in some cases disappeared completely. The pain and offensive breath had also abated, and gingival hemorrhage diminished or disappeared.

The gingiva was of pale pink color, with no hemorrhage, bearing against the teeth. The gingival papilla was of distinct festoon shape occupying interdental spaces in the area of dental neck. Part of the patients still had the edema and hyperemia of interdental papilla. As a rule the capillary network pattern occurred on mobile mucous coat.

Application of unified method of evaluation of particular complaints, symptoms and data of objective research by IGS indexes allowed comparison of treatment results in separate groups and making of quantitative evaluation thereof (table).

According to the data given in the table the improved efficiency of treatment in compared groups was unequal and had been determined by the type of therapy applied.

Thus, intensity of painful sensation in the control group (antibacterial therapy) had diminished after the treatment by 72,2% ( $P < 0,01$ ); in the main group 2 (antibacterial therapy + IBLE) – by 80,87% ( $P < 0,01$ ); in the main group 3 (antibacterial therapy + IBLE + PBLE) – by 84,44% ( $P < 0,01$ ); in the main group 4 (antibacterial therapy + IBLE + PBLE + Mexidol) – by 95,15% ( $P < 0,01$ ). The dynamics of hemorrhage reduction in the group 1 came to 56,42% ( $P < 0,01$ ); in group 2 – 65,71% ( $P < 0,01$ ); in group 3 – 73,27% ( $P < 0,01$ ) and in group 4 – 83,64% ( $P < 0,01$ ); relevant dynamics of offensive breath intensity came to 39,53% ( $P < 0,01$ ); 53,89% ( $P < 0,001$ ); 62,26% ( $P < 0,001$ ) and 80,47% ( $P < 0,001$ ); dynamics of the depth of periodontal recesses – 41,32% ( $P < 0,01$ ); 48,09% ( $P < 0,01$ ); 69,00% ( $P < 0,01$ ) and 77,87% ( $P < 0,01$ ); dynamics of teeth mobility – by 47,64% ( $P < 0,01$ ); 58,93% ( $P < 0,01$ ); 65,22% ( $P < 0,01$ ) and 78,45% ( $P < 0,01$ ); presence of elution from periodontal recesses – by 27,35% ( $P < 0,01$ ); 45,4% ( $P < 0,01$ ); 60,45% ( $P < 0,01$ ) and 76,58% ( $P < 0,001$ ) in groups 1, 2, 3 and 4 respectively (Figure).



1.	Pain	6.	Periodontal recess elution
2.	Hemorrhage	7.	PMA index
3.	Offensive bread	8.	OHI-S index
4.	Depth of periodontal recess	9.	PI index
5.	Teeth mobility	10.	IGS

### Conclusion

Positive clinical result of the treatment has been testified by decreasing of periodontal and hygienic indices' values. As well as in the case of clinical symptoms the treatment response has been arranged as follows: group 1 > group 2 > group 3 > group 4.

Dynamics of objective and subjective clinical indices, as well as indices of hygiene, inflammation and destruction of periodontium within compared groups (in% in relation to value before the treatment).

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*Materials of Conferences***GENERAL MEDICAL PRACTICE  
IN THE RURAL AREAS**

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Indicators of practice of a general practice doctor in rural areas are presented in the article: applications to DGP (treatment, preventive, dispensary, and at home) considering age and profile (therapeutic, surgery, specialized). Work strain of DGP depending on a number of bonded first-aid-obstetric points.

In 2010 625,7 thousand doctors worked in Russia, provision of medical care equaled 43,8 doctors per 10 thousand people. A number of doctors of general practice (DGP) equaled 9,7 thousand, and the provision was 0,7–10 thousand people. DGP's part equaled 1,6% of the total number of doctors.

Almost one third of population of the Russian Federation lives in the country. DGP becomes a center figure in providing medical care in a village. At the same time, general medical practice (GMP)

is introduced slowly in the country (I.N. Denisov, E.I. Cherniyenko, Y.A. Korotkov, 2008; Y.M. Komarov, 2008).

During the research we have carried out passport systematization of general medical practices that work in the countryside of Penza region. 1379,8 thousand of people lived in Penza region (1<sup>st</sup> of January 2009), among them 461,9 were villagers (33,5%). An analysis has shown that 30,2% of DGP work without any bonded first-aid-obstetric points (FOP), 20% of DGP serve the population of one bonded FOP, 15,6% – two bonded FOPs, 7,3% – three, 21,8% – four and more FOPs. Besides, 51,0% of DGP who work in village districts of Penza region serve the mature and children, and 49,0% of DGP – only for the mature.

GMP were selected as bases for the research according to the following criterions: presence of good material-technical basis, road-transport accessibility, distance from central regional hospital (CRH) of no more than 15 km, DGP serves the mature and children, length of service in the field of DGP is no less than 5 years.

An analysis has shown that for all four local GMP age structure of the population was identical and corresponded to age indicators of all village districts of Penza region (Table 1).

**Table 1**

Age structure of population, bonded to DGP in basic practices and village districts of Penza region (% of the total)

Age	Pilot practice	1 <sup>st</sup> practice	2 <sup>nd</sup> practice	3 <sup>rd</sup> practice	Village districts of Penza region
Under 1 year	0,97	1,3	0,7	1,1	1,1
1-14	11,6	13,6	9,9	8,3	12,7
15-17	3,8	4,6	3,2	2,5	3,8
<b>0-17 total:</b>	<b>16,4</b>	<b>19,5</b>	<b>13,8</b>	<b>12,0</b>	<b>17,6</b>
18-59	58,4	56,3	55,2	67,6	58,9
60 and over	25,2	24,2	31,0	20,4	24,7
Total:	100,	100,0	100,0	100,0	100,0

As tables 2 and 3 show, structure of applications to DGP is identical in all basic prac-

tices depending on type and purpose of an application.

**Table 2**

Applications to DGP in basic practices and all practices where DGP serve the mature and children, depending on the application purpose (% of the total)

Application purpose	Pilot practice	1 <sup>st</sup> practice	2 <sup>nd</sup> practice	3 <sup>rd</sup> practice	All practices
Treatment	66,7	64,8	67,3	68,1	66,4
Preventive	23,8	22,3	25,4	24,2	22,7
Dispensary	9,5	12,9	7,3	7,7	10,8
Total:	100,0	100,0	100,0	100,0	100,0

Table 3

Applications to DGP in basic practices and all practices where DGP serve the mature and children, depending on the application type (% of the total)

Application type	Pilot practice	1 <sup>st</sup> practice	2 <sup>nd</sup> practice	3 <sup>rd</sup> practice	All practices
Ambulatory	82,3	81,3	83,2	81,8	81,6
At home	15,6	16,3	14,2	16,2	15,9
Emergency	2,1	2,4	2,6	2,0	2,5
Total:	100,0	100,0	100,0	100,0	100,0

GMP of Belinskiy village district was selected as a pilot base of the research. Staff of the GMP included: 1 DGP, 2 nurses of GP, 1 dentist, 2 junior nurses, 1 driver. DGP's length of service equals 15 years (including 10 years in pediatrics and 5 years in general practice).

GMP of the pilot village district serves 1542 villagers, of which 82,6% are the mature, 16,4% are children of ages 0-17, of them 0,97% – under 1 year. Age structure of the population of pilot GMP was identical to that of GMP of village districts of Penza region in general that allows us to define this GMP as a basic model for Penza district. We have selected GMD of Belinskiy village district without bonded FOP as the research base. However, we

should outline that a number of FOPs, bonded to a GMP in the country must serve as a foundation in corrections of indicators of demand for DGPs.

During the research we studied the volume and character of applications to DGP in the pilot village district. A DGP carries out reception of patients in 11 specialities. An application frequency equaled 5070,0 per 1000 of the corresponding population, 3863‰ of applications were made due to diseases. Table 4 contains frequency of applications to DGP of the population of pilot village district with a treatment purpose depending on age.

The received work strains of DGP must be considered while planning their activity and differential wage of a DGP.

Table 4

Number of applications to DGP among the population of pilot village district in specialities with a treatment purpose (per 1000 of the corresponding population)

Speciality	Total	Children (0-14 years)	Teenagers (children from 15 to 17 years)	The mature
<b>Therapeutic profile, including:</b>	<b>2804,8</b>	<b>2598,0</b>	<b>5913,8</b>	<b>2696,2</b>
Therapy	1143,3	-	-	1366,7
Pediatrics	548,0	2592,8	5896,6	-
Cardiology	1035,0	5,2	17,2	1235,7
Endocrinology	78,5	-	-	93,8
<b>Surgery profile</b>	<b>55,1</b>	<b>36,1</b>	<b>155,2</b>	<b>53,5</b>
Surgery	28,5	10,3	17,2	31,8
Traumatology	26,6	25,8	138,0	21,7
<b>Special profile, including:</b>	<b>1003,1</b>	<b>237,2</b>	<b>555,5</b>	<b>1138</b>
Otorhinolaryngology	137,4	128,9	310,3	131,0
Ophthalmology	197,8	82,5	172,4	216,3
Neurology	483,1	5,2	21,1	575,2
Gynaecology	52,5	-	-	62,8
Dermatology	132,3	20,6	51,7	152,7
Total:	<b>3863,0</b>	<b>2871,3</b>	<b>6624,5</b>	<b>3887,7</b>

To analyze a structure of patients' flows to GMP we have outlined 4 types of applications:

1) applications to DGP by residents of the point village (in the area of a rural outpatient clinic (ROC));

2) applications to DGP by residents of a bonded FOP in ROC;

3) applications to DGP by residents of the bonded FOP with a doctors trip to the FOP;

4) applications to a medical assistant by patients of a bonded FOP within the FOP.

For each application type we have calculated the corresponding intensive indexes that allowed us to carry out a comparative analysis and reveal definite legislations.



Table 5

Applications of villagers to DGP and medical assistants (per 1 resident per year)

Number of bonded FOPs	FOP	Applications to a DGP by residents of bonded FOP in a ROC	Applications to a DGP by residents of bonded FOP with a doctor's trip to a FOP	All application to aDGP	Applications to a medical assistant by residents of a bonded FOP at the FOP	General applications (DGP + medical assistant)
1 FOP	2,92	2,01	0,94	2,93	5,78	4,27
2 FOPs	4,51	5,02	1,35	5,69	1,96	6,92
3 FOPs	7,3	3,09	0,7	5,3	4,07	7,61
4 FOPs and more	3,23	3,06	1,38	4,04	5,22	7,53

The analysis has shown that a number of applications to DGP in a ROC by residents of a point settlements oscillated from 2,92 to 7,3 applications per a resident per year; by residents of a bonded FOP – from 2,01 to 5,02. With a doctor's trip to a FOP, a number of applications by villagers who live in the FOP service area oscillated from 0,94 to 1,38 per a resident per year.

Per one villager who lives in a FOP service area number of applications to a medical assistant within the FOP reaches 5,78 applications in a number of practices. All applications to a DGP (within ROC and with trips to a FOP) oscillated from 2,93 to 5,69 per a resident per year.

Total number of applications (to a DGP and medical assistant), that considers applications to DGPs and medical assistants reaches 7,61 applications per a resident per year (table 5).

Analyzing applications of villagers who live in a FOP service area, we can speak of a reason to preserve aid of medical assistants, even in presence of DGP, as applications to a medical assistant form more than a half of total applications of villagers.

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#### THE PROBLEM OF INCREASING KNOWLEDGE FOR INFECTIOUS DISEASES A FAMILY DOCTOR

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Postgraduate training of physicians in the specialty «General medical practice (family medicine)»

should provide mandatory training for family physicians mastering scientific principles of infectious disease, clinical manifestations of infectious diseases and their diagnosis, epidemiological characteristics, skills, organization and implementation of anti-epidemic measures in the foci of infection preventive work among the population served.

The leading role in organizing and implementing the educational process in this direction should be given to the departments of general practice post-graduate education departments medical schools with mandatory separate organization of thematic improvement on the cycle of doctors «Questions Epidemic prevention work in general practice». The program theme this cycle should be designed to meet the requirements of the educational standard (general practitioner intended to provide benefits in various medical specialties only in the first volume of medical care) and in amounts not less than 80 hours. Lectures and seminars must include a review of the epidemiological characteristics, main clinical manifestations, current diagnostic and treatment methods, modern complexes prevention programs and special events in infectious diseases, provided educational standards: airborne, children, intestine, particularly dangerous (quarantine) and wound infections, intestinal infestations, viral hepatitis, tuberculosis and AIDS. Particular emphasis in the curriculum of the cycle should be given the mastery of learner knowledge and skills to the organization of the family doctor to prevent mass infection in identifying the source of infection. Particular attention should be paid to addressing the issues of organizing and conducting immunization of adults and children on the basis of the national immunization calendar.

In the implementation of the curriculum should be involved in the thematic cycle leading specialists of the faculty medical school and institutions of practical public health (tuberculosis dispensary, infectious clinical departments of hospitals and clinics). Therefore, students will have the opportunity to learn skills directly to the training facilities in clinics and hospitals, organized by the Department in conjunction with health authorities. This form of learning approach maximizes the learning process to practice family physician and, therefore, can im-

prove the theoretical knowledge and practical skills to improve on the diagnosis and prevention of infectious diseases in adults and children.

The work was submitted to international scientific conference «Innovative technologies in the higher and vocational training», Spain, August, 2-9, 2012, came to the editorial office on 05.06.2012.

#### **NATURAL GEOMAGNETIC EFFECTS ON SOME PARAMETERS OF HOMEOSTASIS IN THE BODY HUMAN IN THE NORTH**

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It is well known that geomagnetic storms cause nonspecific adaptive stress response in the human body in the form of homeostatic changes in the parameters of the basic physiological systems. The present study is devoted to search for possible patterns of interactions studied with long term observations of patients and healthy individuals. An analysis of morbidity and nosological structure of the seasons in those of working age living in the northern city of Surgut, and sought medical help for five years. Status of resistance of the organism was assessed by clinical and immunological blood tests: a monthly average of lymphocytes (in %) in peripheral blood and immunoglobulin M, G, A (in g/l) in samples of blood serum of healthy people (control group) and patients. Parallel index of geomagnetic activity has been studied over the same five-year period. To determine the closeness and authenticity of the relationship between incidence of disease and the state of the geomagnetic activity used Spearman's rank correlation test (rs).

Analysis of the average frequency of referral of patients for medical care revealed two peaks in March-April and October-November, with lows in July and August. High frequency of spring and autumn uptake was detected in a longer average period of geomagnetic activity. The minimum number of hits identified in the most «magnetically» summer period (July-August). Correlation analysis showed, first, a high reliable direct link between the seasonal incidence and geomagnetic activity ( $rs = 0,804$ ;  $P = 0,002$ ), and, secondly, that the state of geomagnetic activity in the human environment may play a role in triggering seasonal raising the level of morbidity.

During the disease process depends on the activity of the immune system, so has been studied the relationship between the monthly average content of lymphocytes and immunoglobulins in the peripheral blood of patients and the observed state of the geomagnetic activity. It was revealed that the activation of the immune system observed in the periods of geomagnetic activity. Correlation analysis demonstrated a significant direct relationship

to the monthly average geomagnetic activity level in peripheral blood lymphocytes of surveyed men ( $rs = 0,587$ ;  $P = 0,046$ ), and immunoglobulin levels ( $rs = 0,913$ ;  $P = 0,001$ ).

The study showed that during periods of geomagnetic activity (long-term multi-year analysis) observed certain patterns of interaction with the environment inside the body, causing a condition of instability of the biological systems in the spring and autumn, and promoting the development of acute and worsening of chronic diseases in humans, that must be considered when developing regional prevention programs.

The work is submitted to the Scientific International Conference «New technologies, innovation, invention», Turkey (Antalia), August, 16-23, 2012, came to the editorial office on 21.06.2012.

#### **PHARMACOLOGICAL ANALYSIS OF TACTICS OF OPERATIVE TREATMENT OF AN INNOCENT HYPERPLASIA OF PROSTATE**

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In case of presence of evidence for operative treatment of an IHP, transurethral resection of prostate (TRP) is considered to be a «golden standard» for the standard volume of prostate up to 80 cm<sup>3</sup>.

Our objective was to define the applicability of alternatives for unipolar TRP (UTRP), specifically, bipolar transurethral resection and transurethral bipolar plasmatic vaporization of prostate for a small volume of prostate.

Comparative analysis of the results of unipolar and bipolar transurethral resection for an average volume of prostate shows the advantage of BTRP in the majority of significant indicators (complication frequency, bed fund work indicators), insignificantly less time of operation was the only advantage of UTRP.

