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PLAY ESTIMATION OF USABILITY

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The method of scenario analysis of user interfaces has been proposed. It measures different indexes of interface ergonomics. The method mathematical model, experimental procedure and results statistical analysis have been given.

As a rule, to estimate usability the basic characteristic of interface effectiveness is the time which the task solution takes. Illustrative as this approach is, it is quite empty. Indeed, let respondents solve the same task in two competitive interfaces and in a time t_1 and t_2 , at that $t_1 < t_2$. Certainly, first interface is more effective. But why is it? Is the reason related to hardware component or interaction logic? Or is it influence of interface commands? The task solution time does not answer these questions. Our approach is based on other indexes, and we can solve more than one conceptual task.

Firstly, we refuse to measure time and use more subtle interaction models. So we can estimate the *idea, conception, logic of the system instead of the finished (realized in fact) system*. It gives colossal advantage in designing, as system testing is done in the beginning stages of its development that decrease spending substantially and what is more, measuring results suggest new successful solution for the next stages.

Secondly, our measurements do not concern the concrete project. Measuring an interface scheme we can use it in different parallel projects *without repeated testing*.

At last, our method is very simple.

Scenarios diagrams

The set of interface states is described in the form of graph which nodes are system states and ribs are possible action of user in one or other state. The graph of states is reduced by excluding all ways after wrong way within the limits of present task of choice. As a result, we have so-called states diagram (see pic. 1.a) which still contains both right and wrong scenarios of task solu-

tion. We mark incorrect user's choices with grey color so we select trajectories of right scenarios and obtain the scenarios diagram (see pic. 1.b).

Each respondent action is encoded by one letter, in that way the trajectory of user's movement in the interface is described by sequence of letters, by "word". We encode the choices on every state by Latin letters, beginning with A and moving clockwise alphabetically. In that way, for describing any trajectory it is enough to mark first point A on the arch of start choices (see pic. 1.b).

On the diagram (pic. 1.b) successful scenarios are AAAA, BCB, DCB, FAC. Unsuccessful scenarios are BA, C, DCC, etc. There are 19 unsuccessful scenarios in all as many as there are finish grey points on the diagram. There are 4 successful scenarios as many as there are finish black points.

For experiment realization the screens of system are imitated by paper printouts made basing on scenarios diagram; each sheet corresponds to system state and its content corresponds to possible actions in this state. This is the material for the game which experiment moderator plays with respondents.

The game

Two persons take part in the experiment, respondent and moderator. Moderator knows the scenarios diagram. He knows what actions in each state are right and what actions are wrong; the respondent does not know this. The task solution by *all possible ways from most naturals to quite exotic* in as few actions as possible is required of respondent.

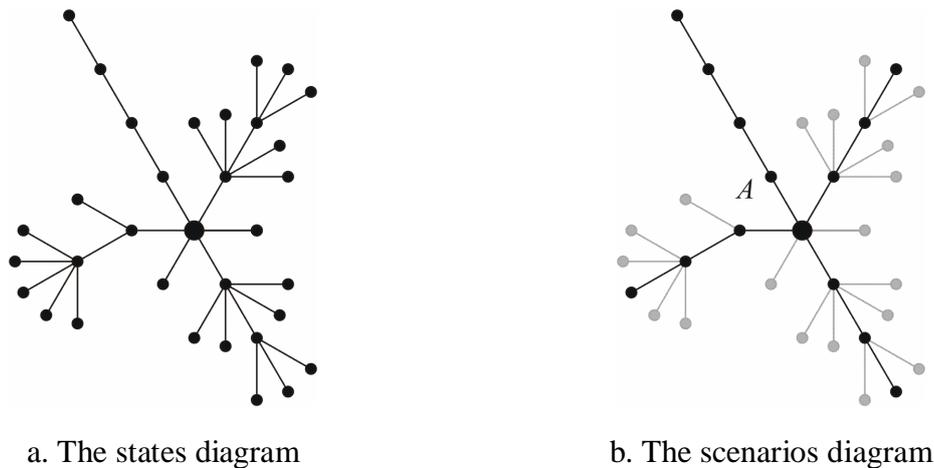


Figure 1. Interface diagrams

Each action of the respondent can be right or wrong. If the respondent does wrong action, the moderator let him know of it and the respondent does next attempt. If he does right action, the moderator also let know of it, but the respondent understands that this is not only right action, because he knows that any problem as a rule has several right solutions. When the goal is reached, respondent returns to initial state to try finding new solution.

After all there comes a point when the respondent thinks that it is enough solutions and there are not others solutions. Then the game is finished.

Experimental protocol

scenario 1 – AAAA,
 scenario 2 – BaCB,
 scenario 3 – DbCB,
 scenario 4 – eBeDCB (repeats scenario 2),
 unsuccessful attempts – eFa.

We can see that the respondent regards as most natural scenario in the line of A. In other directions B and D respondent makes mistakes. Scenario in the line B is repeated twice, and scenario in the line F is not detected at all.

Besides playing the moderator keep a record. The protocol contains notes about all respondent's choices, their correctness and order of execution. Just these series of actions are object of analysis, they describe user interaction manner.

Each action of user is encoded by one letter according to scenarios diagram. Letter series forms sequence of actions which make successful scenario. During the game the respondent makes mistakes, i.e. does wrong actions. Unlike right actions, they encoded by lowercase letters.

For example, basing on the diagram on picture 1.b we can get following experimental protocol:

Numeric characteristics of the interface

Using playing experimental procedure we can get several interface characteristics at once basing on experimental protocols. There are two numeric characteristics among them: *length of way S* and *degree of falsity P*.

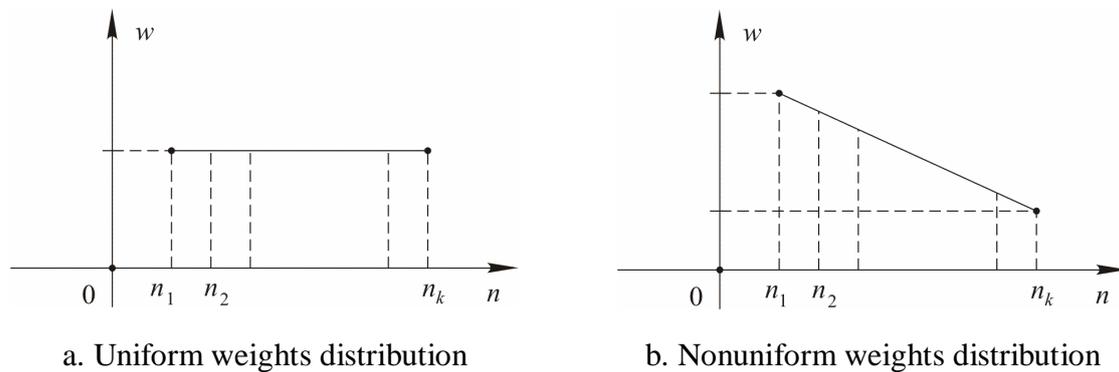


Figure 2. Scenarios weights

Let us begin with length of way. It may be simply defined as arithmetical mean of lengths of all theoretically possible scenarios that lead to the task solution. However, user can know only several of all possible successful scenarios and can use only one or two. First of all consideration must be given to lengths of these actively using scenarios. Let n_1 actions incorrect included was spent to realization of first scenario; n_2 was spent to realization of second scenario etc. We ascribe certain weight w_i to each length n_i , considering it as probability of using one or other scenario in real situation. These probabilities have no uniform distribution:

$$S = \sum_{i=1}^k w_i n_i, \text{ where } w_i = (k - i + 1) \frac{2}{k(k + 1)}.$$

Here n_i — number of actions which respondent spends to realization of i -th scenario (including both productive and mistaken), w_i — weight of corresponding scenario calculated according to its number.

$$P = \frac{\sum m_i}{\sum (n_i + m_i)},$$

where n_i — number of productive actions of i -th scenario, m_i — number of mistakes made by respondent during realization i -th scenario; k — summation limit, number of successful scenarios found by respondent.

larger probabilities answer early scenarios and smaller probabilities answer later scenarios (see pic. 2.b). We ascribe the largest weight to the first scenario and the smallest weight to the last scenario, supposing that next last scenario has zero weight and interpolation of all weights is linear. (In fact this dependence is hardly linear. Most likely it is exponential or logarithmic. However, even linear interpolation is closer to reality than uniform distribution.)

It is easy to obtain formula for the weight of next scenario and to apply weight coefficients for calculating average of way length:

Degree of falsity shows how often user makes mistakes. This value is determined as ratio of wrong actions number to all actions number:

In considering example the respondent has found three successful scenarios: from the beginning in the line A, then in the line B, at last in the line D. Their weights are:

$$w_1 = \frac{2}{1+3} = \frac{1}{2}, w_2 = (3-1) \frac{2}{3(3+1)} = \frac{1}{3}, w_3 = \frac{2}{3(3+1)} = \frac{1}{6}.$$

The respondent spent 2 actions to the first scenario¹. Second and third scenarios required 4 actions including one incorrect. Thus,

$$S = \frac{1}{2} \cdot 2 + \frac{1}{3} \cdot 4 + \frac{1}{6} \cdot 4 = 3,$$

i.e. the respondent spent on average 3 actions to this scenario². Second numeric characteristic of the interface, degree of falsity is calculated as ratio of wrong actions number to all actions number:

$$P = \frac{7}{19} = 0,37.$$

Statistical analysis

Thus, playing experiment gives researcher two-dimensional massive of numeric data S_i , P_i , for which a whole spectrum of known statistical methods is applicable: estimation distribution parameters, comparing means of two samples with Rosenbaum Q-test or Mann-Whitney U-test [2].

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2. Sidorenko, E.V. Mathematical methods of psychology / St-Petersburg, 2004 — 350 p.

¹ We consider as one action a cycle of actions that does not require a choice.

² If we use an arithmetic mean, we would get larger value $S=3,33$.

*Materials of Conference***SYNTHESIS OF NATURAL-SCIENTIFIC AND HUMANITARIAN APPROACHES IN CREATIVE PROBLEMS OF DESIGNING**

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Nowadays the topicality of carrying out the investigations, which would allow creating basic foundations of the universal design object form geometric theory, is evident. Such a theory should be based on mathematical instruments of space division investigation. Up to now the major attention is paid to artistic characteristics of the designed object (color, texture), material properties, technological effectiveness of constructions and the process of manufacturing; the form and its divisions depending traditionally on the designer's taste. A well thought-out form supposes a clearly organized arrangement of the parts, and that is expressed in its harmonic proportional structure. The development of such a problem solving approach, which would allow finding out the principles and laws managing the processes of form making in the outer world, is necessary. The unity of all outdoor and its various manifestations should condition the drawing together of the natural-scientific and humanitarian approaches while solving creative problems. The synthesis of these methods determines the

content of the developed heuristic model of the form's proportional structure design and analysis. The innovative technologies of the computer algorithmic form making, by the virtue of their cheapness and universality combined with the historically accumulated experience of the form elements proportioning, give a new impetus to the design art development and, as a necessary condition, the integration of design solutions into engineering developments. The purpose: is not only to simplify the process of sketch design having shuffled off the routine on the computing device, but also to preserve the proportioning experience accumulated for centuries, to find the ways for its introduction into a new engineering activity. It will allow avoiding the formalism of combinatorial connection of the elements with each other excluding creativity, on the one hand; and giving an opportunity to acquire a new quality of integrity and harmony, on the other hand. The implementation problem of the new design methods based on digital technologies is of current interest in the most diverse applied spheres: professional equipment, interior and costume objects' design, automobile production, architectural engineering, etc.

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ANTIOXIDANT COMPLEX SELMEVIT IN HEMOSTASIS CORRECTION AT SOME UTERINE SURGERIES (report III)

Byshevsky A.Sh., Galyan S.L., Galushko M.G., Zabara Ye.S., Zvereva I.V.,
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Overseeing 486 productive age women subjected to uterine cavity abrasion for the diagnostic purpose or for the purpose of legal abortion, hysterectomy by laparoscopic or laparotomic methods, cesarean section it is proved that a surgical intervention intensifies the registered in them lipid peroxidation acceleration, general blood clotting and the acceleration of thrombin-fibrinogen interaction in blood flow. The inclusion of the complex antioxidant selmevit into a usual therapy course (in pre- and post-surgical periods) restricts these shifts and accelerates their disappearance, somehow restricts intraoperative blood losses, that mitigates the risk of thromboembolic episodes.

Thromboses and embolias – are very dangerous complications of operative interventions on the uterine, the tissues of which – are the sources of fibrillation factors (FF). The uterine surgeries result in the outlet of the tissue factor, the connections like plas-matic FF V, VII, X, XIII and proaggregants [1, 2] into the blood flow. The most serious and frequent intraoperative complications – floods, thromboembolias – are connected with hemocoagulation changes [3]. Like other operative interventions, the uterine surgeries are attended by the lipid peroxidation (LPO) acceleration. The use of antioxidants limits the hemocoagulation shifts [4] like in other surgical interferences [5, 6]. The information about positive effects of antioxidants in the thromboembolias prophylaxis, their relations at obstetric-gynecologic pathology with hemocoagulation shifts, the absence of contraindications to vitamins-antioxidants application, the possibility of outpatient use substantiate their corrective effect [7 – 10].

The **purpose** of the work is the estimation of hemocoagulation changes, morphofunctional properties of thrombocytes (TC), LPO and antioxidant potential (AOP) in women after uterine surgeries, the advisability of selmevit antioxidant complex use for the hemostatic shifts prophylaxis.