Totally 167 patients with prostate volume of up to 80 cm<sup>3</sup> were studied within the research.

Open surgery – adenomectomy was implemented for patients with a prostate of bigger volume. Transurethral enucleation of prostate with bipolar loop – Trans Urethral Enucleation with Bipolar (TUEB) is an alternative method of choice. We have carried out an analysis of its clinical advantages (minimal blood loss during an operation, short period of placement urethral catheter in urinary tracts (24-72 hours), lack of traumatic cut of the front abdominal wall and urinary bladder, quick normalization of urine composition, short recovery and restoration of workability of patients [6, 7]) and economic effect for persons of capable and incapa-

ble age. Selection volume equaled: 122 patients for the method of transurethral enucleation and 122 patients for the method of adenomectomy.

Economic efficiency is a result of the achieved positive medical and social effect. A decrease in morbidity with temporal loss of workability (TLW) cuts down economic losses and thus defines an economic effect. An effect (E) is a difference between economic losses (damage) (ED) in a basis period or within basis conditions (Bc) and losses in a given (calculative) period or in real conditions (Rc).

$$ED = Bc - Rc.$$

Calculation of economic effect of improving quality of preservation and opportune qualitative treatment of men based on defining decrease in economic losses (damage) of a country as a result of decrease in morbidity with TLW. According to the method, suggested by E.N. Kulagina in 1995, 1998, 2001, a damage is calculated by formula:

$$DAMAGE = [(D \cdot Tk) + (B \cdot Tk) + (L \cdot Tk)] \cdot P,$$

where  $D$  is GDP, produced in average per one working person per one business day;  $B$  is an aver-

age sum of benefits for temporal disability from the funds of social insurance for one day of temporal disability;  $L$  is treatment costs per one patient (stationary, ambulatory, and other kinds of medical help) from the budget funds and funds of Obligatory Medical Insurance, calculated per 1 calendar day of TLW;  $Tk$  is the duration of temporal disability per one working person in calendar days;  $P$  is a number of patients among workers of an economy.

Tariffs of medical services for grown population in accordance with N. Novgorod programme of obligatory medical insurance in 2011. Costs are presented in rubles. All numeral data represent average values.

1. Economic effect of using bipolar vaporization before BTRP under prostate adenoma up to 40 cm<sup>3</sup>.

Hierarchic cluster analysis of the duration of post-surgery period (bed-days after a surgery) was used as a clinical component of the research.

Economic damage was defined for bipolar vaporization and BTRP for persons of capable and incapable age (Table 1).

**Table 1**

Economic damage with usage of bipolar vaporization and BTRP for persons of capable and incapable age, rubles.

Capable age	Incapable age	Costs	Bipolar vaporization	BTRp
		<b>Bed/day</b>	<b>4,6</b>	<b>5,9</b>
		Cost of b/d	3941,326	5055,179
		General study	610,05	610,05
		Special study	1820,4	1820,4
		Treatment	21000	26500
		<b>Total</b>	<b>27371,776</b>	<b>33985,629</b>
	Ed of TD		5797,38	7435,77
	<b>Total</b>		<b>33169,16</b>	<b>41421,4</b>

ED of TD for 2011 under implementation of bipolar vaporization =  $[(806,5 + 453,8) \cdot 4,6] = 5797,4$  rubles. Total costs under stationary treatment and implementation of BTRP equaled 27371,8 rubles for the unemployed and 33169,2 for the employed.

Economic effect (a difference between total damages of BTRP and bipolar vaporization for incapable age equaled 6613,9 rubles, and for capable age it equaled 8252,2 rubles.

2. Economic effect of implementation of unipolar and bipolar transurethral resection.

Economic damage was also calculated for persons of capable and incapable age (Table 2).

ED of TD in 2011 under implementation BTRP =  $[(806,5 + 453,8) \cdot 6,4] = 8065,92$  rubles. Total costs of under stationary treatment and implementation of BTRP equaled 34414 rubles for the unemployed and 42480 for the employed.

Ed of TD in 2011 under implementation of UTRP =  $[(806,5 + 453,8) \cdot 7,8] = 9830,3$  rubles. For UTRP total costs equaled 35113,6 rubles for the unemployed and 44943,9 for the employed.

For incapable age economic effect (difference between total costs for using MTRP and UTRP) equaled 699,5 rubles, for persons of capable age it equaled 2464 rubles.

3. Economic effect of using bipolar vaporization before BTRP.

Economic effect of using TUEB before open adenomectomy was calculated as a difference of economic damage (Table 3).

ED of TD for 2011 under implementation of TUEB =  $[(806,5 + 453,8) \cdot 5,6] = 7057,7$  rubles. Total costs under stationary treatment and using TUEB equaled 37288,6 rubles for the unemployed and 44286,3 rubles for the employed.

Table 2

Economic damage under implementation of BTRP and UTRP for persons of capable and incapable age, rubles

Capable age	Incapable age	Costs	BTRP	UTRP
		Bed/day	6,4	7,8
		Cost of b/d	5483,584	6683,118
		General study	610,05	610,05
		Special study	1820,4	1820,4
		Treatment	26500	26000
		Total	34414,034	35113,568
	Ed of TD		9830,34	
	Total		44943,91	

Table 3

Economic damage under implementation of TUEB and open edanomectomy for persons of capable and incapable age, rubles

Capable age	Incapable age	Costs	TUEB	Open adenomectomy
		Bed/day	5,6	13,7
		Cost of b/d	4798,136	11738,297
		General study	610,05	610,05
		Special study	1820,4	1820,4
		Treatment	30000	13000
		Total	37228,586	27168,747
	Ed of TD			17266,11
	Total			44434,86

Ed of TD in 2011 under implementation of open adenomectomy =  $[(806,5 + 453,8) \cdot 13,7] = 17266,11$  rubles. For open adenomectomy total costs equaled 27168,7 rubles for the unemployed and 44434,9 for the employed.

For persons of incapable age we have revealed a negative economic effect (difference between total losses of implementation of open adenomectomy and TUEB), that equaled 10059,8 rubles. For persons of incapable age economic effect was practically equal to 148,6 rubles.

Thus, the economic effect has confirmed implementation of bipolar vaporization for adenoma of small size (up to 40 cm<sup>3</sup>) and BTRP for adenoma of average size (40-80 cm<sup>3</sup>).

Regardless of negative economic effect of treating adenoma of bigger size (over 80 cm<sup>3</sup>) under implementation of TUEB for persons of elderly age and equal economic effect for employed men, implementation of this very method is reasonable due to its expressed positive medical-social efficiency (based on clinical component).

It is necessary to evaluate not only clinical efficiency and safety, but also the economic component of cure while selecting treatment tactics in modern terms. Choosing tactics of operative treatment un-

der innocent hyperplasia of prostate is generally defined by the volume of a prostate itself. Economic effect was calculated for persons of capable and incapable age. We have defined an economic effect of implementation of bipolar vaporization for adenoma of small size, BTRP for adenoma of average size, and, within complex evaluation of medical-social efficiency and economic effect, for adenoma of bigger size – implementation of TUEB.

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**DERIVATE DER (9) AS UNIQUE  
CYTOGENETIC ANOMALY IN A ACUTE  
MYELOID LEUKAEMIA FOR AML – M4:  
A CASE REPORT**

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As far as we know, it is the first case of disease at an acute myeloleukemia (M4), which is described with the given anomaly der (9), as a unique not casual marker of an acute leukosis.

Cases i (9) have been described at an acute lymphoid leukosis (Martineau M, end att., 1996).

Disease cases by the Acute lymphoid leukosis at children with a syndrome of Down in which additional chromosomal reorganization i (9) has been found out have been described (Kalwinsky DK, et att., 1990).

The aberration der (9) as a cytogenetic marker has been described repeatedly at a myelosis at patients (Bennour A. and ett., 2011, Huh J. and ett., 2011).

The present history the first where the mutation der (9) as unique cytogenetic anomaly is described at an acute myeloleukemia (M4) (FAB-classification).

**We represent to your attention the previous history:**

No preleukaemia

**Clinics**

AGE (d: 12; m: 10; y: 59)

SEX M

ENLARGED LIVER (-)

ENLARGED SPLEEN (-)

ENLARGED LYMPH NODES (-)

CENTRAL NERVOUS SYST INVOLVED –

Condition of the expressed asthenia

**Blood Data**

WBC (10×9/l) 2,7

Hb (g/dl) 13,5

PLATELETS (10×9/l) 117

BLASTS (%) 0

BONE MARROW 41,4%

**Cyto-Pathological Classification**

Phenotype (FAB): AML-M4

Immunophenotype (as CD): not done

Rearranged Ig or Tcr: not done

**Pathology:** Punctate nonuniformly cellular at the expense of granulocytes with blasts to 41,4%, promyelocytes – 19,2% difficultly differentiated with blasts. Half of blasts contains azurophilic granularity, In individual blasts – sticks of Auer. It was not possible to find out megacaryocytes. According to cytochemistry: a peroxidase negative (in dynamics – positive 7%), lipids – poorly positive 26%.

Electron microscopy: not done

Precise diagnosis: AML-M4, the first attack

**Survival Data**

DATE OF DIAGNOSIS (04/2011)

TREATMENT according to report «7 + 3»: (Cytarabine 100 mg/m<sup>2</sup> – 7d.; Daunorubicine 60 mg/m<sup>2</sup> – 3d.)

COMPLETE REMISSION None

DEATH RELATED WITH TREATMENT None

RELAPSE None

IF RELAPSE: PHENOTYPE None

ALIVE

SURVIVAL 8 month

**Karyotype**

SAMPLE: Bone Marrow

CULTURE TIME 24 h and 48-hours without stimulating agents

BANDING G-band

DETAILED COMPLETE RESULTS (using ISCN) 46,XY [18], der (9) [1]

KARYOTYPE(S) AT RELAPSE(S): 46, XY [20]

**Molecular Cytogenetics**

TECHNICS: Multiplex PCR

RESULTS: Anomalies it is not revealed

**Other Molecular Studies: None**

**Other Findings: None**

**Comments**

Even the insignificant quantitative clone of abnormal cells can dictate leukemia implications, let in the erased clinical variant, but with the satisfactory forecast for a survival. Moreover, it can be interesting in respect of etiology and forecast studying at an acute leukemia (AML-M4).

CALL FOR COLLABORATION

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## Short Reports

**DYNAMICS OF BDNF BLOOD SERUM CONTENT AND POLYMORPHISM OF BDNF VAL166MET IN PATIENTS WITH CONSEQUENCES OF ISCHEMIC, HEMORRHAGIC STROKE AND CRANIOCEREBRAL TRAUMA**

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The brain-derived neurotrophic factor is considered to be one of neurotrophins performing anti-oxidative, nootropic function and defining neuron specificity. Relationship of allelic polymorphism of the gene that codes this protein, in particular, Rs 6265, with frequency of schizophrenia, Alzheimer's disease, depression and other psychological diseases development is proven.

Determination of frequency of BDNF Val66Met polymorphism genotypes, studying of change of BDNF blood serum content in group of patients who have had a stroke or a serious craniocerebral trauma was the purpose of the present research. Total 93 patients were observed: 64 (68,8%) with consequences of an ischemic stroke, 20 (21,5%) – of a hemorrhagic stroke, 9 (9,7%) – of a craniocerebral trauma.

Material of research was patients' blood taken from an ulnar vein. Allelic polymorphism was determined with the help of polymerase chain reaction. For determination of polymorphism of Val66Met of BDNF gene oligonucleotide primers were used: 5'-GAGGCTTGACATCATTGGCT-3' and 5'-CGTGTACAAGTCTGCGTCCT-3', respectively, Val and Met alleles. BDNF content was defined with the help of immune and enzymatic analysis. As control group results of genetic typing of 110 mentally healthy persons was used. The received results – frequencies of alleles and genotypes – are presented in Table 1.

Table 1

Frequencies of alleles and genotypes of BDNF Val66Met polymorphism in the studied groups of patients

Groups of patients	Alleles				Genotypes						Total geno- types
	Val		Met		ValVal		ValMet		MetMet		
	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%	
All patients	153	82,3 ± 2,8	33	17, ± 2,8	64	68,8 ± 4,8	25	26,9 ± 4,6	4	4,3 ± 2,1	93
Ischemic stroke	103	80,5 ± 3,5	25	19,5 ± 3,5	43	67,2 ± 5,8	17	26,6 ± 5,5	4	6,2 ± 3,0	64
Hemorrhagic stroke	28	70,0 ± 7,2	12	30,0 ± 7,2	14	70,0 ± 10,2	6	39,0 ± 10,2	0	0	20
Traumatic brain injury	16	88,9	2	11,1	7	77,8	2	22,2	0	0	9
Control group	179	81,3 ± 2,6	41	18,6 ± 2,6	72	65.5 ± 4.5	35	31,8 ± 4,4	3	2,7 ± 1,5	110

Comparison of the studied parameters in groups of patients with consequences of ischemic and hemorrhagic strokes gives evidence of tendency of Met allele quantity increase in the latter, and it is caused exclusively by heterozygous genotype (ValMet). In the course of our research MetMet genotype was found only in persons who have had an ischemic

stroke. A small number of observed patients with consequences of traumatic brain injury reduces possibility of interpreting the received results, but the revealed tendency to appreciable quantity of Val allele deserves larger survey.

Average values of BDNF blood serum content in patients with various genotypes are presented in Table 2.

Table 2

Average values of BDNF blood serum content (ng/ml) in patients with various genotypes

Ischemic stroke (n = 64)			Hemorrhagic stroke (n = 20)			Traumatic brain injury consequences (n = 9)		
Genotypes			Genotypes			Genotypes		
ValVal	ValMet	MetMet	ValVal	ValMet	MetMet	ValVal	ValMet	MetMet
26,3	25,4	22,5	25,7	24,5		22,6	18,1	
Average 25,7			Average 24,5			Average 20,3		

In groups with stroke consequences ValVal genotype tends to association with higher BDNF values. To emphasize this tendency, average values of BDNF content in groups of patients whose gen-

otype contained or didn't contain Met allele were compared. Respectively, the ValVal genotype was designated as Met allele – and ValMet and MetMet as Met + (see Table 3).

**Table 3**

Influence of presence Met allele in genotype on BDNF blood serum content

Groups of patients	Alleles	
	Met –	Met +
All patients	25,7 ng/ml	23,8 ng/ml
Ischemic stroke	26,3 ng/ml	24,7 ng/ml
Hemorrhagic stroke	25,7 ng/ml	24,5 ng/ml
Traumatic brain injury consequences	22,6 ng/ml	18,1 ng/ml

In all compared groups ValVal homozygote gives higher blood serum brain-derived neurotrophic factor content.

The obtained data allow to assume differences in genetic predisposition of ischemic and hemorrhagic strokes development and respectively in the conditions

of course of their consequences. One may assume that the persons who have had traumatic brain injury differ from patients with consequences of vascular diseases in respect of BDNF gen allelic polymorphism . It can be of importance for determining the disease prognosis, clinical outcome and differentiated therapy.

## AN IMPACT OF CADMIUM UPON CONTENTS OF PHOTOSYNTHETIC PIGMENTS $\times$ TRITICOSECALE

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The results of research that studied an impact of Cd upon contents of photosynthetic pigments of winter triticale  $\times$  *Triticosecale* are provided. It is shown that growing triticale within environment that contains 0,04 mM Cd<sup>2+</sup> leads to a decrease in numbers of chlorophyll *a*, *b* and carotenoids in average of 70% in 96 hours of exposition. Values of correlation between chlorophylls *a* and *b* (2,8-3,1), and also chlorophylls' part in light-accumulating complexes (55-58%) stay relatively stable during the whole test.

**Keywords:** winter triticale, heavy metals, photosynthetic apparatus, chlorophyll, carotenoids, light-accumulating complex

Cadmium is one of the most toxic heavy metals. An increase in its contents in environment leads to a decrease in growth speed, alteration in intensity and direction of many metabolic processes in cells [2]. It is known that photosynthetic apparatus is one of the most vulnerable to the impact of heavy metals. Here a number and correlation of different pigment groups has a great significance for its work [3]. Therefore, the objective of this work was studying dynamics of contents of main groups of photosynthetic elements of winter triticale  $\times$  *Triticosecale* under its growing in an environment that contains Cd.

### Methods and materials of the research

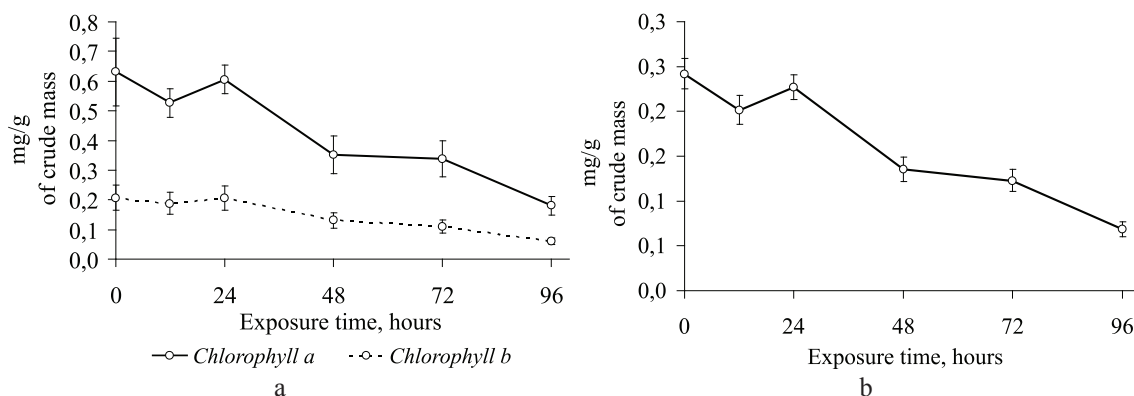
Sprouts of winter triticale of the kind «Don» ( $\times$  *Triticosecale* Wittm. & A. Camus) served as objects of the research. Seeds were preliminary sterilized in 2,5% solution of KMnO<sub>4</sub>, and after this grown in filter paper with presence of 1/10 environment of Knop with microelements of Hogland. Ten-days sprouts were transferred to vegetation vessels and grown in aerated water culture with full nutrition environment under 12-hour light period, air temperature of  $23 \pm 1/15 \pm 1^\circ\text{C}$  (day/night), relative humidity of 55/75% (day/night) and lightness of 35 Vt/m<sup>2</sup>. When a sprout reached the stage of bushing out, it was transferred to a nutrition solution that contained 0,04 mM Cd(NO<sub>3</sub>)<sub>2</sub>. Sprouts after 12, 24, 48, 72, and 96 hours of exposition Cd-containing environment were studied separately. A definition of contents of photosynthetic ele-

ments was carried out in ethanol extracts under 470, 649, and 665 nm with a spectrophotometer SF-26 (Russia), formulas of H.K. Lichtentaller и A.R. Welburn were used for calculations [5]. Chlorophylls' part in light-accumulating complexes (LAC) was calculated via method of H.K. Lichtentaller (1987) with allowance that almost all chlorophyll *b* is located in LAC, and correlation between chlorophylls *a* and *b* in this complex equals 1,2/1,0 [4].

### Results of research and their discussion

The study has shown that growing triticale in presence of 0,04 mM Cd<sup>2+</sup> led to a decrease in number of main photosynthetic pigments. During the first 12 hours of incubation under Cd-containing environment amounts of chlorophyll *a* and carotenoids decreased of 17%, and after that increased, reaching a control value ( $0,610 \pm 0,048$  mg/g of wet mass (for chlorophyll *a*) and  $0,227 \pm 0,028$  mg/g of wet mass (for carotenoids)) by 24 hours (Figure). At the same time, amounts of chlorophyll *b* remained stable up to 24 hours.

During the next day (up to 48 hours), contents of chlorophyll *a*, *b* and carotenoids decreased of 42, 37, and 40% correspondingly. After this some stabilization in pigment levels for 72 hours was observed, it preceded further decrease in their numbers by the end of experiment. By 96 hours the part of chlorophyll *a*, *b* and carotenoids to the control equaled about 28% (Figure).



Dynamics of decrease in chlorophyll *a*, *b* (a) and carotenoids (b) in sprouts of triticale that was grown in Cd-containing environment

Nowadays it is well-known that molecules of pigments are not equal according to their functional characteristics: some of them are included into reaction centers of photosystems, others only take the light-accumulating function [1], therefore, a correlation between dif-

ferent photosynthetic pigments is crucial for maintaining a normal level of photosynthesis and related energetic processes. The research has shown that during the whole experiment a correlation between chlorophylls' forms (*a* and *b*) remained stable of 2,8-3,1 (Table).

A correlation in amounts of chlorophyll *a* to *b*, part of chlorophylls in light-accumulating complexes

Parameter	Exposition time, hours					
	0	12	24	48	72	96
<i>a/b</i>	3,1	2,8	3,0	2,8	3,0	3,0
Chlorophyll part in CCK, % ± σ	54 ± 8	58 ± 7	56 ± 6	57 ± 10	54 ± 8	55 ± 6

It is known that chlorophyll *a* is included into reaction centers and periphery antenna complexes of photosystem I (PS I) and photosystem II (PS II), while chlorophyll *b* is, mainly, a component of LAC of PS II [6].

A preservation of constant values in correlation between chlorophylls *a* and *b* testifies that, regardless of a decrease trend in photosynthetic pigments that is observed within plants that were grown in Cd-containing environment, a correlation between complexes of reaction centers of PS and LAC stays unaltered. Preservation of relatively constant value of chlorophyll part in LAC also proves for the lack of disbalance in work of photosynthetic apparatus (table).

### Conclusion

The research has shown that while growing plants of triticale in environment that contains 0,04 mM Cd<sup>2+</sup>, a decrease in quantitative contents of main photosynthetic pigment groups (chlorophylls and carotenoids). However, as their correlation stayed the same, we can conclude, that general decrease in pigment levels,

obviously, reflected not only character of damage of photosynthesis apparatus under the impact of Cd, but its transfer into new physiological level of functioning that allows it to work relatively slably, but, probably, with lower efficiency.

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## ECOLOGICAL BASIS OF BIOLOGICAL RECULTIVATION OF DUMPS OF DIAMOND DEPOSITS IN YAKUTIA

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The article presents the results of the studies of surface, soils and vegetation of diamond mines piles and experimental work on biological remediation. Yakutia produces 97% of all diamonds in Russia, and its world market share is 25%. Open mining led to the formation of large open cuts, waste rock dumps, tailings ponds. If no recultivation is provided, the permafrost conditions may increase these areas by many times.

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**Keywords:** biological recultivation, diamond deposits, company «Alrosa», Yakutia

The diamond mining operator in Yakutia is the joint-stock company «Alrosa» – the second largest diamond mining company in the world, which produces 97% of all diamonds in Russia, and the proportion of its production in the world market is 25%.

Diamonds are mined by open and underground methods with the resulting formation of

vast areas of man-made forms of relief – the pits with a depth up to 500 meters, waste rock dumps up to 60-100 meters, tailings along the valleys of the dead rivers, etc. Currently, the area of disturbed mining lands occupy over 300 hectares. The processes of thermoerosion, thermokarst, solifluction and impairment start immediately in the permafrost of the disturbed areas (Fig. 1).



Fig. 1. Output of permafrost in industrial outlets

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The «Mir» kimberlite pipe, where diamond mining had been carried out since 1957, produced 140 396 000 m<sup>3</sup> of overburden rock, and Mirny city – the center of the diamond industry – is surrounded by dumps and tailings with area more than 1000 thousand square meters (Fig. 2). In Mirny region there are three such pipes along with the «Mir» – the «Aykhmal» and the «Udachnyi».

Tailings pits are composed of marl, dolomite, limestone, and their destruction to loam under the influence of external factors is very slow, requiring human intervention, i.e. recultivation.

Diamond mining companies' recultivation procedure, especially its biological stage, has been poorly developed, as reclamation projects started to develop in 2000. More comprehensive studies of man-made surface, soils and the degree of overgrowing vegetation is required. In this regard, we conduct landscape, geobotanical and soil studies of diamond mines (Mironova et al, 1990, Mironova, 2000, Landscape-geochemical features of ..., 2006). General research methods are used.

Dumps are a hilly terrain with a plateau-like tops with steep slopes and an average height of 60 m. The surface is mainly composed of marls,



dolomites, limestones of various sizes – from the blocks, boulders, gravel to sand and dust and is heavily compacted by bulldozers. All these factors make it very impervious for plant roots.

According to the classification of natural and man-made landscapes the above-mentioned territories are classified as pipe-depleted, according to the classification of soil – rock

and half-rock frozen (seasonally frozen) man-made soils (GOST 25100-95).

Zonal soils are frozen sod-calcareous typical and leached types developed on eluvium and eluvium-deluvium of Cambrian, Devonian, Silurian limestones and dolomites under the canopy of larch forests. In disturbed areas the soils are utterly destroyed.



Fig. 2. Mirny mine dumps

The dumped ground is characterized by various size and heterogeneity of rocks. The bedrock is represented by Mesozoic and Paleozoic siltstones and sandstones with interbedded conglomerates with a mixture of clay and loam with a high content of pyrite. A small amount of fine material has a heavy grain size as it is formed on the surface of the dumps as a result of weathering (Table). The heavy fraction can have a positive effect for the recultivation activities, as the more there is the «physical clay» fraction, the richer it is gross and moving elements of plant nutrition (Avksentiev et al, 2004). This is due to high sorption properties of soils and heavy soils.

Having a thin profile the soil of dumps are homogeneous in the morphological structure and are not differentiated into distinct layers (none of morphogenetic traits).

The analysis shows light and strong alkaline reaction of the environment, a small amount of carbon and nitrogen. The concentration of mobile forms of phosphorus and potassium depends on the redistribution of carbon. In terms of particle size and chemical composition of the studied soils, or mixtures of these species belong to the group unsuitable for use in biorecultivation (GOST 17.5.1.03-86).

Spectral semi-quantitative assay of soils revealed the accumulation of a wide range of microelements, including elements of toxicant-1, 2 and 3 hazard classes. Zinc and lead are the 1<sup>st</sup> class of hazard. Their concentration in the soil dumps exceeds the local background from 2 to 6 times. The second class of hazard includes boron, chromium, cobalt, nickel, copper, molybdenum, they exceed the norm by 1,5-7 times. The 3<sup>rd</sup> class of hazard includes vanadium and manganese, their excess is minor.

Thus, the dumps' soils are toxic man-made rocky soil and groundwater mixture (TKPGS), and they can not be used to revive the natural vegetation, and the cultivation of agricultural crops and forest without a special screening or decontamination activities (Menshikov, 2004).

On a heavily compacted dumps soils there are currently the not stocked communities of puccinellia Haupt (*Puccinellia hauptiana* V. Krecz.) and the bearded barley (*Hordeum jubatum* L.) with a willow-tea, and lambsquarters. The average plant cover ranges from 5 to 25 %. The average plant height varies from 3-20 cm.

At the pipe dumps higher plants include 14 families of 40 species. Dominated by families of Gramineae (16 species), Compositae

(8 species), legumes (4), Fig-wort (3), sedge (2 species). More common are the species of the genera Chamaenerion, Astragalus, Taraxa-

cum, Artemisia, Puccinellia, Hordeum. The total projective cover of grass varies from 10 to 60%.

Granulometric composition of dumps' soils of The «Mir» pipe  
(Sampling depth 0-10 cm)

Location of sampling	Hygro-scope moisture, %	Loss from HCL, %	Fractions value, %						Physical clay < 0,01	Physical sand > 0,01	Type of granulometric condition
			1-0,25	0,25-0,05	0,05-0,01	0,01-0,005	0,005-0,001	< 0,001			
Dump №2											
Southern Exposure											
Mnt foot (T-6)	1,011	29,18	2,67	8,73	15,52	8,26	13,56	22,08	43,90	26,92	TC
Peak 1 (T-7)	1,007	28,91	0,53	6,65	17,48	7,76	15,28	23,40	46,44	24,65	TC
Slope (T-8)	1,010	23,97	0,27	1,24	19,20	8,08	9,60	37,64	55,32	20,71	JIG
Peak (T-9)	1,013	26,40	0,72	5,76	20,08	6,76	16,68	23,60	47,04	26,56	TC
Northern Exposure											
Brow (T-11)	1,208	24,59	4,50	1,03	19,64	10,20	20,85	19,19	50,24	25,17	JIG
Mnt foot (T-10)	1,144	43,37	1,05	0,79	16,14	11,09	12,38	15,17	38,64	17,99	CC
Peak 1 (T-12)	1,146	47,43	2,46	3,79	17,92	3,44	18,73	6,23	28,40	24,17	JIC
Mnt foot 2 (T-13)	1,047	35,41	2,21	2,08	17,22	11,56	13,90	17,62	43,09	21,51	TC
Peak (T-14)	0,897	28,37	0,89	1,20	24,62	7,63	14,61	22,68	44,92	26,71	TC

On a more moist gullies and rivers, there are also species of Equisetum, Arabis, and rare sprouts of Salix and Larix.

The slopes of the piles, consisting of pebble-cloddy structure of different sizes, lack the

vegetation, and only the fine earth and experimental plots have some separate groups of barley and puccinellia.

Thus, biological recultivation is obligatory to obtain the land cover on the dumps.



Fig. 3. Seedlings at the old man

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## GLOBAL WARMING AND ANTHROPOGENIC FACTOR

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In this paper attempt is made to objectively appraise causes of the observable global warming and to determine place and role of anthropogenic factor.

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**Keywords:** global warming, anthropogenic factor

One of the most discussed topics nowadays is the problem of changes in climate, specifically – global warming. Moreover, not only professionals make discussions and conclusions, but everyone, thus frightening commoners with either dramatic rise of temperature, or a new ice age, or even the Flood. Such ideas are based on different scenarios and forecasts which are misjudged, misunderstood and are often really far from the truth.

Discussions on changes in climate that are based on personal life experience are usually subjective as they grow on comparing *weather* conditions of different life periods. However, one should understand that climate and weather are far not the same things! Weather

condition (weather) are specific actual values of meteorological indications (air temperature and humidity, wind parameters, atmospheric pressure, etc) in a specific place and in real time. While the climate is the same values that are generalized for no less than thirty years, as it is accepted by the World Meteorological Organization. Moreover, changes in climate do not only mean temperature rises. General term «*global climate change*» should be understood as *re-construction of the planetary ecological-climate system and ecosystems of lower levels*.

In order to understand what happens to the climate nowadays and will happen to it in future, it is necessary to consider a multiplicity of natural and anthropogenic factors:

Antropogenic	Natural
Burning of organic fuel (heating energy, transport, household)	Solar activity
Industry	Parameters of heliocentric orbit
Agriculture	Mood movement
Wood production	Movement of heavy planets
Hydro-construction, melioration	Volcanic activity
	Auto-oscillations in atmosphere
	Geomagnetic activity
	Earth spinning speed
	Oceanic circulation
	Tectonic activity

The most important, evident, and unquestioned factors are: solar activity, the Earth's position on heliocentric orbit along which it circles around the sun; and less evident such as: Mood movement and position of heavy planets (Jupiter and Saturn).

But the impact upon the climate system isn't limited by these outer factors, as it is an example of non-linear stochastic system that can generate considerable alterations within itself. As examples we can recall El-Ninho (a boy in Spanish) and, less popular but still having a great influence on European nations, the phenomenon of North-Atlantic oscillation.

Studies that take place nowadays in national department of oceanic and atmospheric research of the USA allowed us to reveal why the global warming went on slower that it has been

shown by climatic models, that were based on accumulation of hotbed gas, during the first decade of the XX century. The main reason is rather high concentration of aerosols in the air that integrate atmosphere from natural origins and due to anthropogenic factors and reflect solar emission back into space.

Through mathematic calculations it has been revealed that aerosol impact decreases expected warming by 25 % in general. As a result, the observed global warming has slowed down due to density of the atmosphere.

It is extremely difficult to define the part of natural and anthropogenic factors in this process, as the atmosphere level of aerosols is a constantly alternating value.

Scientists of the Alabama university in Huntsville, USA who have analyzed the data



of American satellite Terra, have concluded that the climate warms up, Earth atmosphere emits heat into space more actively as it is in calculations of various climatic models. As it has been shown, the atmosphere does not simply give away more energy than we thought, but this process also starts earlier. According to the forecasts, climatic system must absorb solar energy up to the highest heat level, but actually, it starts to lose energy more than three months prior to maximum.

Obviously, natural alterations in cloudness, solar radiation, heat, generated by oceans and a number of other factors that affect atmosphere with a time lag, do not allow us to reveal climatic changes of anthropogenic origin. There are too many variables. The problem of measuring reaction to changes in atmosphere is not solved yet, and it is impossible to divide radiation impact and radiation heat exchange.

Nevertheless, climate warming on our planet shows itself. It is caused, obviously, by the increase in Solar activity, as it was before. It is confirmed by the member of the Russian Academy of Science Andrei Kapitsa and many foreign scientists.