Objects and methods of research

The women were examined at gynecological and maternal obstetric services of the

Tyumen Regional Center of Maternity and Child Welfare Service and maternity hospital N3. The clinical and laboratory examination was carried out the day before and in 1, 3-4, 5-7 days after the operation (complaints and anamnesis study, general visual inspection, special obstetric and gynecological examination, bacterioscopy of cervical channel fluid, sheath and urethra, USI of true pelvis organs). The surgery duration, arterial tension, pulse, breathing rate, somatic temperature, anaesthesia form, intraoperative blood loss were taken into account. In the postsurgical period the thrombo-hemorrhagic complications frequency, hospitalization time, bed days were estimated. The thrombocytic hemostasis was estimated defining the thrombocytes (TC) number [11], their morphologic forms, the number and size of aggregates per 100 free cells, the quantity of aggregate-forming TC per 500 free cells; small (2-3 TC) and big aggregates (4 and more TC) per 100 free cells [12]. The hemocoagulation was estimated defining the ATR, APTT [13], prothrombin ratio (PR) [14]; for the thromboplastin international sensitivity index (ISI) account the PR was raised to the ISI power pointed at the marking and the international normalized ratio (INR) was calculated; the fibrinogen (FG) concentration was defined gravimetrically; the solvable fibrin-monomeric complexes (SFMC) [14], fibrin split products (FSP), antithrombin III activity (AT-III) [15], plasminogen reserve index

(PRI) (the reagents of the “Technology-Standard” firm, Barnaul) and f P₃ [16]. The LPO was estimated on the level of diene conjugates (DC) and malondialdehyde (MDA) [17]. The AOP was judged on the level of vitamin E in erythrocytes [18]. The mathematical treatment was performed by the variance analysis method for small series of observations calculating the arithmetic mean (M), its mean error (m), the mean-square deviation (σ), confidence coefficient of Student (t) and the degree of possibility (p).

The most abundant uterine surgeries (Table 1) were subject to observation. For this purpose two uniform groups were formed: the *comparison group* (usual preoperative preparation and postoperative treatment) and the *main group* (women received selmevit in addition to the usual therapy). The age, social status, clinical-anamnestic characteristics, occurrence of somatic and gynecological diseases, surgical indications and their scope were the same in both groups.

Table 1. Distribution of examined women in groups

No group	Characteristics	n
1	Control – childbearing age women (II phase of menstrual cycle)	20
2	Women subjected to uterine cavity abrasion:	140
	- for purpose of legal abortion carrying out	90
	- for diagnostic purpose	50
3	Women subjected to conservative myomectomy:	79
	- didn't receive selmevit	49
	- received selmevit	30
4	Women after major uterine surgeries:	155
	- hysterectomy by laparotomy method	136
	- didn't receive selmevit	76
	- received selmevit	60
	- hysterectomy by laparoscopy method	19
	- didn't receive selmevit	10
	- received selmevit	9
5	Women subjected to cesarean section:	92
	- didn't receive selmevit	47
	- received selmevit	45
	Total:	486

Research results

At hysterectomy the operation time in the main group reduced by 3,0% (p >0,05), the intraoperational blood loss reduced by 15,2% (p >0,05), there were no complications registered. In the comparison group women undergone the *laparotomic hysterectomy* the surgery duration was reduced by 8,9% (p >0,05), the blood loss – by 15,7% (p < 0,05). The interconnection of hypercoagulation shifts and thrombembolias [20] allows speaking on the positive role of selmevit. In

the main group women subjected to the conservative myomectomy the tendency to the surgery duration decrease (by 9,2%), the intraoperational blood loss decrease by 7,9%, the absence of thrombohemorrhagic complications (in the comparison group – 4,1%). In the main group women delivered with the help of *caesarian section* the intraoperational blood losses were lower by 13,8%, the operation time – by 21,9%, there were no post-operational thrombohemorrhagic complica-

tions registered (in the comparison group – 2,1%, i.e. I case).

Because of the limited article volume we document only a small part of the examined states – the conservative myomectomy. From the data of the Table 2 one can see that before the operation the APTT and TT are prolonged, the PR and INR are increased, the AT-III and PRI are reduced in the *comparison group*. In the *main group* the ATR was prolonged, the PR and INR factors became lower than in the comparison group, the AT-III and activity and PRI increased. In the comparison group women subjected to the conservative myomectomy the ATR was prolonged, the FG, SFMS and FSP levels were increased, the AT-III and PRI were decreased in 24 hours after the operation. The FG level decrease remained for 3-4 days, the ATR, AT-III, SFMC, FSP, PRI – for 7 days, the APTT, TT, PR, INR didn't differ from the initial ones, but didn't reach the control values. In the main group the TT, SFMC and FSP level increased, the AT-III and PRI level fell on the first day after the operation. On the 3-4th day the PRI and AT-III differences retained (compared to the pre-surgical values).

In the pre-surgical period in the comparison group there were differences from

the control: the TC, S, SE, SAN, BAN, AN and f P₃ were increased, the DE number was decreased. The differences from the control were also registered in the main group women: the S, SAN and AN quantity were increased. Together with that the number of thrombocytes, SE, BAN and AN were authentically less (relative to the comparison group).

In the comparison group women in 24 hours after the operation the number of DE, SE, AFN, SAN, AN, f P₃ was increased and the number of D was decreased. The D, SE, NAF, SAN, AN and P₃ factors' differences from the pre-surgical ones retained for 3-4 days. Up to 7 days after the operation the S, SE, NAF, SAN, BAN and AN factors were decreasing and the D number was increasing. However, on the 5-7th day after the operation the SE, SAN, BAN and AN factors remained higher than those of the control.

In the main group patients the thrombocytic hemostasis changes after the operation were less manifested: on the first day the number of D, BAN, f P₃ were decreased, beginning with the 3-4th day the factors didn't differ from the pre-surgical ones, on the 5-7th day only SAN and AN are higher than in the control.

Table 2. Hemocoagulation, thrombocytic hemostasis and LPO before and after the laparoscopic conservative myomectomy in the comparison (1 line) and main (2 line) groups.

Factors	Control group, n = 20	Before operation	1 day	3-4 day	5-7 day
		without selmevit, n = 20, with selmevit n = 15	without selmevit, n = 20 with selmevit, n = 12	without selmevit, n = 20, with selmevit n = 12	without selmevit, n = 20, with selmevit, n = 12
ATR, sec	59,0±2,6	60,4±2,5 66,5±2,3*	70,1±5,7' 69±1,6	75,4±4,6' 60,6±2,6	75±3,1' 62,4±3,6
APTT, sec	40,6±1,3	46,2±1,5* 45,1±4,1	46,6±1,3 40,3±3,1	45,8±1,5 39,9±1,2	44,7±1,5 41,5±1,3
TT, sec	18,5±0,6	24,3±1,6* 19,2±1,6	24,5±1,5 23,7±0,9'	24,0±1,5 22,4±1,2	22±1,3 19,2±0,4
PR	1,4±0,1	2,1±0,3* 1,6±0,2''	1,7±0,2 1,9±0,2	2,6±0,3 1,6±0,1	2,2±0,3 1,5±0,1
INR	1,6±0,2	2,4±0,4* 1,9±0,2''	1,9±0,2 2,3±0,3	3,0±0,5 1,9±0,2	2,5±0,4 1,6±0,1#
FG, g/l	2,5±0,2	2,8±0,2 3,0±0,2	3,6±0,3' 2,8±0,3	3,4±0,2' 3,3±0,4	3,1±0,2 3,1±0,2

SFMC, mg/100 ml	3,5±0,1	3,8±0,4 3,6±0,2	6,7±0,6' 4,7±0,4'	5,2±0,5' 4,1±0,4	4,9±0,3' 3,8±0,3
FSP, mg %	0,547±0,02	0,562±0,03 0,554±0,02	0,640±0,02' 0,622±0,02'	0,632±0,02' 0,568±0,02	0,624±0,02' 0,562±0,02
AT III, %	95,1±2,7	80,4±3,2* 95,5±3,7"	66,8±4,6' 80,6±1,9'	70,6±3,8' 83,3±3,8'	71,2±3,1' 88,0±3,7
PRI, %	109,4±3,7	86,2±3,0* 99,1±2,1*"	68,6±3,0' 67,4±3,5'	73,1±2,8' 77,8±2,6'	77±3,2' 93,7±4,1
TC (x10 ⁹)	248,5±5,4	376,4±22,6* 317,6±16,0 '	392,8±23,3 290,7±11,3	368,5±24,1 288,5±15,1	325,8±17,1 301,4±16,2
D, %	46,5±0,9	43,5±1,4 45,1±0,8	36,9±1,0" 48±0,8"	35,7±1,3" 47,2±0,7	43,1±1,7# 40,7±0,9#
DE, %	24,9±0,6	22,6±0,9* 23,7±0,6	28,7±1,2" 23,3±0,5	26,5±0,9" 24,5±0,5	26,9±1,4" 25,3±0,7#
S, %	18,0±0,5	23,4±0,9* 22,1±0,8*	21,3±0,8 21,7±0,5	24,3±1,3 20,4±0,6	17,9±0,9" # 18,5±0,6 #
SE, %	9,4±0,3	10,9±0,4* 9,0±0,3 '	13,6±0,6" 9,2±0,5	13,4±0,5" 9,4±0,4	11,5±0,4# 9,3±0,2
NAF (per 500 cells)	53,5±0,9	56,5±1,1 56,4±1,8	63,8±1,3" 53,3±1,6	63,1±1,1" 52,3±1,9	56,9±1,7# 53,3±1,7
SAN (per 100 cells)	7,7±0,7	12,3±1,9* 10,8±0,7*	22±2,0" 11,3±0,9	20,9±1,8" 11,6±1,1	14,8±1,8# 10,4±0,7
BAN (per 100 cells)	1,0±0,1	4,3±0,4* 1,1±0,3 '	4,7±0,6 2,0±0,3"	4,4±0,6 1,8±0,4	2,5±0,3# 1,4±0,3
AN (per 100 cells)	8,7±0,8	16,6±1,3* 11,9±1,0* '	26,7±2,6" 13,3±1,3	25,3±2,5" 13,4±1,5	17,3±2,1# 11,8±1,1
P ₃ , %	31,5±2,8	41,2±3,5* 36,6±3,7	60,3±4,1" 51,8±3,6"	53,4±3,9" 41,8±3,3	48,3±3,4# 39,7±4,2#
DC, nmol/ml	110,3±3,4	122,7±3,6* 121,2±3,5*	132,9±3,1" 132,6±3,4"	131,7±3,8" 126,5±3,6	129,8±4,1" 118,4±3,8
MDA, mol/ml	10,4±0,5	11,7±0,3* 10,9±0,4	14,1±0,4" 12,3±0,5"	13,6±0,5" 11,7±0,3	12,8±0,4" 11,2±0,4
Vitamin E, mol/ml	4,6±0,3	3,8±0,2* 4,1±0,2	3,2±0,2" 3,4±0,2"	3,3±0,1" 3,8±0,3	3,5±0,2 4,2±0,4

Designations here and in the text: ATR – activated time of recalcification, APTT – activated partial thromboplastin time, TT – thrombin time, PR – prothrombin ratio, INR – international normalized ratio, FG – fibrinogen, SFMC – soluble fibrin-monomeric complexes, FSP – Fibrin split products, AT III – antithrombin III, PRI – plasminogen reserve index; TC – thrombocytes, D – disco-cytes, DE – discoechinocytes, S – spherocytes, SE – spherocochinocytes, NAF – the

number of aggregate-forming TC, SAN – small aggregates number with 2-3 TC per 100 free cells, BAN - big aggregates number with 4 and more TC per 100 free cells, AN – aggregates number – the total number of SAN and BAN per 100 free cells, DC – diene conjugates, MDA – malondialdehyde; * - authentically significant differences (p<0,05) in healthy women, # - with values before the operation.

The LPO speed in the pre-surgical period in the comparison group was higher than in the control one: the DC and MDA level was increased; the vitamin E level was decreased. In the main group women the DC increase was less high; the rest LPO factors didn't differ from the control ones.

On the first day after the operation the DC and MDA level increased and vitamin E level – decreased in the comparison group; that retained up to 3-4, and DC and MDA – up to 5-7 days.

In the main group on the first day of the operation the content of DC and MDA increased, vitamin E – decreased. On the 3-4th day and on the 5-7 day there were no authentic differences compared to the pre-surgical ones found.

So, the prescription of selmevit to the women subjected to conservative myomec-tomy by laparoscopic method restricts the LPO shifts, coagulative and thrombocytic hemistasis mitigating the risk of thrombo-hemorrhagic complications.

After other operations (uterine cavity abrasion for diagnostic purpose, for legal abortion performance, hysterectomy by laparoscopic or laparotomic method, cesar-ean section) the changes of coagulative and thrombocytic components of hemostasis, the LPO speed changes were the same in direc-tivity differing in intensity. As a whole, the intensity of shifts is consistent with the lati-tude of the operative intervention: the more significant the tissue traumatism is – the more evidently the LPO is promoted, the AOP is decreased and the TC coagulative ac-tivity is increased. At all kinds of the studied surgical aggressions the shifts degree and their duration were lower in the patients of main groups, i.e. the groups having received selmevit. In all the observations the signs of hypofibrinogenemia of consumption ex-pressed in various measures to the power proportional to the LPO shifts intensity and the degree of TC activation became apparent.

Thus, various traumatism degree uterine interventions promote the activation of coagulative hemostasis to the power depend-

ing on the extent of the operation. The he-mostasis activation reaches the degree result-ing in the development of secondary hypo-coagulemia – the hypocoagulemia of con-sumption. The TFI products level reflecting the acceleration of continuous intravascular clotting (CIC) in the blood flow testifies to the FG consumption. Considering the fact that the CIC acceleration attends obstetric-gynecologic operative interventions, one can assume that in these situations the dissemi-nated intravascular clotting is initiated [15].