However, even if we agree with adepts of the anthropogenic hotbed theory, the part of the human factor is significantly overestimated. French geologists have proven that earlier calculations of amounts of carbon oxide that are discharged during volcano eruptions are incorrect, as the greatest amount of CO<sub>2</sub> enters the atmosphere due to the processing of carbonate grounds, along which lava of an extremely high temperatures flows. Besides, as it has been proved by scientists from Arizona university, damage of forest fires is considered incorrectly. They discharge much more carbon oxide into the atmosphere than it has been thought (here the role of anthropogenic factor is high). Economic activity of the humanity equals up to 27 million tons of CO<sub>2</sub> discharges a year, and forest fires add about 15 million tons to it. In total, up to 230 million tons of this gas is discharged into the atmosphere, so the anthropogenic part in it forms only 10% of the total volumes of discharge.

The head of department of the Institute of space research (ISR) of Russian Science Academy Evgeniy Sharkov, during his report at the all-Russian conference «Distant probing of Earth from space» outlined that numerous hy-

pothesis that industrial activity of human had become the cause of the global warming of the planet climate are were incorrect. Planet Earth has a unique thermostabilizing system «ocean-atmosphere» that is in a state of stable balance, and the humanity with its modern energetics and volumes of hotbed gases discharge cannot break this balance on its modern development stage.

A further increase in temperature is expected, and it will reach ~1,0°C by 2050 y. and ~1,5°C by 2100 in general all over the world.

Causes of climatic changes:

1. Radiation balance of Earth has a defining role in forming the planet's climate.

2. The main cause that influences long-term climate oscillations is a change of concentricity of the Earth's orbit around the sun and precession of the Earth's spinning axis (in accordance to the astronomic theory of cyclic alterations in climate by Milankovich [5]).

3. Mixture of deep oceanic waters with shallow water leads to the temperature fall, as an average ocean temperature equals 3,5°C, and earth surface – 15°C (alterations in circulation of the world ocean).

4. Anthropogenic factor, or an influence of human activity.

5. Unstudied cyclic processes in the system of space – ecological-climate system of the planet.

6. Unknown factors that do not possess a lot of energy but provide for the function of the global climatic system.

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## ABOUT ESSENTIAL OILS BIOTECHNOLOGY ON THE BASE OF MICROBIAL SYNTHESIS

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One of the high-priority aims is an expansion of the world assortment of natural essential oils produced by industry – which is currently counted to be around 180 names widely used in pharmaceutical, perfumery, cosmetic, confectionary, soap, and alcohol beverage productions. The revelation of perspective producers is an actual goal in modern biotechnology of aromatic products, in addition to including the scent of fresh rose flowers. The comparative analysis of cultures of microorganisms, which are referred to different taxonomic positions, shows that the quantity of synthesized volatile aromatic substances reaches 180 mg/l cultural liquid during the first two days of growth on fermentative medium. These bio-objects possess the highest growth speed that offers them an advantage and simultaneously increases product outcome yield on useful equipment units. The basic components of essential oils are geraniol and  $\beta$ -phenylethanol. Nerol, citronellol, neral, and geranial were also observed among these basic components.

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**Keywords:** biotechnology, essential oil, microbial synthesis

Essential oils are fragrant, volatile substances, which different plants parts, essentially flowers, leaves, fruits, roots, may contain. They are lightly distilled with a vapor from raw plant material. The essential oils have a wide range of cosmetic and medical actions due to the presence of up to 500 complex organic compounds with different chemical structure in their composition. The properties of essential oils are apparent by their complex pharmacological, biochemical and clinical effects due to their action on three levels: molecular, psychoemotional, and on the level of nervous system – because every smell has several chemical substances. The mechanisms of essential oils are made up of local, reflex and total resoptive actions. Molecules of aromatic compounds, when interacting with olfactory receptors, evoke emotional response. In turn, the emotional reaction can provide mental and physiological changes in the organism. The essential oils cause stimulatory or sedative effects on the central nervous system, apparent immunomodulatory action, or regulate oxidative processes in the organism. The efficiency of essential oils is compared against a wide range of bacteria, fungi, viruses. The increases of the causative agent's sensitivity to antibacterial medicines are marked by their complex administration with essential oils [1].

The essential oils are highly propagated in the vegetable world, from fungi and algae till flowering plants. On the Earth, around 3000 plants exist that can be a source of essential oil. But nowadays the limited amount of higher plants is used in industry. The quality of essential oil depends considerably on ecological factors such as location, where volatile-oil-bearing plants are cultivated. In addition, plantation cultivation is characterized with seasonal prevalence. Biotechnological production is deprived from mentioned disadvantages. But

the biotechnology of essential oils production in culture of isolated cells and tissues is not competitive in comparison with the biotechnology based on the microbial synthesis.

Bacteria, yeasts, actinomycetes, fungi, algae – which are able to synthesize essential oils and aroma substances de novo and also bioconvert them from less valuable components (fatty acids, alcohols, alkanes, etc.) – are of particular interest as a non-traditional source of these substances in connection with a rapid development of modern industrial biotechnology. In nature there are around 100,000 known species of microorganisms, but just only several hundreds of them that synthesize products or provide reactions that are useful for mankind are studied [2].

The study of new sources of fragrant substances has begun in completed earlier investigations. The estimation was carried out by analysis of accumulation level and composition of essential oil, speed of culture growth and other properties which are important for biotechnological production [3-9]. In addition, it is worth paying attention to the investigation of mechanisms of aroma forming substances synthesis, the increasing clarification of metabolic means on influencing this process [10, 11].

The comparative analysis of cultures of blue-green, green, and red algae, referred to as: *Calothrix*, *Cylindrospermum*, *Anabaena*, *Nostoc*, *Spirulina*, *Chlorella*, *Cyanidium* families, showed that the quantity of synthesized fragrant substances is around 3mg/ml cultural liquid of *Nostoc sp.* (Table). But the use of *Chlorella vulgaris*, *Spirulina platensis*, and other microalgae biomass is perspective for production of spirituous extractions that resemble oakmoss resinoid – which enters into the composition of perfumes as odour fixator, and also as a self-contained pigment aromatic source.

## Microorganisms that are essential oils producers

Micro-organism	Taxonomic position (kingdom, division, class, family)	Basic component composition of aromatic product	Reference
<i>Bacillus</i> sp.	Bacteria, Firmicutes, Bacilli, Bacillaceae	$\beta$ -phenylethanol	[9]
<i>Thiocapsa</i> sp.	Bacteria, Proteobacteria, Gammaproteobacteria, Chromatiaceae	$\beta$ -phenylethanol	[9]
<i>Ectothiorhodospira</i> sp.	Bacteria, Proteobacteria, Gammaproteobacteria, Ectothiorhodospiraceae	$\beta$ -phenylethanol	[9]
<i>Spirulina platensis</i>	Bacteria, Cyanobacteria, Chroobacteria, Phormidiaceae or Plantae, Cyanophycota, Cyanophyceae, Oscillatoriaceae	monoterpenoid alcohols, paraffin	[4]
<i>Nostoc punctiforme</i>	Bacteria, Cyanobacteria, Hormogoneae, Nostocaceae or Plantae, Cyanophyta, Hormogoniophyceae, Nostocaceae	monoterpenoid alcohols, paraffin	[4]
<i>Chlorella vulgaris</i>	Plantae, Chlorophyta, Chlorophyceae, Chlorellaceae	monoterpenoid alcohols, paraffin	[4]
<i>Scenedesmus acutus</i>	Plantae, Chlorophyta, Chlorophyceae, Scenedesmaceae	monoterpenoid alcohols	[4]
<i>Saccharomyces</i> sp.	Fungi, Ascomycota, Hemiascomycetes, Saccharomycetaceae	$\beta$ -phenylethanol	[9]
<i>Endomyces</i> sp.	Fungi, Ascomycota, Hemiascomycetes, Endomycetaceae	$\beta$ -phenylethanol	[9]
<i>Eremothecium ashbyi</i>	Fungi, Ascomycota, Hemiascomycetes, Eremotheciaceae	geraniol, $\beta$ -phenylethanol	[7]
<i>Eremothecium gossypii</i>	Fungi, Ascomycota, Hemiascomycetes, Eremotheciaceae	geraniol, $\beta$ -phenylethanol	[7]
<i>Aspergillus foetidus</i>	Fungi, Ascomycota, Eurotiomycetes, Trichocomaceae	lactones, terpene and aromatic alcohols, aldehydes, ketones	[7]
<i>Penicillium canescens</i>	Fungi, Ascomycota, Eurotiomycetes, Trichocomaceae	lactones, terpene and aromatic alcohols, aldehydes, ketones	[7]
<i>Trichoderma viride</i>	Fungi, Ascomycota, Sordariomycetes, Hypocreaceae	lactones, terpene and aromatic alcohols, aldehydes, ketones	[7]
<i>Ceratocystis paradoxa</i>	Fungi, Ascomycota Sordariomycetes, Ophiostomataceae	lactones, terpene and aromatic alcohols, aldehydes, ketones	[7]
<i>Ceratocystis pilifera</i>	Fungi, Ascomycota Sordariomycetes, Ophiostomataceae	lactones, terpene and aromatic alcohols, aldehydes, ketones	[7]

The strains which produce aromatic substances in quantity of around 95 mg/l are revealed among studied representatives of bacteria (genera *Thiocapsa*, *Ectothiorhodospira*, *Bacillus*) and yeasts (genera *Saccharomyces*, *Endomyces*). As a rule  $\beta$ -phenylethanol is contained in aromatic products of these cultures. In comparison with other groups of microorganisms, they possess the highest growth speed that offers the advantage of higher end product outcome yield on useful equipment units [5].

The study of fungi cultures, such as mycelial fungi, deserves particular attention in its ability to accumulate biologically active metabolites which are important for industrial use. The aimed search of perspective objects for aromatic products in biotechnology in the range of genera *Trichoderma*, *Ceratocystis*, *Aspergillus*, *Eremothecium* gives the possibil-

ity to characterize differences between species, strains by level of biosynthesical activity and essential oil composition. During analysis of twenty-one cultures of genus *Trichoderma* a high variability is revealed by these characteristics. The essential oil synthesis *E.ashbyi* reaches 180 mg/l cultural liquid during first two days of growth in fermentative medium. This can be comparable with that of the essential oil content in 500-600 g of rose flowers [6-9]. The basic components of essential oil are geraniol and  $\beta$ -phenylethanol, while nerol, citronellol, neral, geraniol were later identified. Geraniol,  $\beta$ -phenylethanol and other essential oil components affect spasmolytically, antiinflammatory and antiseptically [12]. The essential oil synthesized by *E.ashbyi* closely approaches the functions of the essential oil of fresh rose flowers and has a scent. The component composition of essential oil of *E.gossypii*

is similar, but the monoterpene alcohols ratio is closer to their content in Bulgarian rose oil.

This natural product, whose price on the world market reaches eighty dollars for one gram, is in extreme demand as more than half of world perfume brands are produced on the base of rose oil. It is also used in medicine and pharmaceuticals. The oil is used as a corrigan of pharmaceutical products for their taste and smell improvement. The rose oil and the rose water are widely applied in perfumery, cosmetic, confectionary, soap, etc. industries. The rose oil possesses moderately antibacterial (bacteriostatic) effects, because  $\beta$ -phenylethanol inhibits macromolecules synthesis, but is not toxic for all microorganisms and strains at the same degree [13]. The rose oil regulates the adrenal work, possesses antipyretic, is anti-inflammatory, is anti-edematous, is choleric, hepatoprotective action, is used in the treatment of stomatitis, parodontosis, cutaneous and other diseases.

The rose oil accounts for 0,025 % of composition on average, so for production of 1 kg oil the manual collection and processing of around 4 tonnes of petals is necessary. The rose water remains after oil distillation while oil accounts for 0,02 % of its composition. The main supplier of rose water in the world market is Iran, but the oil is not produced there. In the world, rose oil of good quality and volume – which is nowadays around 600 kg/year – is produced just only in four countries: Taif, Saudi Arabia; Kazanlyk, Bulgaria; Istanbul, Turkey; and the Tashkent region, Uzbekistan [14]. Until 1992, the rose oil production by hydrodistillation method in USSR republics (Ukraine, Moldova, etc.) was around four tonnes per year. But since then, it has sharply reduced due to the economical crisis in CIS countries [15]. For instance, in 2005, in Crimea, only 600 kg rose essential oil (extract) were produced. That is less than maximal levels reached in this region by a factor of two [16].

Thus, the revelation of perspective producers of essential oil – including rose odour direction – is an urgent problem in biotechnology of aromatic products, which are very close to endogenous compounds of human body by their content and actions. In addition, many aroma forming substances are able to engage in spontaneous interactions – stacking – yet are conditioned by geometrical limits. Such nanostructures have a high potential for the application in different fields of bionanotechnology (nanobiotechnology) [17]. One of the high-pri-

ority aims is an expansion of world assortment of natural essential oils produced by industry – that is counted to be around 180 names – at the expense of the introduction of new taxonomically different microorganisms-overproducers.

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## HUMANIST EDUCATION OF PUPILS ON THE BASIS OF TRADITIONS OF THE SIBERIAN COSSACKS

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The article considers the humanistic values of the traditions of the Siberian Cossacks. The main purpose of the publication is to describe the traditions of the Cossacks on the basis of the examined documents and the data of the empirical studies. The work covers the following issues: the main socially significant signs of the Cossacks: the peculiarities of traditions, self-consciousness, means and ways of life activities, social status and social role, social organization, social culture; social functions. The article is relevant, has a scientific and practical novelty.

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**Keywords:** humanist education, siberian cossacks, traditions

Cossacks are a military estate in the pre-revolutionary Russia of the XVIII early XX centuries. In the XIV-XVII centuries they were independent people, free of taxes, who worked for hire, mostly in various fisheries, as well as persons who bore a military service on the outskirts of the country, and the so-called free Cossacks. The service Cossacks were divided into police (regimental) Cossacks and stanitsa (sentry) Cossacks and were used to protect towns and sentry posts respectively, for what they received the land on terms of local ownership and salaries from the government. As a social group the Cossacks were close to the Streltsy, gunners, etc. In the XVIII-XIX centuries, the most part of them was transferred in the poll-tax paying estate and entered the smallholders' group. The other part joined the composition of the Cossack armies (Siberia, Orenburg, etc.).

In the time of the Altai province's formation on June 17, 1917, it consisted of Barnaul, Biysk, Zmeinogorsk, Kamensk and Slavgorod districts (uyezdy). Biysk line was within the Biysk and Zmeinogorsky districts.

In the composition of the Biysk district (uyezd) the following stanitsas (villages): Tcharyshskaya, Antonievskaya, Moraliyevskaya, Nikolayevskaya, Sliudenskaya, Terskaya; the settlements-Smolensky, Sosnovsky, Tigiretsky, Tulatinsky, Yarovskoy were included. The Zmeinogorsky district (uyezd) included the following stanitsa (village): Verkh-Aleiskaya; the settlements-Andreyevsky, Beloretsky, Bobrovsky, Verkh-Ubinsky, Kliuchevsky, Platovsky, Sekisovskiy.

On August 4, 1920 the Siberian revolutionary committee issued the decree of adding a number of volosts of the Zmeinogorsky district of the Altai province to the Semipalatinsk province, with the result that the stanitsas Platovskaya, Verkh-Ubinskaya, Sekisovskaya and

Bobrovskaya turned out to be outside the limits of the Altai province.

Chronological frameworks of the research paper cover the period of 1917-1920. That was the time during which there was a process of liquidation of the Cossacks as a privileged military estate and a special group of the Russian population. This process was initiated with the October revolution and the decree from November, 10th, 1917 «About the abolition of estates and civil ranks». The Cossack estate had been finally eliminated after termination of the Civil war with the decree from March, 25th, 1920 «About the construction of the Soviet power in the Cossack areas». Without denying the statements of some modern historians that the Civil war proceeded up to 1921-1922, we consider that, in fact, the Civil war for the Cossacks of the Biysk line came to an end late 1919 early 1920. By that time the Cossack villages had been occupied by the partisans all over, they had been also deprived of territorial and administrative independence and had been included in the composition of country volosts.

In the opinion of V.V. Isaiev, the revolution and the Civil war's events had a devastating effect on the Cossacks of the Biysk line [1, p. 179]. Under the influence of internal and external circumstances the Cossacks were facing a difficult political choice. On the one hand, they could not support the Soviet power, which was affecting their class and property interests unequivocally. On the other hand, they were unable to act against the people, and engage in a civil war.

The first decrees of the Soviet government were aimed at splitting the Cossacks. The Bolsheviks who came to power, were doing their main stake on the so-called labour Cossacks – mostly on the poor Cossacks and the front-line soldiers.



On the Biysk line these social groups could not become a strong pillar for the new government. The poor Cossacks were not numerous here but the front-line soldiers, representing the average and well-to-do layers of the Cossacks, when returned home, distanced themselves from politics, plunging in the family and domestic life.

The active influence on the Biysk line started only in April-May 1918. The Soviet power became firmly and completely strengthened in Biysk by that time. And in Omsk the Soviet Military Cossack Department developed violent activities on advancing the Soviet ideas into the Cossack stanitsas of the Siberian army. The changes occurred made the movement of the labour Cossacks more active.

On the line of Biysk it (movement) was represented by the front-line soldiers, the Cossack youth, the poor and what was mostly interesting some of the «old men», who were traditionally considered to be the most conservative part of the Cossacks. The labour Cossacks were pursuing a policy of Cossacks' oppression, trying to deprive the Cossack estate of the privileges which it enjoyed in comparison with the peasant population. The labour Cossacks couldn't manage to achieve serious successes and to get a numerous army of their supporters. Many Cossacks were frightened by the prospect of egalitarian redistribution of land with the peasants. Cossacks, connected by a military organization, discipline, and many other attributes of the Cossack life, didn't yield to campaigning. The Civil war became a serious trial for the Cossacks. The political choice was to be done, which was not easy for the main part of the Cossacks. With the termination of the Civil war the Cossacks had the opportunity to return to peaceful life. The settlements and villages (stanitsas) of the Biysk line, divided between districts (uyezdy) and volosts, deprived of their former independence, began to lose gradually its character [2, p. 75].

At the present time the fate of the Cossacks both in Altai and in the whole Russia to a large extent is not determined. In the places of the historical settlement of the Cossacks the various organizations, putting before themselves the purpose – to revive the Cossacks in Russia began to arise. Out of the numerous Cossack communities, including Altai, the Union of Siberian Cossacks under the leadership of ataman S.N. Smoliakov was established in Siberia by 1990. The representative of Altai colonel Belozertsev Y.A. has become ataman of the Siberian Cossack Troops since 1993. Ostanin A.V. was ataman of the third Military (Altai) Department of the Siberian Cossack

Army. In 1993 the Structure of the Altai department was as follows. The management Board of the Altai division – the town of Barnaul; the village (stanitsa) of Novoaltaiskaya; the village (stanitsa) of Tcharyshskaya; the village of Ust'-Kalmanka, Bikatunskaya Cossack line, stanitsa Antonievka, stanitsa Altaiskaya, stanitsa Barnaulskaya, stanitsa Vernaya, the Bolshaya Alma-Ata village (stanitsa) of a separate Siberian sotnia (Cossack squadron). The list of settlements in its overwhelming majority is conditional, since it is predetermined to a large extent by the historical tradition. The role of the Cossacks in a modern life has become to be conceived as a combination of the old traditions, the way of life – including the economic one – with regard to life realities. The Altai Cossacks are seeking to recreate their economic lifestyle on the basis of the traditional community Cossack land use, and they borrow the farming methods of economic management.

The information containing in the examined documents and the data of the empirical studies indicate that the main socially significant signs of the modern Cossacks, should include: the specific character of traditions, self-consciousness, means and ways of life activities, social status and social role, social organization, social culture; social functions. A fundamentally important feature is the degree of preservation of the Cossack traditions.

When a little Cossack reached one year old, he was led to the first communion. The whole process of development of the Cossack was built in a spiral. Each coil in it is a closed cycle, and it took a certain age period. The next round began with the same, but at a new qualitative level. Each level included physical, intellectual and moral (spiritual) development. A little Cossack under 7-8 lived in the woman's half of the kuren (garrison). At this moment the upbringing went out both of the female part of the family and the male's. Generally it was based on a vizualization. And the main thing here was a personal example of the seniors and the immersion of «the kid» in the appropriate environment. There is father's or grandfather's saber on the kuren's wall. The stripes on the trousers are a symbol of the Cossack, the saber is our Cossack weapons and the symbol of the Cossack's will, the horse is a friend and comrade of the Cossack, the crosses and medals on his grandfather's, father's, uncle's, chest are the decorations for the part and exploits in the military companies.

For the night the «kids» were told fairy tales how the Cossacks won the witches and utter monsters, and how they came from one or another situation with honor, they were



sung songs about the glory of the Cossacks, past campaigns, battles and heroes. The men watched how a little Cossack was being formed. Games had been established for centuries, and they were certainly aimed at the development of little Cossacks. Practically all of them were under the supervision of the stanitsa (farmstead) old men, who were strictly following the behavior of each Cossack. And in that case, if someone behaved unworthily, the old people enthusiastically taught and corrected the negligent. Physical development was mainly at the age of 8 (in some families from 7 years old) and up to 12 years. Since 8 the Cossack was removed into the male half of the kuren. At that time a ceremony in the hole was held again. Since the same time a little Cossack learned to handle with a whip (a subject that is very symbolic for the Cossacks and very ancient). It is connected with the legend about Yegory the Brave and with some more ancient legends about the dragon fighters. Since the same time a little Cossack was started to be invited for a «conversation». The main point in the upbringing of the Cossacks in that period was the following: to teach him how to cope with his own fear in any of its manifestations. And, observing the reaction of the Cossack, the elder people said: «Don't fear, the Cossack isn't afraid of anything!», «Be patient, Cossack, you'll be ataman!» At the age of 12 the process of physical training was mainly completed. A little Cossack was trained to combat weapons – a saber (dagger).

The beginning of the Cossack child's entering the Spas (the Cossacks' system of survival) began with his being baptized. The tasks of the Spas (The Savior) became more complicated, but the main direction of the education of a-he or a-she-young Cossack was not physical, but spiritual. The young Cossacks got back to physical development only through the concept of spirituality. There are two basic actions in the Spas, uniting into one thing: a very quick thinking for taking the only right decision; a quick action for making the decision that sometimes is not even noticeable for the enemy. When reaching the second and the third levels of the Savior the young Cossack is being taught to develop intuition. A deferential, respectful attitude to the old age was brought up since childhood. The domestic people watched strictly how the children behaved themselves when meeting the adults. The strict educational requirements in relation to the seniors pursued the purpose: to cultivate respect in the Cossack youth to the elder people: to their father and mother since childhood, to be thankful for their

efforts and cares about the education of their rising generation. The status of the elderly was maintained even then, when the old people remained all alone without children for various reasons. In the villages (stanitsas) such elder people were supported with the means from the military funds, and people took it as a rule to bring or treat products to a week lonely old man or woman.

The tradition of partnership was one of the main educational ideas throughout the Cossack history. Its practical value has increased at the beginning of the XX century, when the Cossacks entered a series of wars and emigrations. In many respects thanks to their brotherhood and partnership the Cossacks were able to adapt quickly to the conditions of emigration.

Religion is the Cossacks' important factor in the formation of a human spirituality. The Cossacks' world-view was based on the orthodox canons. The first words of the combat motto were «For the faith...». The Cossack gave his whole life to serving the Faith with all his heart and soul. But if in the beginning of his life it was an active energetic form with the weapon in his hands, then later, if he managed to survive to the old age and not to die on the field of battle, he dedicated himself to a truly spiritual service.

We have reflected only a small part of cultural traditions. The Cossack education was carried out on the basis of humanistic principles and methods and was based on the economic structure, household traditions, social norms of life, allowing them to support and safeguard the firmness and vitality of the Cossacks. The Cossacks are the custodian of the highest values both spiritual and moral.

In the process of studying the origins of the Siberian Cossacks' culture, the Military-Patriotic Centre of the Cossack Cadets for Revival, Preservation and Augmentation of the Cossacks' traditions of the town of Biysk (historical past of the town is connected with the Cossacks) was created on the basis of Regional Budgetary State Educational Institution of Primary Professional Education «Vocational School № 4» in 2002. The further aims of the Center are the military-patriotic education of youth, increasing the prestige of military service, forming motivation to serving in law enforcement bodies. The activities of the centre of the Cossacks are organized in the form of a traditional Cossack stanitsa management board, a democratic interaction. That is the novelty of the pedagogical approach.

The Center of the Cossack cadets sees its prospects in expanding the boundaries of the project, in the establishment of branches; the recruitment of the town Cossack community by the Cossacks cadets; the establishment of a resource centre on the basis of an experimental platform in a military-patriotic education; the establishment of a town coordinating center (the organization of a military-field training with the participation of the town military units; preparation and participation in all-Russian, regional fairs, festivals; monitoring, generalization and promulgation of the experience; the establishment of relations with the Cossacks and the cadets' organizations of the Russian Federation.

The Military-Patriotic Center of the Cossack cadets has established extensive social

communications for ten years that is the striking evidence of its openness and dynamic progress.

During this period of time the pupils and teachers of the Center of the Cossack cadets have become the organizers and participants of various activities: town, regional, inter-regional festivals, exhibitions, fairs, round tables, conferences.

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## INTERTEXTUALITY IN EUROPEAN LITERATURE EXPRESSED THROUGH THE PRECEDENT SITUATIONS AND CHARACTERS

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This article aims in making a retrospective analysis of linguistic and semiotic researches, concerning intertextuality in European literature – expressed through precedent phenomena: a precedent name and a precedent situation (circulation of plots); and summarizing the main characters existing in written fiction.

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**Keywords:** intertextuality, precedent phenomena, plot, fabula, european literature, linguistics, monomyth

Quoting famous polish aphorist Stanisław Jerzy Lec: «Everything has already been said before, but luckily, not everything has already been thought of».

We analyzed the linguistic articles, philosophical treatises and studies of literature from 347 B.C. to modern times: Aristotle, J.C. Friedrich von Schiller, Victor-Marie Hugo, Georges Polti, Carlo Gozzi, Joseph John Campbell, Christopher Booker, Jorge Luis Borges and summarized the researchers' opinions about intertextuality in European literature and ways of its expression: through precedent situation and precedent name.

Indeed, modern world of science and culture tends to be constantly quoting itself. Which is not surprising, assuming our society is highly globalized. It happened even before Mass Media became so powerful throughout the planet. Scientific and artistic worlds and their creators, even if preferring to be independent, always happened to be aware of each other's works which, to different extends, were often interinfluencing. These days almost all segments of general thinking seem to be interpenetrative. In the field of science it can be perfectly explainable: no research in any possible area of study can be accomplished (and even started) without being based on the previously made set of works, no matter developing or disproving them completely. The whole history of science is based on the principle of taking into account prior techniques, research and exploration surveys.

However, for literature, a subjective zone of expressing each author's uniqueness, such a paradigm always looked inappropriate. Any work of art is supposed to reflect individual perception of the world described by means of the particular language and the precise resources of this language skilled by the author.

Usually, when comparing literature to science in general, the researchers mention that they both use the means of the language to verbalize their ideas, although the aims of the two are completely different.

Nevertheless, there is a very important aspect both literature and science share: both phenomena are drawn heavily on the basis of

all the previous experience. And, returning to the field of literature specifically, it doesn't involve the language itself only.

No text is being born in the modern world without being dependent on the previously created one.

This can be logically explained, given that generally Western civilization (also applying to Eastern Europe and countries whose history is strongly marked by European immigration or settlement, such as the Americas, and Australasia) shares the features of mentality in many areas: heritage of social norms, ethical values, traditional customs, religious beliefs, political systems, and specific artifacts and technologies, artistic, philosophic, literary, and legal themes and traditions.

### Intertextuality

Speaking of the tradition in literature, which Western world gave birth to, we shall of course mention the phenomenon of «novel». While epic literary works in verse such as the Mahabarata and Homer's Iliad are ancient and occurred worldwide, the novel as a distinct form of storytelling only arose in the West in the period 1200 to 1750. The phenomenon «intertextuality» and the term itself was introduced to linguistic study by Julia Kristeva in 1966. Intertextuality is the shaping of texts' meanings by other texts. It can include an author's borrowing and transformation of a prior text or to a reader's referencing of one text in reading another.

### Basic Plots

The 36 «basic» plots were suggested as the only number of universal plots by Aristotle around 347 B.C. Such an idea was afterwards supported and developed by **Johann Christoph Friedrich von Schiller** (1794) and **Victor-Marie Hugo** (1896) who also stuck to the number of 36 plots. The mentioned principle was further elaborated by **Georges Polti** (1895) in his research «The Thirty-Six Dramatic Situations». Polti claims to be trying to reconstruct the 36 plots that Goethe alleges. **Carlo Gozzi** (1761) earlier in 18<sup>th</sup> century came up with the following list of fabulas:

1. Supplication (in which the Supplicant must beg something from Power in authority).
2. Deliverance.
3. Crime Pursued by Vengeance.
4. Vengeance taken for kindred upon kindred.
5. Pursuit.
6. Disaster.
7. Falling Prey to Cruelty of Misfortune.
8. Revolt.
9. Daring Enterprise.
10. Abduction.
11. The Enigma (temptation or a riddle).
12. Obtaining.
13. Enmity of Kinsmen.
14. Rivalry of Kinsmen.
15. Murderous Adultery.
16. Madness.
17. Fatal Imprudence.
18. Involuntary Crimes of Love (example: discovery that one has married one's mother, sister, etc.).
19. Slaying of a Kinsman Unrecognized.
20. Self-Sacrificing for an Ideal.
21. Self-Sacrifice for Kindred.
22. All Sacrificed for Passion.
23. Necessity of Sacrificing Loved Ones.
24. Rivalry of Superior and Inferior.
25. Adultery.
26. Crimes of Love.
27. Discovery of the Dishonor of a Loved One.
28. Obstacles to Love.
29. An Enemy Loved.
30. Ambition.
31. Conflict with a God.
32. Mistaken Jealousy.
33. Erroneous Judgement.
34. Remorse.
35. Recovery of a Lost One.
36. Loss of Loved Ones.

So, when the new book has the promising review, which pledges to have an audacious off-the-wall plot, the real outcome will most probably be questionable. The reader of any work of belletristic literature (given it belongs to the Western culture and being written after the appearance of Greek and Roman mythology and Bible) will of course be able to correlate the plots and guess the outcome of it.

**Joseph John Campbell**, an American mythologist, writer and lecturer in 1949 creates the work named «The Hero with a Thousand Faces» in which he refers to a basic pattern found in many narratives from around the world. According to Campbell, there is a so-called Monomyth: a phenomenon uniting all the plots of the Western literature and determining the behavior of each character in any given plot. Campbell breaks down the cycle of any fabula into three main stages: departure, initiation and return. His work is quite interest-

ing from the point of view of originality of all the plots, its genuine source. However, it seems logical to mention also the typical character of each plot, which this work lacks.

A very remarkable research summarizing seven basic plots in literature has been done by **Christopher Booker** (2005) in his work «The Seven Basic Plots: Why We Tell Stories». He describes seven stories that, as he claims happen to be the example of any other story ever told in the western world. The mentioned plots can be summarized as: Overcoming the Monster, Rags to Riches, The Quest, Voyage and Return, Comedy, Tragedy and Rebirth. His research seems remarkable from the point of view of describing the particular characters, typical for each plot.

For the first type, summarizing the similar stories under the shared title «Overcoming the Monster» he gives the examples of Cinderella (Rags to Riches), Jason and Ulysses (The Quest), Robinson Crusoe, Alice in Wonderland (Voyage and Return), Elinor Dashwood, Edward Ferrars, Elizabeth Bennet, Mr Darcy (Comedy), Faust, Macbeth, King Lear (Tragedy), Biblical characters and Sleeping Beauty (Rebirth) and David and Goliath, Dracula (Overcoming the Monster). Unfortunately, the author is not seeking for the original prestories of the typical plots in literature. Therefore, we can hardly trace historical development of fabula and diachronic continuation of typical characters of literature in his work.

A fascinating work on the topic has been done by a famous Argentinian writer and researcher **Jorge Luis Borges** (1980) in his set of novels «El oro de los tigres». His short and laconic, yet pretty convincing novel titled «The Four Cycles» dwells upon the idea that throughout the history of literature or whatever originally existed before it was concentrated around the four basic plots. Which were, according to Borges, the following:

– «The Doomed City **under Attack**» (the oldest type of story): all citizens know that they will not survive over the battle. The main hero knows that he'll die without seeing the victory. Typical characters: Achilles, Sigfrid, Hercules, Sigurd;

– «Travelling of The Lost Soul»: the main character is not understood by the society, he searches the world to find answers and to discover who he really is. Typical characters: Don Quixote, Beowulf;

– «The Big Journey in Search of Treasure»: the main character greatly differs from the previous one, because he hasn't been rejected by the society. Typical characters: Jason, Frodo Baggins;

– «Sacrifice of a God-like Creature»: the main character tries to save the world, the peo-



ple, searches for religion or the meaning of life. Typical characters: Attis, Odin, Andrey Bolkonsky, Master («Master and Margarita» by M.Bulgakov), Zarathustra.