At the same time, after surgical inter-ventions, thrombocytes activate – their abil-ity to aggregate formation and release reac-tion increases. On the basis of hemocoagula-tion and TC changes time sequence data at extreme conditions or factors [5] the TC ac-tivation has been reputed to be the initiator of hemocoagulative shifts in our observa-tions.

The fact that together with the activa-tion of hemostasis the LPO accelerates and the AOP dies out [4] testifies that the activa-tion of the hemostasis coagulative compo-nent after the operative intervention into the uterine cavity is conditioned by the LPO ac-celeration, as it is shown in other pathologi-cal states determined by various extreme conditions or factors [8, 10]. The abovementioned has been acknowledged by the fact that the introduction of selmevit increasing the AOP and inhibiting LPO diminishes the hemostatic shifts caused by the operation upon the uterine and the hemostatic profiles are normalized quicker (it is common knowledge that vitamins composing selmevit do not influence hemostasis essentially in conditions of health [8], but normalize he-mostasis if its disorders are connected with the LPO activation [8, 10]. It testifies that the LPO shifts initiate hemostatic shifts as it was shown in the experiment [5, 6]. The above-mentioned is also confirmed by the fact that the antioxidant effect is manifested, although to a not large extent, by an intraoperative blood loss decrease – the factor depending on the hemostasis state.

So, our findings confirm the idea about the connection between hemostasis and free-radical oxidation at the LPO level, and it proves the applicability of selmevit in pre-surgical preparation and post-surgical treatment as means of non-specific correction of hemostatic shifts appearing at the states attended with an oxidative stress, at gynecological diseases requiring surgical aggression, in particular.

Conclusions

1. In women with uterine surgical indications the LPO speed, the TC aggregate-forming ability, general blood coagulability and TFI markers content are increased. In 24 hours after uterus lining biopsy or abortion by conservative myomectomy the shifts are redoubled without reaching the critical extent.

2. In women subjected to laparotomic or laparoscopic hysterectomy, cesarean section the hemostatic shifts reach the degree of the blood DIC initial stage (the shifts do not disappear by the 5-7th day after the operation).

3. The supplement of usual therapy with selmevit (before and after the uterine surgeries) reduces the hemocoagulation shifts degree in the pre-surgical period, and especially the shifts caused by an operative intervention.

4. At all the examined states the blood clotting activation is connected with the LPO acceleration and AOP decrease. The prescription of selmevit restricts both of them that allows associating the selmevit effect with its antioxidant properties.

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REGULATION OF CELL CYCLE TRANSITION AND INDUCTION OF APOPTOSIS IN HL-60 LEUKEMIA CELLS BY LIPOIC ACID: ROLE IN CANCER PREVENTION AND THERAPY

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Background: Lipoic acid (LA), a potent antioxidant, has been used as a dietary supplement to prevent and treat many diseases, including stroke, diabetes, neurodegenerative and hepatic disorders. Recently, potent anti-tumorigenic effects induced by LA were also reported and evident as assayed by suppression of cell proliferation and induction of apoptosis in malignant cells. However, the mechanism by which LA elicits its chemopreventive effects remains unclear.

Methods and Results: Herein, we investigated whether LA elicits its anti-tumor effects by inducing cell cycle arrest and cell death in human promyelocytic HL-60 cells. The results showed that LA inhibits both cell growth and viability in a time- and dose-dependent manner. Disruption of the G₁/S and G₂/M phases of cell cycle progression accompanied by the induction of apoptosis was also observed following LA treatment. Cell cycle arrest by LA was correlated with dose-dependent down regulation of Rb phosphorylation, likely via suppression of E2F-dependent cell cycle progression with an accompanying inhibition of cyclin E/cdk2 and cyclin B1/cdk1 levels. Evidence supporting the induction of apoptosis by LA was based on the appearance of sub-G₁ peak in flow cytometry analysis and the cleavage of poly(ADP-ribose) polymerase (PARP) from its native 112-kDa form to the 89-kDa truncated product in immunoblot assays. Apoptosis elicited by LA was preceded by diminution in the expression of anti-apoptotic protein bcl-2 and increased expression of apoptogenic protein bax, and also the release and translocation of apoptosis inducing factor AIF and cytochrome c from the mitochondria to the nucleus, without altering the subcellular distribution of the caspases.

Conclusion: This study provides evidence that LA induces multiple cell cycle checkpoint arrest and caspase-independent cell death in HL-60 cells, in support of its efficacious potential as a chemopreventive agent.

Background

α -Lipoic acid (LA), also known as thioctic acid, occurs naturally as a prosthetic group in various mitochondrial enzymatic complexes and plays a fundamental role in metabolism. It is involved in different multienzyme complexes such as pyruvate dehydrogenase, α -ketoglutarate dehydrogenase, branched-chain α -keto acid dehydrogenase, and glycine decarboxylase complex [1]. The two sulfur molecules in LA undergo cycles of oxidation and reduction, enabling it to function as a potent antioxidant that is capable of directly terminating potentially damaging free radicals. Several features have been described for LA such as (a) specificity of free radical scavenging in both oxidized and reduced forms, (b) interaction with other antioxidants, (c) metal-chelating activity, (d) effects on gene expression, (e) bioavailability, (f) location (in aqueous or membrane domains, or both), and (g) ability to repair oxidative damage, which make it an outstanding antioxidant [2-4]. Added to cell culture medium *in vitro*, LA readily enters cells

and is reduced by mitochondrial and cytosolic enzymes to dihydrolipoic acid, most of which is rapidly effluxed from the cell to the culture medium [5]. Experimental and clinical studies have indicated the potential usefulness of exogenous LA as a therapeutic agent for the prevention and treatment of various pathologies including diabetes [6], atherosclerosis [7], ischemia-reperfusion injury [8], degenerative processes in neurons [9], diseases of joints [10], radiation injury [11], heavy metal poisoning [12] and HIV activation [13]. LA is readily absorbed from the diet, and to date, only mild side effects have been detected following LA administration; supports the overall feasibility of using LA as a dietary supplement [3].

In recent years, LA has gained considerable attention in the cancer field as an anti-cancer agent [14,15]. Results from antiproliferation studies on cancerous cell-based models have suggested that the tumor-suppressive effect of LA corresponds with apoptosis induction, a critical parameter impaired in cancer cells, and this induction is

selectively exerted in cancer and transformed cell lines, while being less active toward normal nontransformed cells [16-18]. Thus, LA was shown to induce apoptosis in tumor Jurkat, FaDu, Ki-v-Ras-transformed mesenchymal cells and human lung epithelial cancer H460 cells [19,20]. In human leukemic T cells, LA also potentiated Fas-mediated apoptosis through redox regulation without affecting peripheral blood monocytes from healthy humans [21]. In experiments using antioxidant response element (ARE) reporter assays, LA has also been shown to induce phase II protective genes which are involved in the prevention of carcinogenesis, in non-cancerous animal- and cell-based studies [22-24]. These studies support the potential utility of LA as an anticancer agent and the importance of the elucidation of the detailed mechanism of its antitumor activity. Because of its widespread use and therapeutic potential of LA, however, the mechanism by which LA elicits its chemopreventive effects remains largely unknown.

We sought to determine the LA-induced apoptosis and cell cycle arrest and the underlying mechanisms of action. Our study shows for the first time that LA is capable to block multiple cell cycle checkpoints including G₁/S and G₂/M and induce caspase-independent cell death via AIF/ cytochrome c translocation from the mitochondria to the nucleus. Our findings provide mechanistic support to the potential utility of LA as an agent for the treatment of leukemia.

Materials and methods

Reagents

DL- α -Lipoic acid was purchased from LKT laboratories (St Paul, MN). Primary antibodies like anti-Rb, anti-E2F, anti-cyclin B1, anti-cyclin D, anti-cyclin E, anti-cdk1, anti-cdk2, anti-AIF, anti-cytochrome c, anti-bcl-2, anti-bax, anti-actin, anti-histone H1, and secondary antibodies were purchased from Santa Cruz Biotechnology, Inc. (Santa Cruz, CA). Primary antibodies like anti-pRb (ser 780) and anti-pRb (ser 807/811) were purchased from Biosource International, Inc. (Camarillo, CA). Anti-PARP was purchased

from Biomol International, L.P. (Plymouth Meeting, PA). Fetal calf serum, RPMI 1640, penicillin and streptomycin were purchased from Cellgro, Inc (Herndon, VA). All other chemicals and solvents used were of analytical grade.

Cell culture and growth inhibition assay

Human HL-60 cells were obtained from American Tissue Culture Collection (Manassas, VA) and maintained in RPMI 1640 supplemented with penicillin, streptomycin and 10% heat inactivated fetal calf serum as previously described [25-27]. For treatment, cells were seeded at a density of 1×10^5 cells/ml. LA dissolved in 1 N NaOH solution and neutralized with HCl, was added to the culture media to the final concentration specified in the text. At the specified times, control and treated cells were harvested. Cell count was performed using a hemocytometer and cell viability was determined by trypan blue exclusion [25-27]. Harvested cells were washed twice with PBS, and pellets were stored at -80°C for additional biochemical and molecular analyses.

Cell cycle analysis

Cell cycle phase distribution was assayed by flow cytometry. Following 24 and 48 h treatment of HL-60 cells with different concentrations of LA (0, 2.5, and 5 mM), cells were washed with PBS and stained with 1.0 μ g/ml DAPI containing 100 mM NaCl, 2 mM MgCl₂ and 0.1% Triton X-100 (Sigma) at pH 6.8, as described [26,28,29]. The DNA-specific DAPI fluorescence was excited with UV light emitting laser (Ni-Cad), and collected with appropriate filters in an ICP-22 (Ortho Diagnostic, Westwood, MA) flow cytometer. MultiCycle software from Phoenix Flow Systems (San Diego, CA) was used to deconvolute the cellular DNA content histograms to obtain quantitation of the percentage of cells in the respective phases (G₁, S and G₂/M) of the cell cycle. Flow cytometry was also used to show cells undergoing apoptosis, evident by appearance of the sub-G₁ peak [26,28,29].

Preparation of whole cell extracts and subcell fractionation

For immunoblotting experiments, cells were collected by centrifugation and were lysed in ice-cold RIPA buffer (50 mM Tris, pH 7.4, 150 mM NaCl, 1 mM EDTA, 1% Triton X-100, 1% deoxycholate, 0.1 % SDS, 1 mM dithiothreitol and 10 μ l/ml protease inhibitor cocktail). The extracts were centrifuged and the clear supernatants were stored in aliquots at -70°C for further analysis. Subcellular fractionation was performed using mitochondria isolation kit obtained from Sigma (Sigma Chemicals, St Louis, MO) and different compartmental proteins were used to study the translocation of AIF and cytochrome c. Protein content of cell lysates and subcellular fractions was determined by coomassie protein assay kit (Pierce, Rockford, IL) with BSA as standard.

Immunoblotting

The aliquots of lysates (20 μ g of protein) were boiled with sample buffer for 5 min, and resolved by 10% SDS-PAGE. The proteins were transferred to a nitrocellulose membrane and blocked in TBST buffer (10 mM Tris, pH 7.5, 100 mM NaCl and 0.05% Tween 20) containing 3% non-fat dried milk overnight at 4°C . The blots were incubated with various primary antibodies, followed by incubation for 1 h with appropriate secondary antibodies conjugated to horseradish peroxidase in TBST. Actin and histone expression was used as loading control. Fractionation of the mitochondrial and nuclear proteins was confirmed by probing the membrane for mitochondrial specific cytochrome c oxidase antibody or nuclear specific histone H1 using their specific antibodies. The intensity of the specific immunoreactive bands were detected by enhanced chemiluminescence (ECL), using the manufacturer's protocol (Kirkegaard & Perry Laboratories) and quantified by densitometry and expressed as a ratio to actin or histone, as previously described [27].

Results

Inhibition of HL-60 cell growth by LA is both time and dose dependent

Initially, we investigated the effect of LA on cell growth inhibition. Exponentially growing HL-60 cells were treated with increasing doses and exposure times of LA, and subjected to trypan blue exclusion assay to measure the cell growth and viability. LA treatment resulted in dose- and time-dependent inhibition of cell growth, compared with controls, and the magnitude of cell growth suppression was seen as early as 24 h exposure to 5 mM LA (89%; Fig. 1A). By 48 h there was a ~8%, ~64% and 86% diminution of cell growth by 1, 2.5 and 5 mM LA, respectively, which was accompanied by ~1, ~3% and 36% temporal, dose-dependent decrease in cell viability (Fig. 1B).

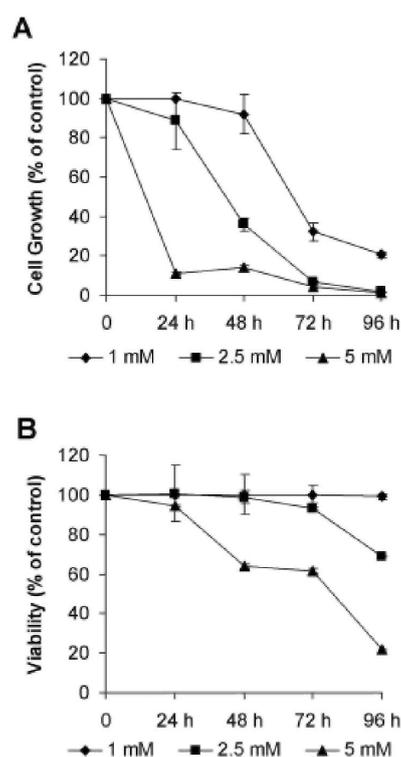


Figure 1. Control of cell growth viability of HL-60 cells by LA. (A) Cells were treated with 0, 1, 2.5 and 5 mM LA and the cell numbers were determined at 24, 48, 72 and 96 h. (B) Cell viability was measured trypan blue dye exclusion assay. Effects of LA were presented as a percentage of control, and values are expressed as mean \pm SD for three experiments.

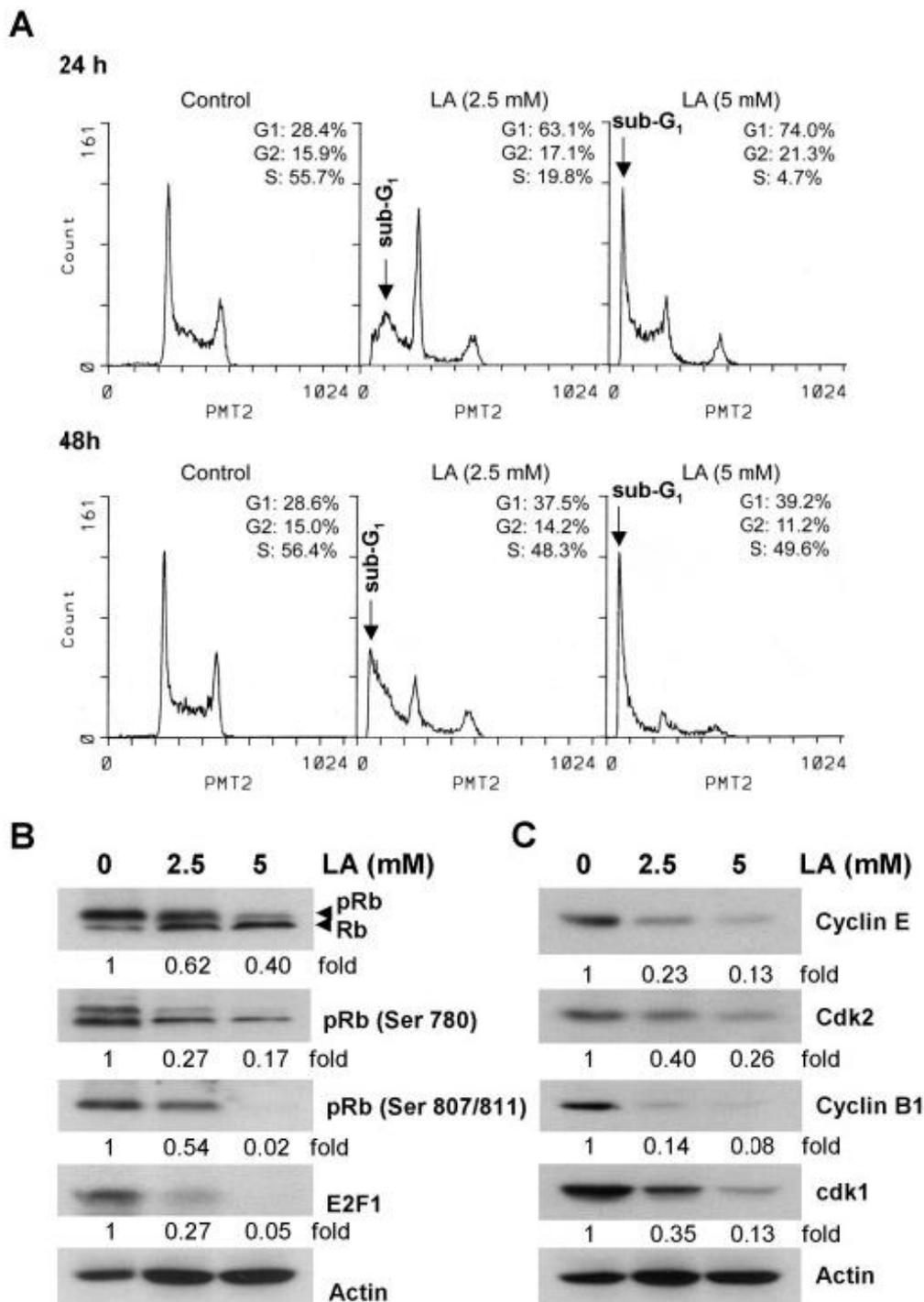


Figure 2. Effects of LA on cell cycle phase distribution and the expression of various cell cycle regulatory proteins in HL-60 cells. (A) Cells were treated with 0, 2.5 and 5 mM LA for 24 and 48 h and analyzed by flow cytometry. Cells with hypodiploid DNA content (sub-G1) represent apoptotic cell fractions. (B) Western blot analysis of total Rb, pRB (ser780), pRB (ser 807/811) and E2F expression in cell lysate treated with LA for 48 h. (C) The level of immunoreactive cyclins B1, E, cdk1 and cdk2 in LA-treated HL-60. The intensity of the specific immunoreactive bands were quantified by densitometry and expressed as a fold difference against actin.

LA induces HL-60 cell cycle arrest by altering the expressions of specific signaling proteins

To assess LA-induced cell growth suppression is mediated via alterations in cell cycle, we evaluated the cell cycle distribution by flow cytometry. Since 48 h treatment with 1 mM LA showed minimum affects on cell growth and viability, only cells exposed to 2.5 and 5 mM LA for 24 and 48 h were analyzed. The percentage of cells in G₁, S, and G₂ phases were calculated and presented as histograms in Fig. 2A. LA caused a significant decrease in S-phase cell population (55.6% in control vs. 19.8% and 4.7% in cells treated with 2.5 and 5 mM LA, respectively), accompanied by a concomitant accumulation in the G₁ phase cell population (28.4% in control vs. 63.1% and 74% in 2.5 and 5 mM LA treated cells). To further explore the cell cycle arrest by LA in HL-60 cells, specific cell cycle regulatory proteins required for G₁, G₁/S and S phase transition were measured by Western blot analysis. First, we measured the expressions of cyclins D, E and cdk2, as they play a pivotal role in controlling the phosphorylation status of Rb, which in turn activate transcription factor E2F to induce cell entry into the S-phase. Results in Fig. 2B show that LA treatment caused a dose-dependent reduction in cyclin E/ cdk2 expression without affecting cyclin D1 (data not shown), and at the same time LA treatment also resulted in ~38 to 60% suppression of the phosphorylated Rb (pRb). Moreover, LA caused a significant reduction in the phosphorylation of Rb at two specific sites, Ser-780 and Ser-807/811, was also observed (Fig. 2B). In addition, a more pronounced decrease in the expression of E2F was also detected in the treated cells (Fig. 2B), suggesting that these changes collectively contributed to the decrease in S phase cell population by LA (Fig. 2A).

Since LA-treated cells also show alterations in G₂/M progression, we also as-

sayed the expression of cyclins A, B and cdk1 expression and observed a dose-dependent down regulation of cyclin B1/cdk2 (Fig. 2C) without a corresponding alteration in the expression of cyclin A (data not shown).

LA induces apoptosis by increasing bax/bcl2 ratio and by causing poly(ADP-ribose) polymerase (PARP) cleavage

Cell cycle analysis revealed that LA apparently induced apoptosis as evident by the appearance of sub-G₁ fraction (Fig. 2A); notably, the percentage of apoptotic cells increased from 1.4% in control cells to 59.6% and 72.9% in 24 and 48 h, 2.5 and 5 mM LA-treated cells, which might contribute to the growth inhibitory effects of LA (Fig. 3A). Corroborative evidence of induction of apoptosis was obtained by biochemical analysis showing that PARP cleavage was substantially increased in cells treated for 48 h with increasing doses of LA (Fig. 3B). As additional support, other apoptosis markers including AIF, cytochrome c and bax/bcl-2 ratio were also examined to further ascertain the response of cells to LA treatment, by western blot analysis. Treatment of HL-60 cells with 2.5 mM LA for 24 h resulted in a 1.5 fold increase in total cytochrome c, while the total AIF levels remained unchanged (Fig. 3C). As bcl-2 plays an integral role in the release of cytochrome c during cell death, we determined its expression and correspondingly, also bax, an apoptosis agonist, in control and LA-treated whole cell extracts. Western blot analysis clearly showed a dose-dependent suppression of bcl-2 expression, accompanied by concomitant increases in bax, in LA-treated cells, compared to control cells (Fig. 3D), which was most vividly illustrated as a marked increase in bax-to-bcl-2 expression ratio (Fig. 3D). These results further support the ability of LA to activate the mitochondria-dependent apoptotic cascade.

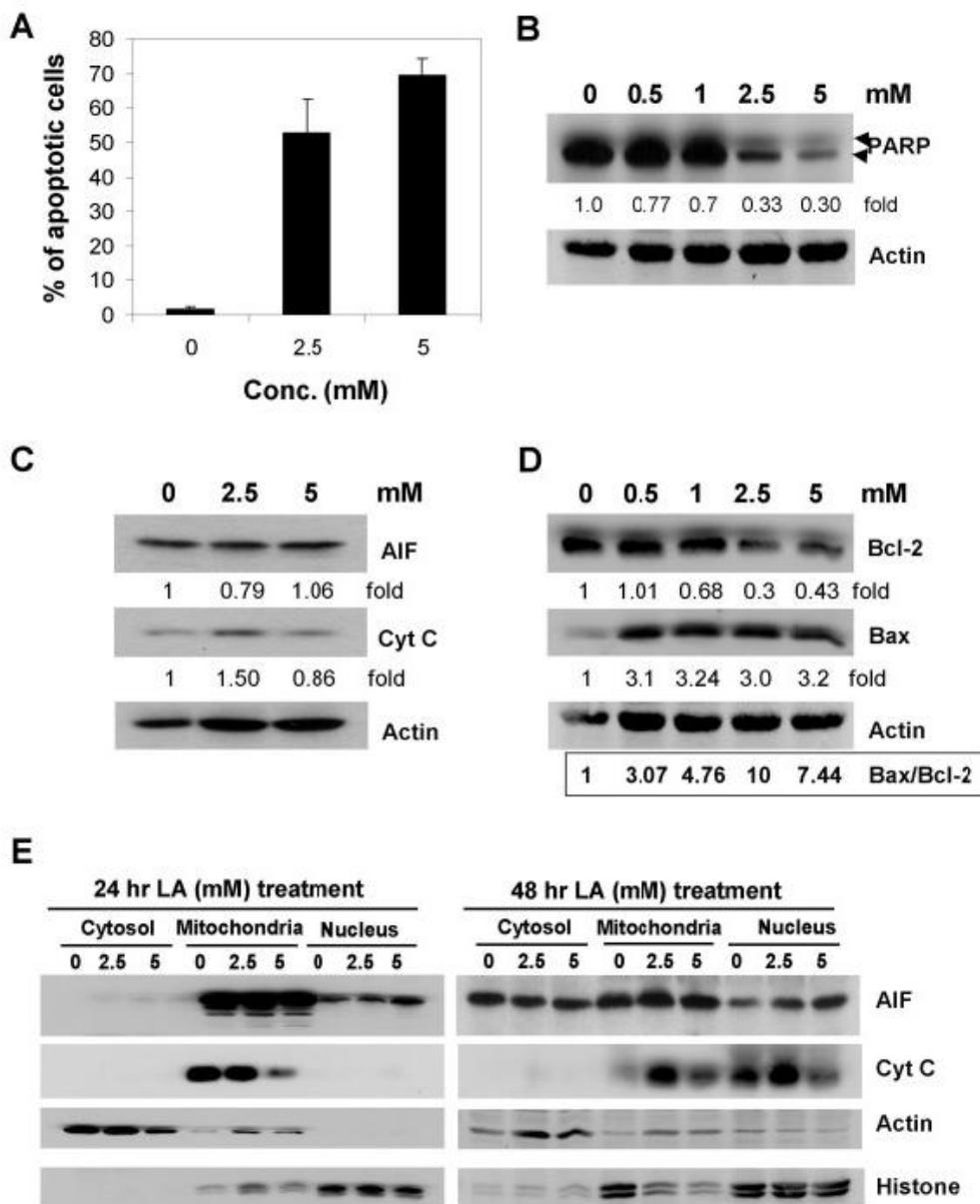


Figure 3. Induction of apoptosis by LA and analysis on poly(ADP-ribose) polymerase (PARP) cleavage, AIF/cytochrome c expression, and bax/bcl-2 ratio and subcellular distribution of AIF/cytochrome c by LA. (A) HL-60 cells were treated with 0, 2.5 and 5 mM LA for 24 to 48 h; LA induced cell death, evident by the flow cytometric measured sub-G1 fraction was calculated and shown as % of total cell population. (B) Western blot analysis revealed down regulation of PARP expression at accompanied by appearance of 89 kDa cleaved PARP fragment in > 2.5 mM, 48 h LA treated cells. (C) AIF and cytochrome c (Cyt C) expression in 48 h LA treated cells. (D) The actin-adjusted level of bax and bcl-2 and changes in the ratio of bax to bcl-2 in HL-60 cells treated for 48 h with increasing dose of LA. (E) Subcellular distribution of immunoreactive AIF and Cyt C in the cytosol, mitochondria and nucleus in control and 24 and 48 h LA-treated HL-60 cells. Actin and histone was used as loading control for cytosol and nucleus fractions, respectively. For mitochondria fraction verification was performed as detailed in Methods.

LA induces translocation of cytochrome c and AIF

Induction of apoptosis by LA conceivably may involve the translocation of cytochrome c and AIF. This possibility was tested by biochemically fractionating different subcellular compartments and quantifying the appearance of cytochrome c and AIF by western blot analysis, following treatment with LA. Typical results in cells treated with 2.5 and 5 mM LA for 24 and 48 h showed a spatiotemporal release of AIF from mitochondria into the nucleus (Fig. 3E). Similarly, cytochrome c was also apparently released from the mitochondria, and unexpectedly, was not accompanied by a concomitant cytoplasmic increase (Fig. 3E). These results suggest that LA-elicited cell death may not occur via a classical cytochrome c mitochondriacytosol translocation mechanism but rather, a caspase-independent mode of cell death via the nucleus directed shuttling of AIF and cytochrome c.