**Paulo Coelho** (2000) summarized the pre-stories mentioned in «The Four Cycles» saying that: «Borges said there are only four stories to tell: a love story between two people, a love story between three people, the struggle for power and the voyage. All of us writers rewrite these same stories ad infinitum». Well, that is not precisely the essence of it. Coelho simplified the idea of Borges and adapted it for the modern popular fiction.

Originally Borges looked deeper into the religious texts as well as into folklore and mythology to find out the genuine «stirps» of every story we are now having in the European culture.

The first story is about the fateful hero who is doomed to die in the besieged town. It is the story about the rebellious warrior, someone who looks fearlessly into the face of death, knowing there is no chance of deliverance. As an example, Borges brings on the story of Troy and its main character – Achilles. The second story is the story of Great Return. Its main character is, of course, Ulysses. The third story is the story of the Searching. The central figure, mentioned by Borges describing such adventures is Jason, searching for the Golden Fleece. The fourth one is the plot the story of which tells us about the Suicide of the God. Among others Borges mentions the central Biblical saga about Jesus Christ, sacrificing himself for the humankind.

### Basic Characters

So, being based on the research made by Borges, we may point out the most nameable and therefore influential characters of pre-stories of ancient literature, folklore and mythology created in early ages:

1) **Achilles** (Greek mythology, Iliad.), Siegfried (Das Nibelungenlied), Sigurd (The Poetic Edda), Hercuľēs (Greek mythology, Iliad) = **the devoted fighter**;

2) **Ulysses/ Odysseus** (Greek mythology, Odyssey), Beowulf (heroic epic poem under the same title), Don Quijote (The Ingenious Gentleman Don Quixote of La Mancha) = **the adventurous traveler**;

3) **Jason** (Greek mythology, Odyssey, Iliad) = **the searcher of the great answers/treasure**;

4) **Attis** (the consort of Cybele in Phrygian and Greek mythology), Odin (the god of war in Norse mythology), Jesus Christ (Bible), Zarahustra (legends of the «death of God»), and the «prophecy» of the Übermensch, «Thus Spoke Zarathustra: A Book for All and None» by Friedrich Nietzsche) = **the sacrificing god**.

André Gide's gives a very comforting remark on the subject: «Everything that needs to be said has already been said. But since no one was listening, everything must be said again».

Summarizing the retrospective analyses of the works devoted to the intertextuality in European literature, we shall draw a conclusion, that theorists of literature, literary critics and scholars name different number of basic plots, on which the whole amount of fabulas of modern prose and poetry builds itself. We made an attempt to distinguish the basic characters of the mentioned fabulas and name typical plots in accordance to that. The analyses brought us to the number of 4 characters. The theory of intertextuality in the modern literature and linguistic studies has the problem of functioning criteria among its main discussion points. Consequently, we may suggest, that intertextuality, expressed through precedent phenomena, such as a character or a plot, shall be studied through the mentioned aspects.

«At the beginning there was the Word – at the end just the Cliche», – Stanisław Jerzy Lec.

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## VIBRATION CONTROL FOR HIGH-RISE CONSTRUCTIONS

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The vibration control system for high-rise constructions presupposing foundation insulation with the help of roller supports and structural rigidity adjustment is proposed. Passive elements – diagonal links with hydraulic dampers. They supplement an active part of a control system, increasing reliability of control with construction oscillations. In the active system the oscillation control is executed by electric hydraulic actuators. The active system comprises a subsystem of measurement and estimation of state variables and of identification of disturbing effects at incomplete information. Control subsystem providing optimal the control law. Mathematical models of the object with built-in control links and electro-hydraulic actuators (EHA) have been set up. Method of arranging EHA in the structure has been proposed. Effectiveness of the proposed vibration control system under seismic impact on the structure and at different design concept of passive-active communication has been studied.

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**Keywords:** high-rise structures, oscillation control system, seismic and wind loads, electric-hydraulic actuators

**1. The urgency of the problem.** Controlled structures are of current interest in high-rise building construction. Vibrations of high-rise buildings, pipes, TV towers are the result of seismic, wind, technological, and pulse pressures and can achieve several meters in the structure's high points. There are bending, vertical and torsional oscillations, with bending and torsional deformations being considered as the most dangerous.

Typical damages arising from these load impacts are as follows:

1) at a relatively moderate foundation and soft soil destruction comes from non-uniform yielding of foundation;

2) during the loading affect there may occur a phenomenon close to the resonance, which leads to strong rocking of structures, with the stresses in structural elements and at their joints exceeding the tensile strength, so the building collapses.

Control process consists of reducing vibrations to allowance or eliminating vibration amplitudes of the construction at minimum time and of eliminating resonance.

**2. Development of the problem.** In the process of working out the vibration passive control systems (VPCS) a device (a set of devices) with constant parameters that reduce the vibration amplitudes of high-rise buildings without an external energy source are used. VPCS are classified [1, 2] on the operation-based principle: damping, isolating, adaptive, inertial, aerodynamic, regulating construction rigidity. The last systems are considered most effective.

Each system has its advantages and disadvantages. However, all passive systems are simple and reliable, always ready for operation but they also provide an effective vibration control in the restricted range of disturbing frequency spectrum and need additional adjustment and control during building's vibrations.

Vibration active control systems (VACS) with external power supply operate according to a specific program and provide:

- installation of measuring devices and the use of algorithms or devices for optimal estimation of state variables and identification of external impacts;

- applying algorithms for calculating optimal control actions, analog-digital and digital to analog converters and computers;

- optimal placement of actuators in the design to ensure the generation of optimal control efforts.

Depending on the type of energy used we distinguish hydraulic, pneumatic, electrical, electromagnetic systems of active vibration control. Selecting the type system defines the required technical specification

**3. Description of the VCS.** We choose the combination system which comprises:

- insulating roller VCS, that reduces the cutting efforts in the object's foundation;

- electro-hydraulic system controlling rigidity of the construction enabling passive and active vibration control.

The main part of the insulating system is homogeneous roller moving **without sliding**. It is necessary because of the exact unwind specification before the seismic disturbance. Practical implementation is possible by using steel, cast iron rollers etc.

Passive link is made in the form of reinforced concrete or steel beam, with one end being rigidly connected to the structural framing assembly and the other one is adjusted to the piston (cylinder) of the actuators. Girder section meets the optimum operating conditions of additional links [3].

A positioning electro-hydraulic servo drives of translational motion on the basis of electro-mechanical transformer and hydraulic booster of the «nozzle-flapper» type and main shift feedback is accepted as a VACS actuator (Fig. 1).

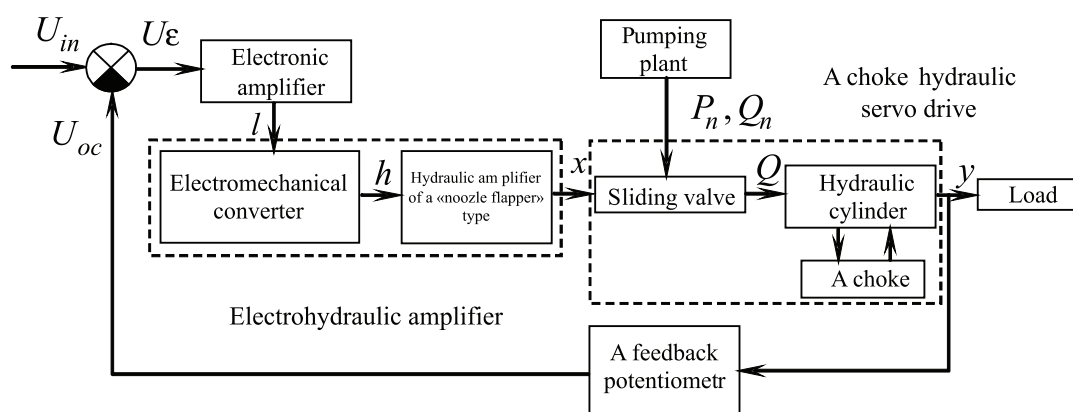


Fig. 1. Functional diagram of electro-hydraulic actuators

Further, during the study let's consider three types of passive link: tough; equipped with a «hydraulic spring», equipped with a hydraulic damper with communicating hollowness through an alternating choke with shift feedback.

The initial state of the actuator in the control system is characterized by: declutched electromagnets of electric-hydraulic distributor; filled pipes, hydraulic ram hollowness under pressure of hydraulic fluid in the hydraulic accumulator. As a result, we obtain the operating mechanisms' availability performance even under impulse loads on the controlled process.

At the passive control the electric unit of the actuator is switched off. Electromechanical converter and electro-hydraulic amplifier are in a neutral position. Fluid overflow from one hydraulic ram hollowness into another one is done by means of the choke.

With the active control by management signal from the computer  $U_{in}$  there appears current on the windings of electromechanical transformer that results in the shifting of the control sliding valve of the hydraulic booster and forces the hydraulic ram stock move together with the control object. The rod movement results in joint action of potentiometer lamellas that leads to development of current in the main negative feed-back circuit. This current is compared by adder in magnitude and sign with the control current  $i_{in}$ .

Thus, the translational motion of piston and hydraulic control cylinder is performed, the system of actuator working both in lengthening, and shortening of the additional link. Thereby the construction vibration control is available under disturbing force effect. Let's compile a mathematical model of a high-rise building with built-in passive-active links.

**4. A mathematical model of the object with a built-in VCS.** During modeling it is

suggested that the internal forces and shifts caused by static load component are given. Therefore, the model will describe small vibrations of the construction relative to stationary balanced state. In addition; we rely on the following assumptions.

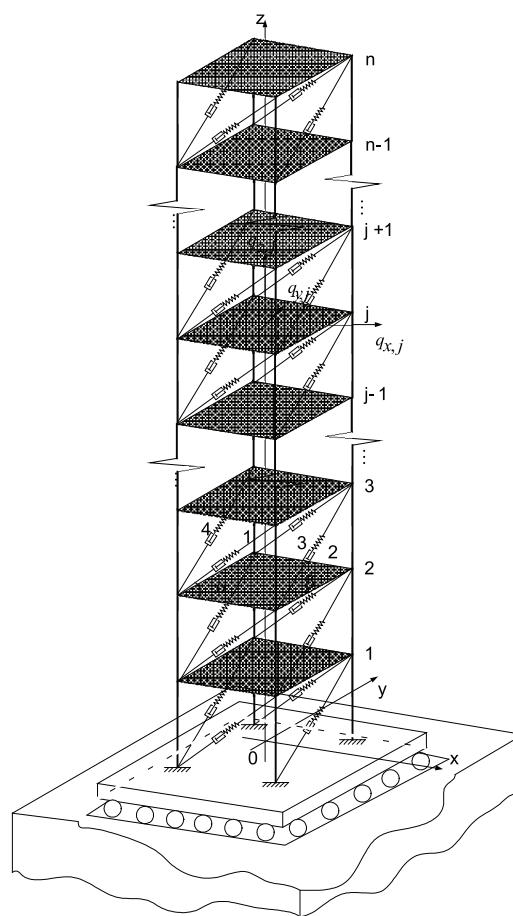


Fig. 2. High-rising construction scheme equipped by passive-active links and roller bearers

1. The high-rise building is set on roller bearings, according to the scheme shown in Fig. 2. Roller slippage is not observed. Restriction of the building horizontal motion of the building is performed mechanically and by means of springs and dampers.

2. General lay-out of the links must: connect the adjacent sections of the structure in order to suppress the horizontal and vertical

vibrations of the high-rise building, and satisfy the controllability criterion; should not disturb the structure's static equilibrium and interfere the control object technological process.

3. It is believed that the passive-active links located on all sections of the multi-dimensional structure, with the vector of generalized coordinates being written in the following form

$$\mathbf{q}(t) = [\mathbf{q}_x^t(t) \mid \mathbf{q}_y^t(t) \mid \mathbf{q}_z^t(t) \mid \mathbf{q}_{p_1}^t(t) \mid \mathbf{q}_{p_2}^t(t) \mid \mathbf{q}_{p_3}^t(t) \mid \mathbf{q}_{p_4}^t(t) \mid \mathbf{q}_{p_5}^t(t) \mid \mathbf{q}_{p_6}^t(t) \mid \mathbf{q}_{p_7}^t(t) \mid \mathbf{q}_{p_8}^t(t) \mid \mathbf{q}_{p_9}^t(t) \mid \mathbf{q}_{p_{10}}^t(t)]^T.$$

With the following marking-off vectors of the object's generalized coordinates in the respective directions are formed by the scheme

$$\mathbf{q}_w(t) = [q_{w,1}(t) \mid \dots \mid q_{w,j}(t) \mid \dots \mid q_{w,n}(t)],$$

$$w := x, y, z.$$

Vectors of generalized moves of pistons (cylinders) HA

$$\mathbf{q}_{p(c)_w}(t) = [q_{p(c)_w,1}(t) \mid \dots \mid q_{p(c)_w,j}(t) \mid \dots \mid q_{p(c)_w,n}(t)],$$

$$w := \overline{1,4}$$

where  $n$  – number of vertical sections of the construction;  $t$  – transposing sign.

To take into account inertial and dissipative characteristics of the passive-active link we use a four-mass mechanical model of a multi-variable construction and the 2-type Lagrange equation at the disturbing efforts impact.

$$\frac{d}{dt} \left( \frac{\partial L}{\partial \dot{\mathbf{q}}} \right) - \frac{\partial L}{\partial \mathbf{q}} + \frac{\partial D}{\partial \dot{\mathbf{q}}} = \mathbf{F}.$$

Where the Lagrangian function  $L = T - \Pi$  is a function difference of kinetic and potential energy of the construction;  $D$  is a dissipative energy function of the object;  $\mathbf{F}$  – disturbing impact vector;  $\mathbf{q}(t)$  – the generalized coordinate vector. The equation of the controlled high-rise building (see the paper) [1, 4] looks like

$$\mathbf{M}\ddot{\mathbf{q}}(t) + \mathbf{K}(t)\dot{\mathbf{q}}(t) + \mathbf{H}(t)\mathbf{q}(t) = \mathbf{B}_F\mathbf{F}(t), \quad \mathbf{q}(t_0) = \mathbf{q}_0, \quad (1)$$

where it is designated:

– inertia matrix

$$\mathbf{M} = \text{diag} [\mathbf{M}_x \mid \mathbf{M}_y \mid \mathbf{M}_z \mid \mathbf{M}_1^p \mid \mathbf{M}_2^p \mid \mathbf{M}_3^p \mid \mathbf{M}_4^p \mid \mathbf{M}_1^c \mid \mathbf{M}_2^c \mid \mathbf{M}_3^c \mid \mathbf{M}_4^c];$$

– the object mass matrixes

$$\mathbf{M}_w = \text{diag} [m_{w,1} \mid \dots \mid m_{w,j} \mid \dots \mid m_{w,n}], \quad w := x, y, z;$$

$m_{w,j}$  – section mass of the construction  $j$ ;

– piston (cylinder) mass matrixes with associated mass of additional link

$$\mathbf{M}_l^{p(c)} = \text{diag} [m_{l,1}^{p(c)} \mid \dots \mid m_{l,j}^{p(c)} \mid \dots \mid m_{l,n}^{p(c)}];$$

– dissipative  $\mathbf{K}(t)$  and rigidity  $\mathbf{H}(t)$  matrixes are described in details in paper [1, 4],

– block matrix of disturbing efforts «distribution»

$$\mathbf{B}_F = \begin{bmatrix} \mathbf{B}_F^x & \vdots & \vdots & \vdots & \mathbf{0} & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \mathbf{0} \\ \vdots & \mathbf{B}_F^y & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \mathbf{B}_F^z & \vdots & \mathbf{0} & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \mathbf{0} \end{bmatrix}^T$$

–  $\mathbf{B}_F^x, \mathbf{B}_F^y, \mathbf{B}_F^z \in R_{n \times v}$  – disturbance «distribution» matrixes over the building;

– disturbing effort vector

$$\mathbf{F}(t) = [a_x(t)\mathbf{M}_x \mid a_y(t)\mathbf{M}_y \mid a_z(t)\mathbf{M}_z],$$

where  $\mathbf{a}(t) = a_x(t)\mathbf{i} + a_y(t)\mathbf{j} + a_z(t)\mathbf{k}$  – priming coat acceleration vector at seismic activity.