Discussion

LA has pleiotropic pharmacologic effects. The therapeutic potential of LA in cancer treatment has been shown in several studies [14,17,20], however, the mechanisms by which LA elicits its chemopreventive properties remain largely unknown. Using HL-60 cells, we have confirmed the cancer cell growth suppressive effects of LA. Further, we now provide evidence for two novel LA-elicited changes that possibly contribute to its chemopreventive potentials: (i) LA induces blockade at both well established cell cycle checkpoint, respectively, G₁/S and G₂/M, (ii) LA promotes the demise of treated HL-60 cells, possibly by a combination of mechanisms that includes the mitochondria-dependent apoptotic cascade encompassing a caspase-independent mode of cell death mediated via the translocation of AIF/cytochrome c. The proposed mechanism of LA is depicted in Figure 4.

Targeting dual checkpoints of the cell cycle by LA is particularly noteworthy as it effectively, as a single agent, accomplishes

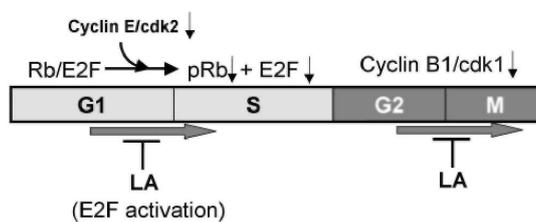
the same cellular endpoint as what has been eloquently proposed by Li et al [30] of inducing malignant cell demise through the deliberate bi-checkpoint blockade-mediated induction of apoptosis, as exemplified by the combined administration of β -lapachone and taxol to deliver a one-two punch for tumor cell killing and eradication. The mechanism by which LA acts in dual cell cycle checkpoint control may be complex and appears to involve at least the down regulation of cyclin E/cdk2 and cyclin B1/cdk1 in a manner that effects synergistic cell cycle arrest and induction of apoptosis [30,31]. It is notable that earlier studies have also demonstrated the post-translational elevation of p27Kip1 and p21Cip1 as specific LA elicited effects [14,19]. Taken together, these results not only reinforce the essential role of LA in cell cycle control but are likely to be directly involved in contributing to its therapeutic potential in cancer treatment.

Results of flow cytometry analysis assessing the presence of cells with fractional DNA content (evident as the sub-G₁ peak), in combination with the appearance of specifically processed 89-kD PARP product as demonstrated by immunoblot analysis (Figures 2 and 3), showed clearly the restoration/activation of programmed cell death in HL-60 cells treated with LA. Since the flow cytometric data appeared to show a more pronounced effect of prolonged treatment by LA, especially at the higher concentrations it is possible that more than one mode of cell death is triggered by LA. Equally likely is the possibility that these two assays alone are not sufficiently definitive to establish the mode of cell death in the treated cells. Experiments exploring TUNEL and agarose gel electrophoresis for detecting appearance of DNA ladders, and the use of caspase inhibitors are contemplated to address these and other possibilities. Despite the limitations mentioned above, it is important to point out a significant finding in this study, i.e., the demonstration of translocation of two proteins, respectively, AIF and cytochrome c

from mitochondria to the nucleus after LA treatment. A dose- dependent increase of AIF appearing in the nuclear fraction was observed as early as 24 h, whereas cytochrome c release and nuclear accumulation occurred at 48 h. Recent studies have demonstrated that AIF plays a critical role in caspase-independent induction of apoptosis [32,33]. Our studies also showed that LA down regulated bcl-2 expression, which in turn may aid the release of AIF by altering mitochondrial permeability and contributing to its relocalization to the nucleus, and thereby promoting the induction of caspase-independent apoptosis. A companion and equally important change in this regard may be the cellular fate of cytochrome c, which, in our studies of the effects of LA, became nuclear bound. It is notable that previous studies have demonstrated a novel role of cy-

tochrome c in the activation caspase-independent apoptosis, as involving the nucleus accumulation of cytochrome c instead of a more generally accepted classical mechanism in which the cytoplasmic translocation of cytochrome c from mitochondria provides a key trigger for caspase-dependent apoptosis [34]. Indeed, there is increasing awareness and acceptance regarding the co-existence of caspase-dependent and caspase-independent apoptotic and other modes of cell death for a given cell type [35]. Such a notion is consistent with and supported by our observation of the re-localization of mitochondrial proteins, AIF and cytochrome c into nucleus by LA treatment, suggesting that LA signals cell death in responsive cells by a caspase-independent, nuclear activated other apoptotic and perhaps other cell death mechanism.

A. Cell cycle control by LA



B. Induction of apoptosis by LA

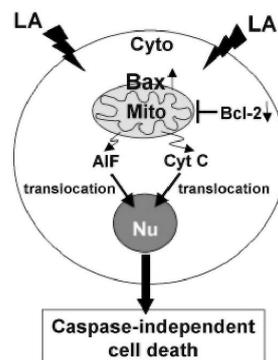


Figure 4. Proposed mechanism of action of LA. In this model, the ability of LA to suppress cell proliferation and induce apoptosis in HL- 60 cells is hypothesized to involve (A) disruption of cell cycle control, (B) perturbation in apoptogenic/anti-apoptotic (bax/bcl- 2) regulatory protein expression and translocation of mitochondrial AIF and cytochrome c (Cyt C) from mitochondria to nucleus and promoting the caspase-independent induction of apoptosis.

Importantly, the concentrations of LA used in this study are similar to those used in other *in vitro* studies reporting the cell cycle arrest and apoptosis inducing properties of LA [19]. Notably also, mM LA concentrations have been reported in the plasma after oral dosing in pharmacokinetic studies and are considered non-toxic. Moreover, the half-life of LA in plasma is short (30 min), suggesting that it is rapidly taken up into tissues or further metabolized [36]. Therefore, it is plausible that high concentrations, in the mM range, may accumulate in target tissues.

Conclusion

The results of this study demonstrate conclusively that LA treatment causes cell cycle arrest and alterations in the expression/translocation of mitochondrial apoptogenic/ anti-apoptotic proteins including AIF and cytochrome c, and the net result being a reduction in cell proliferation concomitant with cell cycle arrest and induction of apoptosis. These findings may be part of the mechanisms that underlie or contribute to the beneficial effects of this readily available dietary supplement in cancer prevention.

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EFFECTIVENESS OF ACUPUNCTURE, SPECIAL DRESSINGS AND SIMPLE, LOW-ADHERENCE DRESSINGS FOR HEALING VENOUS LEG ULCERS IN PRIMARY HEALTHCARE: STUDY PROTOCOL FOR A CLUSTER-RANDOMIZED OPEN-LABELED TRIAL

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Background: Venous leg ulcers constitute a chronic recurring complaint that affects 1.0-1.3% of the adult population at some time in life, and which corresponds to approximately 75% of all chronic ulcers of the leg. Multilayer compression bandaging is, at present, the only treatment that has been proved to be effective in treating this type of ulcer. There is no consensus, however, about the dressings that may be applied, beneath the compression, to promote the healing of this type of ulcer, as there does not seem to be any added benefit from using special dressings rather than simple, low-adherence ones. As well as analgesia, acupuncture provokes peripheral vasodilation, in skin and muscles - which has been demonstrated both experimentally and in clinical practice - probably due to the axon reflex, among other mechanisms. The aim of the present study is to measure the effectiveness and cost of compression treatment for venous leg ulcers combined with special dressings, in comparison with low-adherence ones and acupuncture.

Methods/design: Cluster-randomized open-labeled trial, at 15 primary healthcare clinics in the Sevilla-Sur Healthcare District, with a control group treated with compression bandaging and low-adherence dressings; the experiment will consist, on the one hand, of the compression treatment applied in combination with special dressings (Treatment 1), and on the other, the compression treatment applied in association with low-adherence dressings, together with acupuncture (Treatment 2).

Discussion: The results will be measured and recorded in terms of the median time elapsed until complete healing of the ulcer, and the rate of complete healing at 3 months after beginning the treatment. An economic analysis will also be made.

This study, carried out in the context of real clinical practice, will provide information for decision-taking concerning the effectiveness of special dressings. Moreover, for the first time a high-quality study will evaluate the effectiveness of acupuncture in the process of healing venous leg ulcers.

Trial registration: Current Controlled Trials ISRCTN26438275.

Background

Venous leg ulcers (VLU) constitute a chronic recurring complaint that affects 1.0–1.3% of the adult population at some time in life, and which corresponds to approximately 75% of all chronic ulcers of the leg [1]. They are caused by sustained venous hypertension, which is the result, in almost 50% of cases, from superficial venous insufficiency or from malfunctioning valves in perforating veins, with a normally-functioning deep venous system. Other factors that may result in sustained venous hypertension are those that impede the pumping function of the leg muscles, such as conditions that reduce spontaneous movements (Parkinson's dis-

ease, stroke, spinal cord injuries or excessive sedation). This type of chronic venous insufficiency is characterized by oedema, venous dilation, painful legs and stasis dermatitis. VLU patients have a worse quality of life than non-affected persons of the same age due to the pain, malodour and loss of independence that it causes [2]. The precise procedure by which hypertension leads to ulceration has yet to be clarified, but various mechanisms are known to be capable of intervening in its development and maintenance, such as plasma extravasation, pericapillary deposits of fibrin [3], disorders of the fibrinolytic system [4], the fixing or retention of growth factors by macromolecules

in the dermis, or leukocytes in the veins of the legs [5-7].

In the USA, VLUs have been estimated to cost a billion dollars a year, representing an average cost of over 40,000 dollars during the lifetime of each patient [1], without taking into account the financial effects of impaired quality of life, sick leave and frequent hospitalization. In the United Kingdom, the average cost of treating venous ulcers varied between 814 to 1,994 euros per year, of which a large proportion is devoted to nursing expenses [8,9]. In Europe, the total cost of VLU treatment amounts to 1% of the annual healthcare budget [10], with an estimated mean cost of 250 euros in Spain per patient, per year of treatment [11].

Developing a healthcare plan for VLU patients includes curing active ulcers and preventing relapses. To achieve these goals, such a plan must address the treatment of infections associated with these ulcers, preventing the development of infection, stimulating granulation and epithelial tissues, compression, raising the leg position, improving mobility, reducing obesity, improving nutrition and, in some cases, performing surgery [12,13].

Perhaps the most controversial aspect of the local treatment of VLUs concerns the type of dressings to use [14]. The use of wet dressings has been shown to favour granulation and epithelialization processes and, therefore, the healing of the ulcer, but no evidence has been provided to assist in choosing between special dressings and simple, low-adherence ones [15]. The application of external compression causes various complex physiological and biochemical effects that affect the venous, arterial and lymphatic systems. Provided the degree of compression does not adversely affect arterial blood flow, and that the correct techniques and materials are applied, the effects of compression may be very positive, reducing oedema and pain, whilst at the same time favouring the healing of ulcers caused by venous insufficiency. However, there are many

ways in which this compression may be applied, and there is no consensus as to which is best [16]. Depending on the size of the ulcer, healing rates with compression treatment range from 40–70% at three months to 50–80% at 6 months [17,18]. The latest systematic review carried out by the Cochrane Collaboration recommends compression therapy and low-cost, low-adherence dressings as a first-line treatment for healing VLUs [15].

In addition to analgesia, acupuncture provokes peripheral vasodilation in the skin and in muscles, probably due to the axon reflex [19-21]. Stimulation of A δ and C fibres releases vasoactive neuropeptides, as well as proinflammatory agents like the calcitonin gene related peptide (CGRP), the P substance (SP), neurokinin A (NKA), opioids, galanin, somatostatin and vasoactive intestinal peptide (VIP) [22,23]. Deep, prolonged vasodilation may also be mediated by CGRP [24-26]. Some studies have suggested that the neuropeptides released by sensory nerve stimulation are beneficial in maintaining skin integrity [23,27,28], for healing ulcers [29,30] and for peripheral vascular disorders [31,32]. Another key element in regulating the vascular tone and the blood flow is the endothelial synthase of nitric oxide (NO), which is responsible for catalyzing the NO [33], which is active in arteriolar vasodilation and reduces peripheral resistance, facilitating normal blood flow to the tissues [34]. It has been shown that the expression of NO-synthase (NOS) is greater in skin regions where acupuncture points and channels are located. In these areas, moreover, there are raised levels of NO in the blood after acupuncture [35,36], which suggests that the acupunctural stimulation of the sensorial nerves may act as an *in vivo* modulator of NO levels [32]. Although studies have been carried out to examine the effectiveness of acupuncture in treating VLUs, these have been of poor quality and have reported contradictory results [37-39].

In this paper, we propose a multicentre cluster-randomized study, with a predetermined sample size, and appropriate follow

up, assessing the patients' quality of life and employing an objective results measure that will enable us to accurately evaluate the length of time needed for patients' ulcers to heal, thus meeting the recommendations of the Cochrane Collaboration's review body [15,16].

Methods/Design Research aims and questions

The aim of this study is to determine whether the combination of compression bandaging with simple, low-adherence dressings and acupuncture is more effective than when the same bandaging is employed in combination with special dressings or with simple, low-adherence dressings, but no sensory stimulation (acupuncture), with respect to the complete healing of venous leg ulcers.

The following research questions are proposed:

- In terms of the healings of venous leg ulcers, is it better to employ compression bandaging associated with sensory stimulation (acupuncture) and simple dressings, than the same bandaging without sensory stimulation, with special dressings, or than the compression bandaging without sensory stimulation and with simple dressings?
- What are the differences between healing treatments with special dressings and those with simple, low-adherence ones, in terms of the complete healing of venous leg ulcers?
 - How long does it take for venous leg ulcers to recur?
 - How effective is the treatment in terms of reducing pain intensity?
 - How effective is the treatment in terms of reducing the amount of analgesic and anti-inflammatory medicines consumed?
 - Are there any quality of life changes related to the health of patients with venous leg ulcers?
 - What is the total financial cost of each of the treatments studied?
 - What is the cost-effectiveness ratio of the treatments studied, for patients with venous leg ulcers?

- What is the opportunity cost of treatments not implemented?

Design

Open-labeled, controlled multicentre prospective study, with random cluster allocation to treatment groups (Primary Healthcare Clinics) in the Sevilla-Sur Health District (Andalusian Public Health System).

Study duration

April 2008-December 2010

Subjects

Target population

patients with venous leg ulcers who request treatment at the Primary Healthcare Clinic.

Study population

patients with venous leg ulcers who request treatment by a healthcare professional (doctor or nurse) at one of the Primary Healthcare Clinics in the Sevilla-Sur Health District taking part in the study, with at least one active venous leg ulcer (open, CEAP C6 [40] with a diameter exceeding 1 cm.

Patients with one or more of the following will be **excluded** from the study:

- Arterial pathology (systolic pressure in the ankle of less than 80 mm Hg or ankle/arm systolic index less than 0.8).
- Diabetic ulcer of the foot, rheumatoid arthritis or systemic vasculitis.
- Use of anticoagulants
- Pregnancy

Sampling units

the Primary Healthcare Clinics participating in the study.

Analysis units

per Healthcare Clinic (according to the group assigned) and per patient.

Randomization and blinding procedure

a list of random numbers will be created, using statistical software, to which the researchers involved in the study will not have access. This list will be applied to the list of participating Clinics until the clusters for each group are obtained. Three types of cluster will be used, according to the treatment for the venous leg ulcer provided at the Clinic (**A**: compression therapy plus simple,

low-adherence dressings and acupuncture; **B**: compression therapy plus special dressings; **C**: compression therapy plus simple, low-adherence dressings). Before beginning, the list of Clinics will be randomly ordered, by drawing lots blindly, with no repetitions, from a bag containing the names of all the Clinics taking part. None of those participating in this process will belong to the research group, and none of them will play any further part in the study.

Ethical criteria

The ethical validity of this study has been analyzed and approved by the Andalusian Government Committee for Clinical Trials, following the approval of the corresponding Research Commission at each of the participating Clinics. The study design takes into account the fundamental principles set out in the Helsinki Declaration, and those of the Council of Europe Convention concerning human rights and biomedicine, as well as the requirements under Spanish law in the field of biomedical research, the protection of personal data, and bioethics. All the patients involved must sign their informed consent to the proposed clinical research procedures. During the course of the study, audits will be performed as required by the relevant Research and Ethics Committee, as well as those of each Clinic's Quality Committee, independently of any external audits (such as that of the research financing body) that may be necessary.

Sample size

The sample size has been calculated following the parameters of Campbell et al. [41], on the basis of historical data [18]. The success rate for complete healing of venous leg ulcers at 3 months, with compression bandaging plus special dressings, is 44%. With an alpha (significance) level of 0.05 and a power of detection of differences of 80%, assuming a two-tailed approach, the total sample size needed will be 375 patients, in order to detect differences of 15% between the groups, as regards the rate of complete healing of venous leg ulcers at 3 months. This calculation assumes a possible

dropout rate of 5% and an intra-cluster coefficient of correlation of 0.05 (according to the expected variance of the response within a single cluster). There will be 15 clusters (Primary Healthcare Clinics) and so each Clinic will need to recruit 25 subjects. Therefore, 3 treatment arms will be formed, with 125 patients in each (with 5 Clinics per arm).

Interventions

The compression treatment and application of dressings will be performed in accordance with the standard procedure and the criteria of the nursing staff responsible. A priori, one treatment session per week is planned, but this may be modified in the light of the patient's response. Follow up of the patients recruited into this study will be continued for one year after the randomization process. The acupuncture sessions in Group A will be given at the same time as the cleansing of the ulcer and the changing of the compression bandage, and will continue for 3 months, or until the ulcer has healed completely (whichever occurs first). If, after these 3 months, the ulcer has not healed, the sessions will be continued (as before, together with the cleansing of the ulcer) for another 3 months. The acupuncture treatment will not be continued for longer than 6 months (figure 1).

The patients taking part in the study will be given recommendations about suitable hygiene-posture routines (resting with the legs raised, not standing for long periods, taking regular walks, keeping the skin well hydrated) and nutritional advice, if necessary. Both the compression treatment and the application of dressings will continue until the ulcer has completely healed. If a recurrence occurs before the one-year follow-up period has ended, the patient will be entered into a sub-cohort and given a new treatment plan.

Compression therapy (Groups A, B and C in the study) Compression therapy will be given to all the participants in the study. Once the patient has been examined and the ankle/arm index calculated by means of a Doppler scan, an evaluation will be

made of the state of the skin and of the shape of the leg, after confirming the absence of neuropathology, arterial pathology and cardiac insufficiency. The bandaging will be of a Class 3, high-compression multilayer type [42], following cleansing and application of the dressing, as follows: 1) With a 50% overlap, apply a cotton bandage in a spiral pattern from the base of the toes to just below the knee, without imposing any tension; 2) Apply an elastic bandage in a spiral pattern,

with 50% overlap and stretched to 50% of its extension, from the base of the toes to just below the knee; 3) Apply a cohesive elastic bandage, with 50% overlap and stretched to 50% of its extension, from the base of the toes to just below the knee, and apply light pressure to ensure the adherence of the bandage. The oedema of the leg should be reduced by raising the limb for 15 minutes before applying compression.

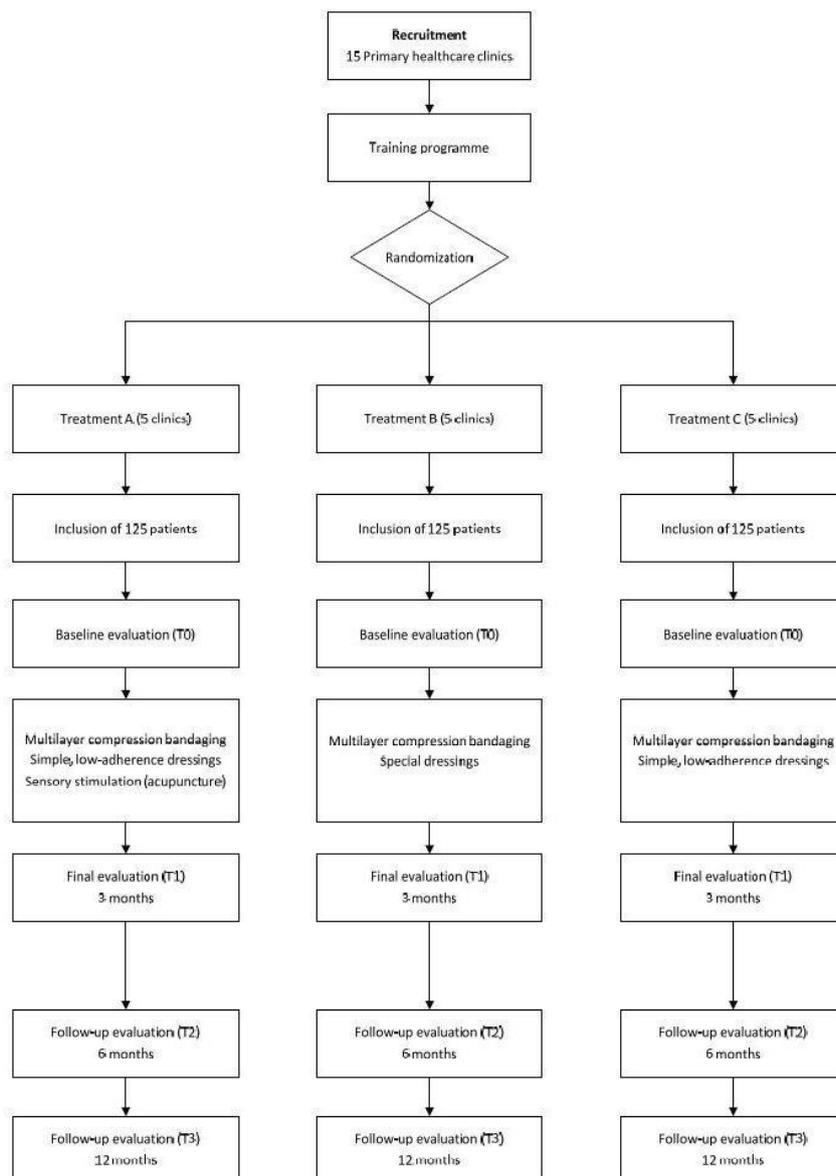


Figure 1. Flow diagram for the study. Flow diagram for the diverse phases of the study

Treatment of the ulcer for the patients given low-adherence, simple dressings (Study groups A and C)

- Cleaning: with tap water and mild soap [43-45], followed by careful drying

- Debridement: if necrotic tissue or sloughing are observed, perform enzymatic debridement, which may be combined with excision debridement, if necessary

- Managing infection: if infection is suspected, take a sample and begin treatment with silver sulfadiazine for a maximum of 2 weeks. If a culture study confirms the infection, treat using oral antibiotics

- Dressings: simple, low-adherence type (paraffin-impregnated tulle gras)

Any adverse reaction or side effect that may occur should be recorded in the Data Record (DR), with a detailed description and the date of occurrence.

Treatment of the ulcer for the patients given special dressings (Study group B)

- Cleaning: with tap water and mild soap, followed by careful drying

- Debridement: if necrotic tissue or sloughing are observed, perform enzymatic debridement, which may be combined with hydrogel to favour autolysis. If necessary, excision debridement should be applied

- Managing infection: if infection is suspected, take a sample and begin treatment with silver dressings (hydrofibre or hydro-polymer) for a maximum of 2 weeks. If a culture study confirms the infection, treat using oral antibiotics

- Dressings: Cover with hydropolymers. Use alginate or hydrofibre dressings if exudate must be controlled

Any adverse reaction or side effect that may occur should be recorded in the DR, with a detailed description and the date of occurrence.

Acupuncture (Study Group A)

The nursing staff will be trained in the specific techniques of localization, puncture and manipulation in order to apply acupuncture at the perilesional zone of the ulcer(s), in healthy skin, using 4–8 needles, and at 2 points located on either side of the tibial

crest of the affected limb (Yinlingquan SP9 and Zusanli ST36). The puncture will be carried out after cleansing of the ulcer. The needle to be inserted is a sterile, single-use filiform acupuncture needle, 30 mm long and 0.30 mm in diameter, fitted with a guide tube (S-J3030, manufactured by Seirin Corporation). Application will be made at each of the above-mentioned points, after sterilizing the skin, and with the patient lying face up or sideways. The puncture will be made vertically, unless otherwise specified, to a depth of 10–28 mm. The insertion will be followed by broad bidirectional rotational movements of the needle handle in order to produce the sensation of *Deqi*, commonly described as an irradiated feeling. The needle will be held in place for 20 minutes, and moved for 10 seconds every 5 minutes (4 manipulations per session). The acupuncture sessions will be applied for the first 3 months of this treatment programme or until the ulcer has completely healed. If complete healing is not achieved in this period, the sessions may be prolonged for another 3 months, after which the acupuncture treatment will be discontinued.

For each session, the number of needles used and the exact location of their application will be recorded. Any adverse reaction or side effect arising from this treatment should be recorded in the DR, with a detailed description and the date of occurrence.

A priori, the ulcer should be cleansed once weekly, the same frequency as the sensory stimulation with acupuncture. Nevertheless, this may be increased or decreased, at the discretion of the nursing staff.

All treatment will be given by the professional healthcare staff (nurses) employed at the Primary Healthcare Clinics, coordinated by the treatment programme head in each case. In order to standardize criteria and training procedures in the use of compression bandages, the data record system and the application of the study treatments, a **specific ad-hoc training course** will be given to all the healthcare staff involved in

the study. This training will be structured as follows:

- Aims: acquisition of skills in applying acupuncture protocols for venous ulcers, in applying treatment techniques using the different kinds of dressing and in using the data record system. Standardization of criteria for applying compression bandages.

- Content: differential diagnosis of leg ulcers, calculation of the ankle/arm index, selection and localization of acupuncture points, the insertion of needles, the preparation and application of ulcer cleansing treatment, the reaction to possible infection, training in techniques with compression bandages, giving instructions to patients, implementing follow up, and giving all the study participants hygiene, posture and nutrition recommendations

- Instruction method: workshop

- Duration: 10 teaching hours

Outcome measures

Primary outcome

Time until complete healing is achieved

Complete healing is defined as the complete epithelialization of all the leg venous ulcers, not just the reference one.

Secondary outcome variables

Complete healing at 3 months after beginning treatment Complete healing is defined as the complete epithelialization of all the leg venous ulcers, not just the reference one (table 1).

Changes in the size of the surface area of the ulcer (in cm²) When the baseline evaluation is made, the ulcer will be measured; if there are more than one, the largest ("the main ulcer") will be assessed. Nevertheless, the outcome variable of complete healing will be determined on the basis of all the ulcers observed on the patient when the baseline assessment is made. The area of the ulcer will be calculated using a compact digital tablet (Visitrak), with which the area can be assessed quickly, conveniently and accurately. The outline of the ulcer is drawn on a tracing sheet used as the digital screen; this

has three layers to minimize the risk of cross contamination or secondary infection, and the layer in contact with the patient is sterile. The surface on which the data are recorded is kept clean and may be included in the patient's case history.