So, the mathematical model of a controlled space multidimensional modeling (see equation (1)). has been obtained. Its feature is a registration of inertia and dissipative characteristics of actuators of a passive-active vibration control.

#### 5. Actuator mathematical model.

At drawing up a deterministic vibration model for a loaded choke hydraulic control one relies on the following assumptions [3, 5]:

1. The choke hydraulic control is considered as a system with lumped parameters.
2. Hydraulic control power supply is performed at a constant pressure from an unrestricted consumption source.
3. Hydraulic accumulator capacity is matched on the basis of supplying the entire control process.
4. Hydraulic accumulator, spool-type distributor, electromechanic convertor are located near the hydraulic control. Therefore, due to short hydraulic lines wavelength processes do not make significant impact on the hydraulic control dynamics.
5. Hydraulic ram is located in the middle of additional link, with symmetry being assumed for study simplification.
6. The piston and the cylinder move right and left relative to mid-(zero)position.
7. During transient analysis the inertia, dissipative and position load is considered.
8. Metering -difference characteristic of the flow controller (control valve) is approximated by the parameter with zero values in the neighborhood of datum origin.
9. The flow control windows have equal specific consumptions.

10. Hence the vibration control system operation is momentary the hydraulic fluid temperature variation is neglected.

11. In the study of dynamic processes in the hydraulic control the adiabatic fluid elastic modulus  $F_{zh}$  is taken which is considered to be constant in the service pressure range, hydraulic fluid being clean.

12. Pressure being changed, hydraulic fluid specific density is neglected and variation rate is considered by the following relation

$$\frac{dP}{dt} = \frac{E_{zh}}{V} \frac{dV}{dt} \Delta ABC.$$

13. In the study of hydraulic control dynamics gas-air phase occurrence and dissolution in the operating fluid is considered.

14. Volume strain of pipes and building chamber curtains are noted by the reduced elastic modulus  $E_{pr}$ .

15. Hydraulic head losses in the connecting flues are negligible.

16. Acoustic effects in the connecting flues and time lag in the transmission lines are not considered.

17. Hydraulic flow inertia in the connecting lines and in the hydraulic control chambers are not considered due to pipelines being short and filled with hydraulic fluid.

18. In the hydraulic control the viscous and dry friction are considered. The dry friction characteristics are taken as linear. Fluid viscosity index is constant.

Mathematical model of a loaded electro-hydraulic actuator is described [2] by equations given in this table. The analog block diagram of the loaded electro-hydraulic actuators is shown in Fig. 3.

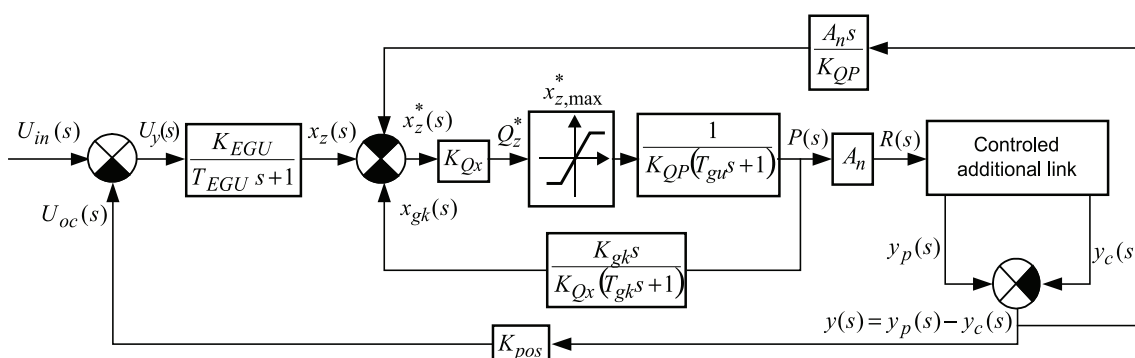


Fig. 3. Block diagram of a loaded electro-hydraulic actuator analog (Additional controlled link)

Mathematical model of a loaded electro-hydraulic actuator

Cauchy form	Standard image form
$U = U_{in} - U_{oc}$	$U(s) = U_{in}(s) - U_{oc}(s)$
$U_{oc} = K_{pos} (y^p - y^c)$	$U_{oc}(s) = K_{pos} [y^p(s) - y^c(s)]$
$T_{EGU} \dot{x}_z + x_z = K_{EGU} U$	$(T_{EGU}s + 1)x_z(s) = K_{EGU} U(s)$
$K_{Qx} x_z^* - K_{QP} P = A_n (\dot{y}^p - \dot{y}^c) + \frac{V_{pol}}{2E_{pr}} \dot{P}$	$K_{Qx} x_z^*(s) = K_{QP} [T_{gu}s + 1] P(s);$ $T_{gu} = \frac{V_{pol}}{2E_{pr} K_{QP}}$
$x_z^* = x_z - x_{gk} + \frac{A_n}{K_{Qx}} (\dot{y}^p - \dot{y}^c)$	$x_z^*(s) = x_z(s) - x_{gk}(s) + \frac{A_n s}{K_{Qx}} [y^p(s) - y^c(s)]$
$K_{Qx} (T_{gk} \dot{x}_{gk} + x_{gk}) = K_{gk} \dot{P}$	$K_{Qx} (T_{gk}s + 1) x_{gk}(s) = K_{gk} s P(s)$

Here is considered that the piston and cylinder dynamics is described in the multidimensional structure mathematical model, with marking-off introduced:

$U, U_{in}, U_{oc}$  – electro-hydraulic amplifier input voltage, input voltage, and feedback link voltage accordingly;

$K_{pos}$  position feed-back ratio;

$y^p, y^c$  piston and cylinder moving accordingly;

$T_{EGU}, K_{EGU}$  – electro-hydraulic amplifier time constant and coefficient of amplification;

$x_z, x_{gk}$  – sliding valve and hydro-condenser movement correspondently;

$P$  – differential head in the hollowness of hydraulic vibration absorber;

$R$  – hydraulic vibration absorber force;

$A_n, V_{pol}, E_{pr}$  hydraulic vibration absorber piston area, hydraulic vibration absorber hollowness fluid volume, reduced elastic modulus correspondently;

$K_{Qx}, K_{QP}$  – mutual conductance and metering-difference characteristic correspondently;

$T_{gk}, K_{gk}$  – hydraulic condenser time constant and coefficient of amplification.

Equation conversion given in the table provides obtaining dependence of the control voltage and output force of the hydraulic vibration

absorber with consideration of actuators location it can be written as

$$\mathbf{E}\ddot{\mathbf{R}}(t) + \mathbf{G}\dot{\mathbf{R}}(t) + \mathbf{L}\mathbf{R}(t) = \mathbf{N}\mathbf{U}(t),$$

where  $\mathbf{E}, \mathbf{G}, \mathbf{L}, \mathbf{N}$  are corresponding matrix coefficients. Further it is assumed that all actuators are similar.

**6. VCS Performance study.** Numerical study of control system is presented by the example of a high-rise structure – tower-type headgear. A mass reinforced concrete tower-type headgear erected in the sliding form 120 sm high and plan sizes 21×21 m was subjected to seismic impact with oscillation strength of 7 grades with direction cosines  $\cos x = 35^\circ$ ,  $\cos y = 55^\circ$ ,  $\cos z = 45^\circ$  relative to global coordinate system. Impact frequency resonates with the structure's main vibration tone. Control system sensors and additional links are set on the marks 12, 24, 36 m, providing its observability and controllability relative motion of the tower-type headgear on the mark 36 m by axes  $x$  exceeds allowance by 8 times, by axes  $y$  – 6 times, by axes  $z$  – by 1,5 times; on the mark 24 m by axes  $x$  – 7 times, by axes  $y$  – 6 times, by axes  $z$  – 1,3 times; on the mark 12 m by axes  $x$  – 6 times, by axes  $y$  – 5 times, by axes  $z$  – doesn't exceed.

**7. Conclusions.** Analysis of numerical modeling outcomes provides the following conclusions:



– using rigid links and links equipped with «hydraulic spring» alternates frequency characteristics of a building and allows to avoid resonance by reducing vibration amplitude but it does not protect the structure from failure;

– using passive links with hydraulic vibration absorber changes the frequency characteristic of the structure reducing vibration amplitude significantly, That being provided, the links maintain serviceable condition and the building does not collapse. As a result of reducing general link rigidity the required full vibration suppression of the multidimensional structure is not achieved;

– using active links reduces vibration amplitude of the structure down to allowance level and maintains the building's integrity vibration amplitude significantly.

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## NETWORK SWITCHING OF THE INVERTER IN FREQUENCY CONVERTER

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Switching processes in d.c. frequency inverter with properties of a direct frequency converter are considered. It is shown, that the application of the frequency converter described will allow to simplify the power scheme and the control system essentially.

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**Keywords:** frequency converter, inverter

Adjustable frequency converters are widely used in electric drives and electrotechnologies.

In [1-2] a frequency converter with a power scheme practically identical to a three-phase bridge scheme of a frequency inverter with independent voltage and current inverters is presented. Thyristor switching is natural (in the network) as in the proper frequency converter but there is bilateral communication between the loading and the network, i.e. the mode of recuperation of energy into the network is possible and the frequency range is approximately the same as in a «classical» frequency inverter.

Thus, the obvious advantage of the frequency inverter being suggested is the simplicity of its power scheme: two thyristor bridges instead of six bridges employed in a «classical» frequency inverter of a similar ripple.

However, some drawback are present: first, double energy transformation (as in all direct current frequency inverters), which is not so essential considering small losses in thyristors; and second, three single-phase saturated transformers are included into the rectifier power supply circuit.

Hence, the decision on the frequency inverter competitiveness in comparison with the usual ones is possible only taking into account the key parameters of the switching transformers already mentioned and intended for specified loadings. In the article the switching processes in frequency inverters employing direct current and network switching with reference to use as the loading for asynchronous short-circuited engines («4 A», 380 V) are described.

When analyzing switching processes in the scheme we accept the following assumptions:

1. Inductance of a choke in the rectified current circuit  $L_d \rightarrow \infty$ , so the current in the inter-switching intervals constant;

2. Switching transformers have cores with an «ideal» rectangular hysteresis loop.

Comparison of the calculation results of switching transformers relative capacity

and volt second integral allows us to conclude that the latter is a determining one, i.e. the switching transformers «capacity» in this case does not exceed 5% of capacity of the installation as a whole – at the rated loads and 10% – at possible double overloads.

In a «classical» frequency inverter without a transformer there are reactors limiting current (air or core-type). In the frequency inverter under consideration switching transformers can be used reactors limiting current and they are quite commensurable with reactors (as for as the mass and dimensions are concerned). At the same time the number of thyristors in the frequency inverter being described is three times as less. Hence, the design and the control system can be simplified (the number of control channels is less). The whole installation turns out much more compact than the traditional frequency inverter and its application for low-voltage asynchronous engines («4 A») is justified, especially for the drives working in a start-stop mode, in a mode of variable rotation frequencies accompanied by «delays» at transitions to smaller rotation frequencies, i.e. when a mode of recuperative delay takes an essential part of time in the running drive cycle (problems of the realization of a recuperation mode in frequency inverters with independent inverters are well-known).

Noteworthy, that at low frequencies modulation of switching delay angle  $\alpha$  can be carried not to get the quasisinusoidal current in the engine windings.

The application of a frequency inverter with the above mentioned type of inverter switching can appear rather effective, e.g. both in over-synchronous valve cascade where switching transformers are used only in the vicinity of a transition across the synchronous frequency of the engine rotation [1] and in synchronous frequency-adjustable electric drives for acceleration up to the rotation frequency when switching due to the e.m.f. of an engine is already possible. However, the recommendation given demands both circuit studies and further quantitative analysis but this problem is beyond the frameworks of the article.

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## OPTIMIZATION OF SEMIBRIDGE TRANSISTOR INVERTERS CONTROL SYSTEMS

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The article deals with a half-bridge inverter operation system which allows automatically coordinate the duration of enabling pulses at the control input of transistors with the necessary duration of their switching-on, thus reducing breaks in transistors.

**Keywords:** transistor, voltage sensor, logical gate, capacity

Transistor inverters, both single-cycle and duple, have found a wide application as components of various secondary power supplies [1, 2].

A special version of duple inverters is a semibridge inverter.

In the semibridge inverter the necessary duration of the stage «on» decreases with the growth of loading, i.e. the necessary duration of the stage «on» can be much less than the duration of unlocking impulses produced by control system output and it leads to unjustified losses in transistors.

To decrease these losses two logic double input elements «&» and two voltage gauges at semibridge transistor inverter capacitors are included into the semibridge transistor inverter control system, the voltage gauges outputs and the semibridge transistor inverter control system outputs being connected to the double input logic elements «&» inputs, the outputs of double input logic elements «&» being connected to the corresponding control transistor inputs of a semibridge transistor inverter. It has allowed to coordinate the duration of unlocking impulses at the control transistor inputs of a semibridge transistor inverter automatically with the desired duration of the stage «on» and, thus, to reduce the losses.

The control system (Fig. 1) functions as follows. When voltage  $U$  is applied, capacitors 4 and 5 are charged up to 0,5 V. Let's apply a voltage impulse from control system 2 to logic element «&» input 13. The other input of element 13 has also got a signal from voltage gauge 11, and a logic unit will be sent to transistor input 6 from logic double input element «&» 13 and transistor 6 will be «on».

If the loading current is small, capacitor 4 during an unlocking impulse will not have time to get discharged and transistor 6 will be unlocked during this time.

When the unlocking impulse from control system 2 disappears the impulse from the second output of control system 2 does not act. This pause is necessary for locking properties of a transistor to be restored, the duration of a pause being stipulated in a typical control

system 2. After a pause the unlocking impulse from control system 2 comes to the input of logic double input element «&» 14. There is a signal from voltage gauge 12 at the second input of element «&» 14 and an unlocking impulse comes to transistor input 7. Then the cycle repeats.

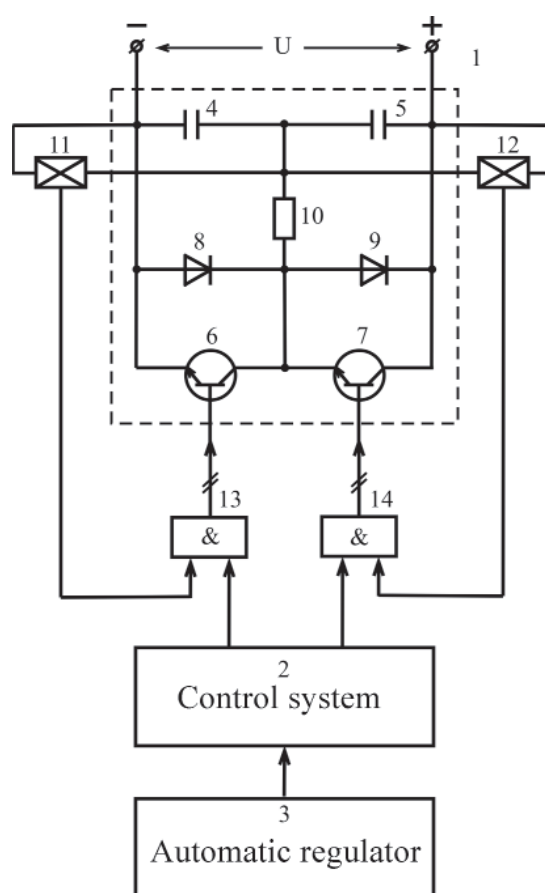


Fig. 1. The inverter control systems

Thus, at small loading current the duration of unlocked state of transistors 6, 7 is determined only by the «width» of an unlocking impulse from control system 2.

If the loading current exceeds some critical value  $I_{cr}$  (Fig. 2), capacitors 4 and 5 will have time to discharge completely during a half-

cycle of an inverter operation. In this mode the control system provides constant loading capacity ( $U_d I_d = \text{const}$ ). As soon as the voltage at capacitor 4, for instance, reaches zero, the «unit» at the logic element output 13 will disappear, transistor 6 will be locked and the electromagnetic energy accumulated in loading 10 will be discharged in the circuit: loading 10 – diode 9 – capacitors 5 – loading-10. Besides, the discharge current will flow through output capacity of a power supply.

The losses in transistor 6 are excluded in this interval and the electromagnetic energy accumulated in loading partially comes to capacitor 5 and pack to the power supply. It is obvious that the greater the loading current, the higher the efficiency of the scheme suggested.

For instance, if the inverter is used for supply via a stepping down transformer of an electric arc in a welding device, the control system functions either in an idle mode or at

current  $> I_{cr}$ . In this mode this control system sufficiently reduces unproductive losses in inverter transistors.