Pain intensity measured on a visual analogue scale There exists sufficient evidence to corroborate the validity of the visual analogue scale of pain intensity. Many studies have demonstrated the validity of the concept [46] and its reliability [47,48]. With this method, the subjective intensity of pain may be measured quickly and straightforwardly. The patient is asked to mark the degree of pain intensity on a millimetric scale, from 0 (no pain) to 100 (the worst pain imaginable).

Changes in the health-related quality of life at 3, 6 and 12 months (12-item Short Form health survey, version 2) [49].

Adverse events – Adverse effects

A record will be kept of any adverse events or adverse effect observed by health-care staff or reported by the patient or by his/her carer.

Cost-utility

Health utility will be measured in terms of the quality-adjusted life years (QALY) gained for each patient, calculated from the area beneath the SF-12 curve at 3 months from the start of treatment.

Opportunity cost

This will include the sum of the outputs from the activities potentially left undone as a result of providing a given treatment, rather than a possible alternative, together with the potential financial cost of the resources employed. Using the ABC method, the resources imputed to each patient will be distributed in a multidisciplinary table based on a modular "counter"-type framework for each case, in order to apply the analytical model and to obtain the SF-12 curve showing the variation in health-related quality of life and the potential cost savings for the Public Healthcare System.

Table 1. Outcome measures. Work scheme with description of assessment visits and times

	Baseline (T0)	Weekly treatment	Evaluation at 3 months (T1)	Weekly treatment (if necessary)	Evaluation at 6 months (T2)	Evaluation at 12 months (T3)
Sociodemographic data	X					
Ankle/arm index	X					
Nutritional study	X					
Localization of ulcer(s)	X		X		X	X
Area of main ulcer	X	X	X	X	X	X
Duration of the main ulcer	X					
Exudate culture (if necessary)	X	X	X	X	X	X
Changes in the size of the main ulcer		X	X	X	X	X
Characteristics of the main ulcer	X	X	X	X	X	X
Complete healing (date)		X	X	X	X	X
Pain intensity		X	X	X	X	X
SF-12	X		X		X	X
Adverse events/effects		X	X	X	X	X
Compliance with hygiene-posture recommendations	X		X		X	X
Location of treatment (clinic/home)		X		X		
Time employed in treatment		X		X		
Materials employed in treatment		X		X		
Number of needles used (Group A)		X		X		
Obtention of Deqi (Group A)		X		X		

Covariables

The covariables recorded will be the patient's age, sex, educational level, occupation, income, weight (kg), height (cm), mobility, systolic arterial pressure, diastolic arterial pressure, arm/ankle index and ankle diameter (cm), the duration of the active ulcer

(weeks), the location of the ulcer (if more than one ulcer is present, stating the location of the largest one, which is taken as the reference ulcer), whether the ulcer is unilateral or bilateral, the number of ulcers on the leg(s), whether the ulcer is new or recurrent (in the latter case, recording the time since

the first appearance, in years and months), the signs of granulation at the base of the ulcer, the signs of epithelialization at the edges of the ulcer, the presence of fibrinous and/or necrotic tissue, the presence of lipodermatosclerosis, and the presence of infection. Other variables recorded will include dependence on tobacco, alcohol or other psychoactive substances, the presence of diabetes mellitus, the results of a nutritional study (haemogram and biochemical tests: albumin, prealbumin, transferrin and proteinogram), the time elapsed until recurrence occurs (weeks), compliance with hygiene-posture recommendations, self care, and the assistance or otherwise of non-professional carers. In addition, a record will be kept of all medication taken (corticoids, immunosuppressors, anticoagulants, etc.) and information about possible cultures of the ulcer exudate.

Data handling

The data on the variables of interest will be recorded on a purpose-designed form to be completed by each researcher at each clinic. This information will be entered into a database for subsequent statistical analysis.

Data collection

The routine follow-up evaluation, to be made following cleansing session, will be performed by the nursing staff responsible. The baseline evaluation (T0), that of the results at 3 months (T1), and the follow-up evaluations at 6 and 12 months (T2 and T3) will be carried out by the healthcare personnel responsible for the treatment programme (and who will be blinded with respect to the group to which each patient is assigned).

Measurements (measurement times)

Baseline evaluation basal (T0)

- The data obtained in the examination made prior to beginning treatment will include personal and sociodemographic characteristics, background and case history, ankle/arm index, nutritional status, previous treatment received, results of the ulcer exudate culture, the dimensions of the ulcer and observations regarding its condition, location

and duration in an active state, as well as about the patient's health-related quality of life.

- Follow up. At each visit, the nurse applying the treatment will record the macroscopic status of the ulcer, any adverse events that may have occurred, the time employed in providing the treatment, the location of the treatment (clinic/ home) and the name of the person performing it. If total healing of the ulcer is detected during a routine examination, the treatment programme official at the relevant Clinic should be informed. For the patients in Group A, a record should also be kept of the data concerning the acupuncture session (the number and location of local points).

Follow-up evaluation at 3 months after starting treatment (T1) At three months after starting the treatment, a fresh assessment will be made of the patient's condition, quality of life and compliance with hygiene-posture recommendations, as well as of the physical status of the ulcer (appearance and size).

Follow-up evaluation at 6 months after starting treatment (T2) With the same content as the previous evaluation.

Follow-up evaluation at 12 months after starting treatment (T3) With the same content as the previous evaluation.

Data analysis

The data analysis will be carried out by personnel blinded to the treatment groups, and for two types of populations: (1) intention to treat (ITT), with all the patients randomized; (2) per protocol (PP), including only the patients with no more than slight variances from the protocol.

The baseline variables for the different groups will be compared, to test the homogeneity produced by random allocation, in terms of differences of the means and of proportions, and the only differences taken into consideration in this comparison will be those that are clinically relevant for subsequent analysis. The magnitude of the difference in any imbalance produced by the random allocation to groups will be evaluated

by using ratios of the means, or medians, or proportions, bearing in mind whether the level of analysis is per cluster or per individual.

The final analysis will be carried out as a univariate survival analysis (using the Kaplan-Meier method and the log-rank-test for inter-group comparison). The hazard ratios for each treatment will be calculated, together with the corresponding NNTs, calculating a 95% confidence interval, using Cox's proportional risk regression model. The assumption of proportionality will be assessed from the interaction between the time elapsed until success (total healing) and treatment group, and will be tested graphically by observing the parallelism in the log-log curves. A multilevel analysis will be carried out to adjust for possible unbalanced variables in the baseline analysis, taking the patients as level 1 and the Primary Healthcare Clinics as level 2. The interactions between clinic and treatment group will be examined, as will the possible variability in the intercept. The level of significance will be set at $p < 0.05$, for all the tests made. Cost-effectiveness, cost-utility and opportunity cost analyses will be made.

Discussion

We have identified three shortcomings in the present study design: the first arises from its conceptualization, in attempting to measure the effectiveness of procedures (acupuncture) whose efficacy has yet to be proven. It might be argued that a previous step should be to design a double-blinded study of effectiveness, comparing the above methods with a placebo procedure. However, apart from the impossibility of implementing a double-blind test for acupuncture, our viewpoint is to seek to determine the validity of clinical practices that are feasible in pragmatic contexts. The second limitation concerns the variability of the effects produced by nursing care; nevertheless, the cluster design employed is aimed at minimizing the risk of habit-formed contamination in the treatments applied and that of contamination between patients, in the sense

of their sharing information about the results. These problems are addressed by standardizing the protocols/procedures and by organizing meetings to standardize the criteria applied, as well as by performing a posteriori statistical analysis of the influence of the "therapist" factor. Finally, the fact that the outcome variable assessed is that of the complete healing of all leg venous ulcers suffered by the patient complicates analysis, but we believe a more limited study would have less probability of being of interest to patients concerned with the time elapsed until the complete healing of all their ulcers.

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INDUCTION OF MATURATION AND ACTIVATION OF HUMAN DENDRITIC CELLS: A MECHANISM UNDERLYING THE BENEFICIAL EFFECT OF *VISCUM ALBUM* AS COMPLIMENTARY THERAPY IN CANCER

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Background: *Viscum album* (VA) preparations have been used as a complimentary therapy in cancer. In addition to their cytotoxic properties, they have also been shown to have immunostimulatory properties. In the present study, we examine the hypothesis that the VA preparations induce activation of human DC that facilitates effective tumor regression.

Methods: Four day old monocyte-derived immature DCs were treated with VA Qu Spez at 5, 10 and 15 µg/ml for 48 hrs. The expression of surface molecules was analyzed by flow cytometry. The ability of Qu Spez-educated DC to stimulate T cells was analyzed by allogeneic mixed lymphocyte reaction and activation of Melan-A/MART-1-specific M77-80 CD8+T cells. Cytokines in cell free culture supernatant was analyzed by cytokine bead array assay.

Results: VA Qu Spez stimulated DCs presented with increased expression of antigen presenting molecule HLA-DR and of co-stimulatory molecules CD40, CD80 and CD86. The VA Qu Spez also induced the secretion of inflammatory cytokines IL-6 and IL-8. Further, Qu Spez-educated DC stimulated CD4+T cells in a allogeneic mixed lymphocyte reaction and activated melanoma antigen Melan-A/MART-1-specific M77-80 CD8+T cells as evidenced by increased secretion of TNF-α and IFNγ.

Conclusion: The VA preparations stimulate the maturation and activation of human DCs, which may facilitate anti-tumoral immune responses. These results should assist in understanding the immunostimulatory properties of VA preparations and improving the therapeutic strategies.

Background

VA preparations are aqueous extracts from *Viscum album* (also known as European mistletoe) consisting of different types of lectins [1-3]. In addition to mistletoe lectins (ML), biologically active components of VA preparations include viscotoxins, several enzymes, peptides (such as viscumamide), amino acids, thiols, amines, polysaccharides, cyclitols, lipids, phytosterols, triterpenes, flavonoids, phenylpropanes and minerals [3,4]. VA preparations have been used as a complimentary therapy in cancer. Several studies have reported the clinical benefits of VA preparations in cancer patients [5, 6]. Treatment with VA preparations or purified ML has also been shown to be associated with tumor regression in several experimental models [7, 8]. The mechanisms

underlying the anti-tumoral activity of VA preparations are complex and not completely understood. The proposed mechanisms include induction of apoptosis of tumor cells and lymphocytes, inhibition of angiogenesis and stimulation of the cellular compartment of the immune system [9-14].

During the course of tumor development, the tumor evades the immune system through the secretion of various factors such as VEGF, IL-10 and PGE₂ that have been shown to inactivate the immune system [15]. The different pathways of immune evasion by tumors involve: induction of immune tolerance, resistance to killing by immune effector cells, and imparting functional paralysis of professional antigen presenting cells (APCs) such as dendritic cells (DCs) [15].

DCs are the professional APCs that are specialized in the uptake of antigens and their transport from peripheral tissues to the lymphoid organs [16,17]. Because of their capacity to stimulate naive T cells, DCs have a central role in the initiation of primary immune responses [18]. DCs reside in periphery as immature cells with a high ability to endocytose target antigens [19]. Upon receiving appropriate stimuli and in the context of inflammation, DCs undergo maturation process characterized by increased surface expression of antigen presenting HLA molecules and co-stimulatory molecules such as CD80 and CD86 and secrete several pro-inflammatory cytokines [20].

Tumor cells suppress the maturation and activation process of DCs [21]. Thus, several studies have demonstrated that DCs that reside in the tumor site or in the vicinity of tumor are immature with a decreased ability to stimulate T cells [22, 23]. In addition, tumor cells secrete several anti-inflammatory cytokines such as IL-10 and TGF, which can suppress the functions of DCs [24-26]. In view of the anti-tumoral and immunostimulatory properties of VA preparations, and the central role of DCs in anti-tumoral immune response, we examined the hypothesis that VA preparations stimulate the DCs, which in part explains the mechanisms underlying the beneficial effect of VA preparations in cancer therapy.

Table 1. Concentrations of Mistletoe Lectins and Viscotoxins in VA Preparation Concentration used ($\mu\text{g/ml}$)

Preparation	Concentration used ($\mu\text{g/ml}$)	Lectin (ng/ml)	Viscotoxin (ng/ml)
VA Qu Spez	5	0.375	0.012
VA Qu Spez	10	0.750	0.024
VA Qu Spez	15	1.125	0.036

Methods

Antibodies and reagents

Recombinant human (rh) interleukin-4 (IL-4) was obtained from R&D Systems (Lille, France), and rh granulocyte macrophage-colony-stimulating factor (rh GM-CSF), rhIL-2 and rhTNF α were obtained from Immunotools (Friesoythe, Germany). FITC-conjugated monoclonal antibodies (mAb) to HLA-DR and CD80, PE-conjugated mAbs to CD86, CD40 and CD83 and APC-conjugated mAbs to CD11c were obtained from BD biosciences (France).

VA preparations

VA Qu Spez, was a kind gift from Weleda AG (Arllesheim, Switzerland). VA Qu Spez is the extract of *Viscum album* growing on oak trees. The VA preparations are therapeutic preparations that are free from endotoxins. VA preparations are formulated in sodium chloride (NaCl 0.9%) isotonic solution as 5 mg/ml vials. During the manufacturing process, VA preparations are prepared by standardizing the levels of Mis-

tletoe lectins and Viscotoxins. The concentrations of the lectins and viscotoxins of the different preparations used in the study are summarized in Table 1.