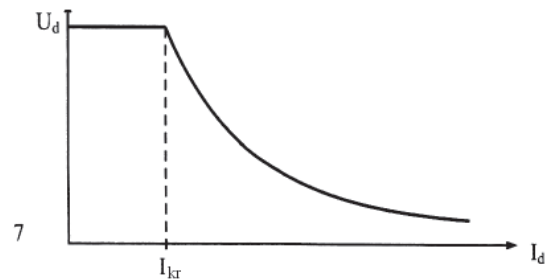


Fig. 2. The volt-ampere load characteristic

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*Materials of Conferences*

**TO THE CHALLENGE  
OF THE REGULATORY INSOLATIONAL  
REGIME OBSERVANCE  
AT THE BUILT – OVER AREAS**

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The regulatory insolation regime observance challenge at the built – over areas, lands, and territories has been considered in this paper. The isolation regulations have been reflected.....Also ..... have been shown.

In the modern world, the urbanization pace is continued to be gone forward at the steady gait. With the industrial production rising growth, the towns and the cities are growing, the existing buildings are compacted, in connection with which there is the regulatory insolation regime observance challenge of the residential, the apartment buildings and the surrounding areas, lands, and territories.

So, the insolation terms and the conditions are determined by the natural factors number: the Sun's passage height, depending on the country's geographical latitude, and the season of the year, as well as the atmospheric transparency. So, the planning and the building factors are exerted their strong and the considerable influence upon the following: the buildings techniques, the premises and the buildings orientation to the cardinal points throughout the world's countries, the light apertures dimensions, the walls thickness, the windows frames design, especially the architectural façade solution peculiarities and the special features (e.g. the balconies, the terraces, etc.). The insolation intensity of the solar radiation total flux, and its ultraviolet rays' intensity from the Sun's height over the horizon are taken into account in the insolation calculations. So, the maximum intensity of the solar radiation flux at the Sun's position is possessed just at its zenith; then, the radiation intensity is slowly decreased, as the Sun is approached to the horizon.

The regulatory conditions observance purpose of the natural light and the insolation is the necessary conditions provision for the normal life of the comfort in the various states light of the sky. So, the natural lighting facility conditions are determined by the natural illumination factor (NEF) for the diffuse light of the cloudy sky. The solar radiation influence conditions are determined by the insolation time duration in the cloudless sky. So, all these indices and the figures are quite independent from each other, that is, for one and the same premises performance standards are not the insolation duration means that the natural light rules, and vice versa.

So, at present, the legal need for the research carrying out on the insolation established regimes observance and the significance of the works to be ensured the population necessary insolation has been legislated by the Federal Law articles and the regulations «On the Sanitary and Epidemiological Population Welfare» № 52-FL dated from 30.03.99.

Thus, the main documents, having governed the criteria and the requirements to be insured people the necessary insolation regime, are the following:

- The building norms and the regulation RF BN&R 23-05-95(2003) «The Natural and Artificial Lighting» (hereinafter referred by the text RF BN&R 23-05-95(2003)) are the fundamental document, having set the standards of the natural, the artificial and the combined buildings and the structures lighting, and also, as well as the norms of the artificial lighting residential areas, the enterprises' playgrounds, and also the places of the business work outside the buildings.

- The sanitary rules and the norms «The Hygienic Requirements for the Insolation and the Sun Protection Premises of the Residential and the Public Buildings and the Areas. SanR&N 2.1/2.1.1.1076». The sanitary and the health regulations are established the hygienic requirements for the insolation and the sun protection of the residential and the public buildings and the housing areas. So, the hygienic evaluation of the insolation and the sun protection of the residential and the public buildings, and the areas of the residential buildings is carried out to be determined the observance with these current Sanitary Rules.

So, the Sanitary Rules observance is the compulsory one for the citizens, the individual entrepreneurs, and the legal entities, having engaged in the design, the construction, the reconstruction, and the maintenance of the facilities.

Their local territorial building norms (TBN) may be accepted on the Federation subjects'

territory. Such kinds of the documents are lost their legal force, and they can only be taken into account, and can be considered, as the recommendations on the Russian Federation other subjects territory. The example can be served «The Natural, the Artificial, and the Combined Lighting. MFCH 2.06-99» and «The Outdoor Lighting Standards in the Urban and the Rural Settlements. TBN 23-330-2002 XMAO».

At the present time, the architectural and the urban development solutions, having built-up areas, lands, and territories in the South of the Tyumen region, are accepted by the established federal standards of the insolation.

At the new and reconstruction design of the existing buildings for the various purposes for the nor-



mal human life, it is very significant to be observed the insolation hygienic standards and the premises' natural lighting, as having set forth in the regulations.

The lighting and the insolation regulatory parameters provision is the measure of the consumer quality housing. At the same time, the quite new buildings and the facilities construction should not impair the lighting performance of the already existing building. So, the gaps magnitude between the buildings is, mainly, determined, on the basis of the conditions for the insolation and the lighting regulatory values provision. Thus, it is obligatory to be followed the SanR&N, the BR&R, the TBN, having defined the insolation and the natural lighting required level.

So, the main requirements to the premises insolation in the various climatic regions are not quite the same, they are constantly varied. In the Southern regions, where over the long hot period there is the solar radiation excess, the premises' insolation in the Summer months is the negative factor. In these areas, the insolation is quite favorable, mainly, in the relatively cold period of year. In the middle zone of the Russian Federation, the insolation apartment houses, nurseries, children and the medical Institutions, and the hospitals is considered the mandatory one from March up to September, the rest period – it is considered the quite desirable one. In the Northern regions, where the acute shortage of the solar radiation is felt much, it is necessary, to fully possible, to be used the favorable premises areas insolation effect.

The residential and the public buildings placement and their orientation (except for the kindergartens, the secondary schools, the boarding – schools) must be provided the continuous duration of the insolation, and the residential areas and the territories for the following zones:

- further North 58° N.L. – at least, 3 hours per day for the period from 22 April to 22 August;
- further South 58° N.L.–at least, 2 hours per day for the period from 22 March to 22 September.

In the building houses terms in the 9 floors and more, it is allowed one – off intermittence of the insolation permitted premises, having provided, under condition the total increase in the duration of the insolation during the day at 0,5 hour, respectively, for each zone.

The kindergartens, the nursery and daycare facilities, the secondary schools, the boarding – schools, the health – care facilities and the agencies, and the recreation buildings placement and the orientation must to be provided the continuous 3 – hour duration insolation in the premises, having provided by the Sanitary regulations and the rules to be ensured insolation of the residential and the public buildings and the areas of the residential buildings, having approved in the prescribed manner.

The insolation normalized duration, it should be provided not less, than in one living room, 1-, 2-, 3-room apartments, and not less, than in two living rooms of 4- and 5-room apartments; dormitories in the bedrooms (e.g. not less, than in 60 %).

According to the experts' and the specialists' opinion, having given the significance of the light comfort conditions ensuring, through the natural light and the insolation rules implementation in the new buildings and the in the existing building, and the fact, that all these factors are the crucial ones in the gaps determining between the buildings, in the framework of the projects the appropriated section is deserved to be distinguished, which could be included and be named the lighting passport of the construction site. So, in this section, the TBN developers' project are advised to bring the contingency plan, the planned and the existing buildings plans, and the sections, their lighting characteristics and the studies results of the lighting and the insolation regimes of the specific premises.

Thus, in order to be ensured the buildings regulatory insolation, it is necessary the following:

1. The residential and the public buildings' placement and the orientation must be provided the continuous and the non-stop insolation, having prescribed by the sanitary standards.
2. The distance between the residential buildings on the light conditions may be taken, in accordance with the opposing building number of its storeys, but not less, than 2,5 heights.
3. At the buildings insolation calculation, the separate towering building's parts shall not to be considered. So, the smallest distances between the residential buildings on the light conditions (e.g. at the high reflection coefficients) have been shown in the Table.

The Smallest Distances between the Buildings on the Light Conditions

The Indicator (distance)	The distance (m) between buildings (the number of storeys)					
	5	9	12	16	22	23
Between the buildings' long sides of 150 m length	27	48	64	74	90	95
Between the buildings' tower block type (the length < 150 m)		42	52	60	70	72
Between the buildings' long sides and the buildings' ends with windows	15	28	32	35	38	40
Between the buildings' ends without residential rooms' windows	According to the fire-prevention distances standards					

In the case of the third building's location, the distance between two parallel buildings facing should be increased by the 20 %, perpendicular to the latter ends. When buildings have their complex configurations, the distances between them are determined by the calculation, having taken into account the natural light rules.

The insolation measurement and the calculation are now, perhaps, the most severe lighting, the economic, and social and legal challenge. With the land use and the building transfer on the market basis, the housing insolation rates have been become the main factor, having constrained the investors', the owners', the land plots lessees' tendency to the urban areas development compaction, in order to get their maximum profits.

It is very significant the calculation method for the competent natural light and the buildings' insolation organization, it is quite able correctly to be identified the gaps between the buildings on the natural light conditions, which is especially important, in connection with the mass buildings, having carried out in the towns and the cities of the Tyumen region. Thus, it can be concluded, that the insolation calculation has been presented in one of the sections in the planning area, the land, and the territory projects, and it, moreover, has been contained the necessary recommendations on the building height limitation.

The insolation period accounting in the building area has the positive impact on the

health and the working efficiency population, which is greatly reduced the sick leaves and the adults and the children medical treatment cost.

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*Materials of Conferences***GENERAL PHYSIOLOGY  
OF ONTOGENESIS**

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Today there is no generally accepted conception about physiology (mechanic) of ontogenesis. I propose the following scheme of it. Any organism consists of proteins and their complexes with another substances, including nucleic acids. Such complexes are formed as (ultra)structures, which unite into cells, tissues, organs. Proteins are constituents of individual biosystems because exactly proteins organize all processes of life on the molecular level. Primary structure of all proteins of the individual is programmed in its genome and thus all ontogenesis is determined. Another proteins and their complexes cannot be in normal organism. But own proteins and their complexes can allocate in organism and its parts in different ways. In ontogenesis these proofs change, including by uneven production of different proteins and uneven proliferation of different cells, and allometric

growth of different tissues and organs too. In result of uneven accumulation of definite proteins and their complexes, including cells, in the definite part of the body and another proteins and their complexes in the another parts morphologic differentiation, functional specialization and autonomization of the parts (organs) pass. Constant (re)integration of them leads organism on new level of vital activity. Differently say, the main mechanic of development of organism in its ontogenesis (particularly pronounced in embryogenesis) is intermittent, polyfocal growth of organism on its extent: «multiplied» centres of intensive growth (usually – proliferative epithelial anlagen) alternate with intermediate parts (it is possible with mesenchyma), which grow slowly and narrow between isolated, increasing anlagen of organs, including the epitheliomesenchymal anlagen.

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*Short Reports***LOCAL TAXES AND FEES: STRUCTURE, GENERAL CHARACTERISTICS AND NEEDS**

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The article deals with the role and nature of local taxation, as well as the prospects for increasing the share of local taxes in the formation of the budget revenues of municipalities.

The Russian tax system includes federal, regional and local taxes. While federal taxes are payable in all Russian regions, regional and local taxes are applicable to companies registered or doing business in the relevant regions and municipalities.

The Russian tax system has undergone significant revision since 1999 when the Tax Code Part I was enacted. This law combines provisions relating to general tax principles, rights and obligations of taxpayers and tax authorities, and tax administration. Later, in 2001, the regulations on all taxes were revised and incorporated in the Tax Code Part II.

Because of this reform the tax administration became more transparent and predictable, and the number of taxes and the overall tax burden were reduced greatly. The current income tax rates are particularly low, even in the international context, being 20 percent for companies and 13 percent for Russian tax resident individuals.

Still, many aspects of the Russian tax system are the subject to significant uncertainty. Further, the substantive provisions of Russian tax law and the interpretation and application of those provisions by the Russian tax authorities may be the subject to more rapid and unpredictable change (possibly with retroactive effect) and inconsistency than in jurisdictions with more developed tax systems. In particular, the interpretation and application of such provisions will in practice rest substantially with local tax inspectorates.

Interpretation by different tax inspectorates may be inconsistent or contradictory and may result in the imposition of conditions, requirements or restrictions not stated in the law.

Similarly, court rulings on tax or related matters by different courts relating to the same or similar circumstances may be inconsistent or contradictory.

The key principles of the Russian tax system, including types of taxes, the rights and obligations of the tax authorities and taxpayers and procedural aspects of tax administration, are set out in Part I of the Tax Code of the Russian Federation. Some of the most significant provisions of Part I include the following [1]:

– All contradictions, ambiguities and questionable issues in the tax legislation which cannot be resolved should be interpreted in favor of a taxpayer;

– Tax legislation which increases tax rates or introduces new taxes or sanctions cannot be applied retroactively;

– There is a presumption of innocence on the part of a taxpayer, placing the burden of proof on the tax authorities;

– The tax authorities are required to maintain the confidentiality of information regarding taxpayers;

– Tax legislation which mitigates a tax liability and (or) reduces a tax burden may come into legal effect through a simplified tax regime (where such a regime is specifically provided by law).

The stabilization of the economic development of municipalities depends on the efficacy of the fiscal policy in terms of ensuring their financial resources. An important role in this process is given to the current system of local taxation, the basis of formation of the revenue of the municipal budgets. Local taxes are established by representative bodies of local self-government within their jurisdiction. This kind of tax is fully credited to the budgets of municipalities and are designed to address the issues of life and financial security of the territorial communities and municipalities.

All regional and local taxes in Russia are asset-related: property tax, vehicle tax, land tax and tax on gambling businesses. Exact rates are set by regional (property, vehicles, gambling) or municipal (land) legislators within the Code's framework. Corporate property tax, or tax on fixed assets, is assessed on year-averaged book value of fixed assets excluding land (which is subject to land tax. The maximum rate is 2.2 percent; regional authorities can vary rates depending on types of taxpayers and assets. This provides a method to establish disguised individual preferences, which are outlawed by the Code. Vehicle tax is levied annually on owners of motor vehicles and trailers, ships, and aircraft. Tax on gambling businesses is paid by registered gambling outlets at a flat rate per each table, slot machine or bookmaker's cash desk. The Code provides both minimum and maximum rate limits (1:5 ratio), thus prohibits establishment of tax-free gambling [2].

Land tax is the only local tax in Russia: its rates are set by municipal authorities (excluding the federal cities of Moscow and Saint Petersburg, where the rates are set by city legislators). The maximum rate is 0.3 percent on lands zoned for agriculture, housing and summer cottages, and 1.5 percent on other lands. Land values are periodically assessed by land registrars and kept substantially below mar-

ket prices. Unlike corporate property tax, land tax is paid by individual taxpayers.

Land tax is applied to legal entities and individuals who own land or have a permanent right to its use. Legal entities and individuals who apply special tax regimes, use land free of charge, or under lease agreements, are not subject to land tax.

The tax base is the cadastral value of the land determined on 1 January of the year reported. The cadastral value for a specific plot is determined in accordance with the Russian Land Code. In the case of joint ownership, the tax base is determined for each taxpayer's share of the land. The tax base of land formed during a tax period is the cadastral value on the date of its cadastral registration.[3]

As to the increase of incomes of local budgets the program-target method should be used. Thus, in Shakhty, Rostov region, the municipal long-term targeted program «Improving the effectiveness of the mobilization of tax and other obligatory payments and reduce tax arrears to the budget of Shakhty for 2011-2014» has been developed and operated. It sets out the main directions of improving the tax collection system in the local budget, such as:

- Carrying out analytical work to identify the causes of the decrease of the number of tax payers of single tax on imputed income for individual activities compared with the previous period of time;
- The further constant work on the identification of land and timely transmission of information

in inter-district tax inspectorate with the requirements of the Federal Law «On Personal Data»;

– Continuation of work on the surveying of land for multifamily housing, and timely transmission of information to the Regional tax inspectorate for inclusion in the tax base;

– Monthly analyzes of tax arrears that are pumped into the local budget, in the context of the taxpayers [4].

This program increases the degree of analytical and information support of local governments influencing the growth of profitable part of their budgets. But despite all the efforts to replenish the local budget, the own revenue sources account approximately one third, two thirds of income being the subsidies for regional and federal budgets. The same situation is noted in Shakhty.

Thus, the possibility of solving the problem of providing municipal budgets with the sufficient funding at the expense of the tax sources is available. In our opinion, their rational development and utilization taking into account the economic interests of taxpayers and recipients of tax will create necessary conditions for the formation and development of local self-government.

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