Generation and culture of monocyte-derived human dendritic cells

Peripheral blood mononuclear cells (PBMC) were isolated from buffy coats of healthy donors purchased from Hopital Hotel Dieu, Etablissement Francais du Sang (06/EFS/029, dated 29.05.2006), upon ethical approval for the use of such materials. The percentage of monocytes in the PBMC preparations was in the range of 9 to 14%. Monocytes were positively isolated using CD14 beads (Miltenyi Biotec, France). The purity of the monocytes after purification is > 98%. Immature DCs were generated by culturing monocytes for 4 days in RPMI 1640 containing 10% FCS, 50 U/ml penicillin, 50 ng/ml streptomycin, rhIL-4 (500 IU/10⁶ cells), and rhGM-CSF (1000 IU/10⁶ cells). Half of the medium, including all supplements, was replaced on second day.

Analysis of the expression of surface molecules by flow cytometry

To investigate the effect of VA Qu Spez on DCs, 0.5×10^6 immature four-day old DCs were either untreated or treated with TNF α (15 ng) or VA preparations (5, 10 and 15 μ g) for 48 h. On day 6, cell surface staining was performed with specifically labeled mAbs and proceeded for flow-cytometry (LSR II, BD Biosciences, France). Ten thousand events were recorded and analyzed for each sample. Data were analyzed by BD FACSDIVA software (BD Biosciences, France).

Mixed lymphocyte reaction (MLR) with allogenic CD4⁺ T cells

Responder CD4⁺ T cells used for allogeneic MLR assays were isolated from PBMC of healthy donors using a negative isolation kit (DynaL biotech-Invitrogen, France). DCs following 48 hr treatment with VA Qu Spez were washed extensively and were seeded with 1×10^5 responder allogeneic T cells at DC:T cell ratios of 1:10, 1:20 and 1:40. After 4 days, the cells were pulsed for 16 h with 0.5 μ Ci (0.037 MBq) of (³H)thymidine. Radioactive incorporation was measured by standard liquid scintillation counting. The proliferation of cells was measured as counts per minute (mean \pm SEM of triplicate values) after subtracting values of responder T cell cultures alone.

Anergy assay to determine the activation status of the CD4⁺ T cells in the co-culture with VA-treated DCs

The anergy assay was performed according to a modified protocol originally described by Steinbrink et al [27]. Briefly, four-day old DCs were treated for 48 hrs with VA Qu Spez (15 ng/ml) or untreated or TNF α (15 ng/ml). Responder CD4⁺ T cells were then co-cultured during the first incubation at a density of 10^5 cells with 10^4 DC for 72 hrs. Then, T cells from the co-cultures were isolated by using CD4⁺ beads (Miltenyl Biotech) and rested for 24 hrs in the culture medium containing 2 U/ml IL-2. Subsequently, CD4⁺ T cells were restimulated with DCs generated from the

same donor as that used for the first stimulation and have undergone similar VA Qu Spez treatment. After 48 hrs, the cells were pulsed for 16 h with 0.5 μ Ci (0.037 MBq) of (³H)thymidine. Radioactive incorporation was measured by standard liquid scintillation counting. The proliferation of cells was measured as counts per minute (mean \pm SEM of triplicate values). Tests were conducted in triplicates. Additionally, the levels of cytokines TNF- α and IFN γ in the co-culture were analysed.

Activation of melanoma specific cytotoxic T cell (CTL) clones by VA Qu Spez-treated DCs

The melan-A-specific CTL clone M77-80 that was derived from tumor infiltrating lymphocytes of melanoma patient M77 is a kind gift from Dr. Nathalie Labarriere and Dr. Francine Jotereau [28,29]. The VA Qu Spez-treated DCs from HLA matched donor (HLA-A2, 10^4 /well/200 μ l RPMI 1640 medium supplemented with 10% AB serum) were cultured overnight with M77 CTLs (10^5) in 96 well round-bottomed plates along with the MART-1 peptide (1 μ M) and 25 IU/mL rh IL-2. The activation of M77-80 was analyzed by measuring IFN γ and TNF α in the cell free- supernatants.

Analysis of cytokines

Cytokines in the cell-free culture supernatant were quantified using BD CBA Human Inflammation kit and Human Th1/Th2 kits (BD Biosciences, France).

Statistical analysis

Statistical significance was determined using the Mann-Whitney U test.

Results

VA Qu Spez enhances the expression of antigen presenting and co-stimulatory molecules on human DCs

We initially characterized the effect of VA Qu Spez on the phenotype of human DCs. Four-day old immature DCs were treated with VA preparations for 48 hrs and cells were analyzed for the expression of various surface molecules (Figure 1). We have used DCs treated with 15 ng/ml of TNF- α as control in addition to the DCs that

were left untreated. VA Qu Spez enhanced the expression by DCs of co-stimulatory molecules CD80 and CD86 (Figure 1) in dose-dependent manner. The expression of CD80 on DCs by 15 ng/ml concentration of VA Qu Spez (81.74 ± 2.3% population and 1632.8 ± 152 mean fluorescence intensity, MFI) was comparable to the DCs treated with TNF- α (84.93 ± 1.1% and 1644.25 ± 195.4 MFI). In addition, Qu Spez also significantly enhanced the percentage expression CD86 in a dose-dependent manner (Figure 1). However, the expression of HLA-DR, CD40 and CD83 were either unaltered or marginally increased (data not shown).

VA Qu Spez induces the secretion of pro-inflammatory cytokines IL-6 and IL-8 by DCs

In addition to co-stimulatory molecules, DC-derived cytokines play a crucial role in priming T-cell response. We therefore analyzed whether the maturation process of DCs induced by VA Qu Spez is associated with the secretion of pro-inflammatory cytokines such as IL-6 and IL-8. The control DCs secreted 86.02 ± 23.3 pg/ml of IL-8 and 11.55 ± 6.28 pg/ml of IL-6 (n = 5 donors). However, as shown in Figure 2, VA Qu Spez significantly stimulated the secretion of IL-8 (308.052 ± 48.60 pg/ml) and IL-6 (54.97 ± 41.27 pg/ml) by DCs. Together these results indicate that in addition to stimulating the expression of co-stimulatory molecules on DCs, VA Qu Spez induce the secretion of pro-inflammatory cytokines.

VA Qu Spez-treated DCs stimulate T cell proliferation

A major function of DCs is their ability to trigger the activation and proliferation of T cells. We thus examined whether maturation of DCs induced by VA Qu Spez is reflected in their capacity to stimulate CD4+ T cells in an allogeneic MLR. As shown in Figure 3, VA Qu Spez-treated DCs, stimulated the proliferation of CD4+ T cells in a dose-dependent manner. The extent of CD4+ T cell proliferation induced by VA Qu Spez-

treated DCs was significant at DC-T cell ratios of 1:10 and 1:20.

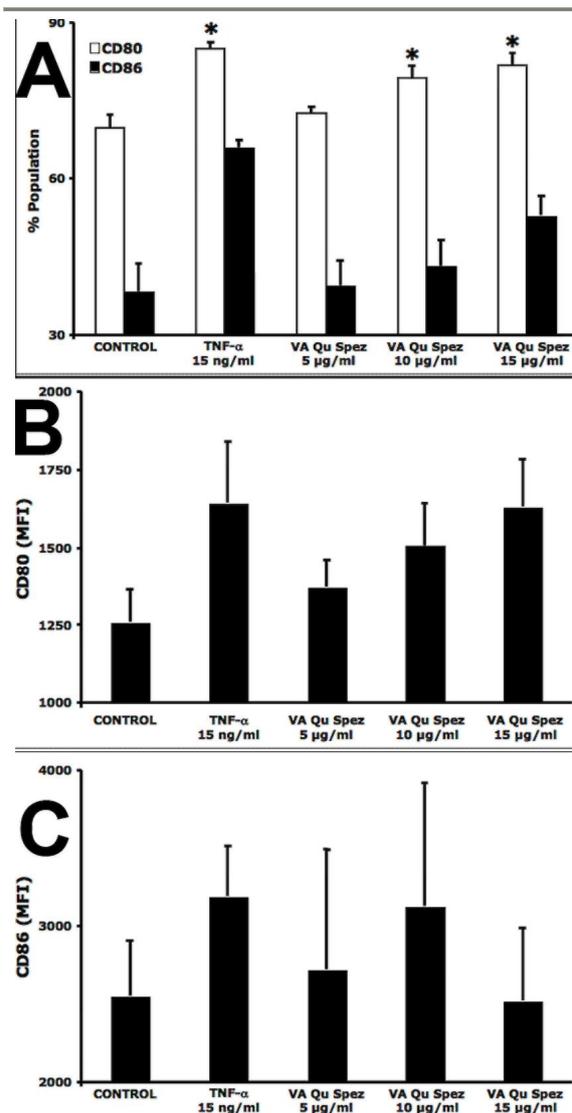


Figure 1. DCs treated with VA Qu Spez show an increased expression of co-stimulatory molecules CD80 and CD86. The 4-day-old DCs (0.5×10^6) were treated with medium alone (Control) or with 15 ng/ml TNF- α or with 5, 10 and 15 μ g/ml of VA Qu Spez for 48 hours. The expression of CD80 (A and B) and CD86 (A and C) was analysed by flow cytometry (BD LSR II). Panel A shows the % of DCs positive for CD80 (open bars) and CD86 (filled bars), while mean fluorescence intensities were presented in Panels B and C. Data are presented as mean ± SEM from five to six independent donors. Statistical significance (*, $p < 0.05$) as analysed by Mann-Whitney test is indicated

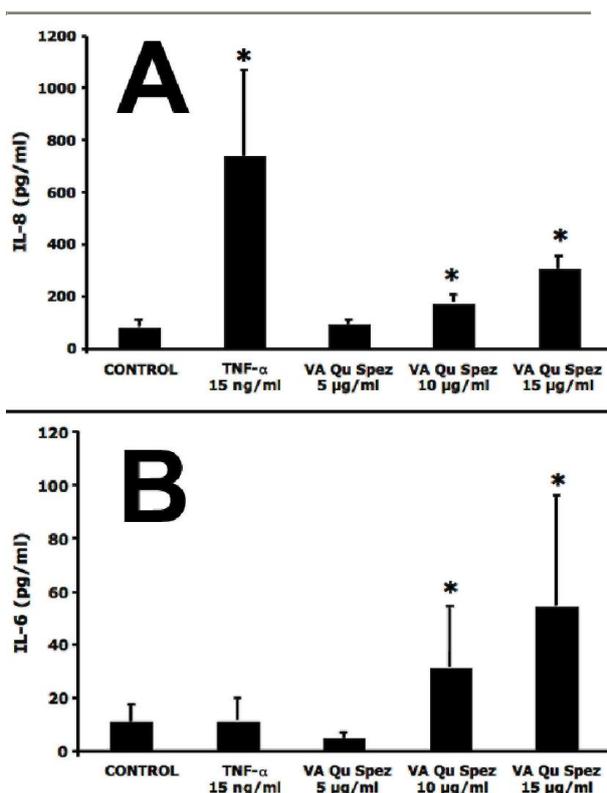


Figure 2. DCs treated with VA Qu Spez show an increased secretion of inflammatory cytokines IL-8 and IL-6. The 4-day-old DCs (0.5×10^6) were treated with medium alone (Control) or with 15 ng/ml TNF- α or with 5, 10 and 15 μ g/ml of VA Qu Spez for 48 hours. The secretion (pg/ml) of IL-8 (Panel A) and IL-6 (Panel B) in cell free supernatants were analysed by cytokine bead array assay. Data are presented as mean \pm SEM from five to six independent donors. Statistical significance (*, $p < 0.05$) as analysed by Mann-Whitney test is indicated

VA Qu Spez-treated DCs do not induce anergy of CD4+ T cells

We performed anergy assay to determine the activation status of the CD4 T cells in the co-culture with VA Qu Spez-treated DCs. As shown in Figure 4a, during first cycle of CD4+ T cell stimulation in a MLR (day 0–day 7), VA Qu Spez-treated DCs (81920 ± 9070 cpm) show similar ability to stimulate the proliferation of CD4+ T cells as compared to TNF- α treated DCs (87439 ± 3910 cpm). Interestingly, CD4+ T cells that

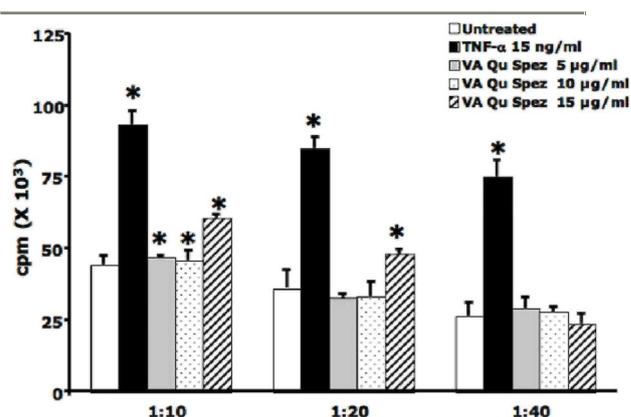


Figure 3. VA Qu Spez-treated DCs stimulate the proliferation of allogeneic CD4+ T cells. The 4-day-old DCs (0.5×10^6) were treated with medium alone (Control) or with 15 ng/ml TNF- α or with 5, 10 and 15 μ g/ml of VA Qu Spez for 48 hours. After 48 hr treatments, DCs were co-cultured with the allogeneic CD4+ T cells at different ratios in a round bottom 96-welled plate. After 4 days of co-culture, the cells were pulsed overnight with 0.5 μ Ci (0.037 MBq) of (3 H)thymidine to quantify T-cell proliferation. Radioactive incorporation was measured by standard liquid scintillation counting, and the results were expressed as counts per minute (mean \pm SEM of triplicate values). Statistical significance (*, $p < 0.05$) as analysed by Mann-Whitney test is indicated

were re-stimulated / challenged during second cycle of stimulation with VA Qu Spez-treated DCs show increased proliferation (202276 ± 2052 cpm) as compared to the control DCs (76236 ± 4436 cpm) and TNF- α treated DCs (154341 ± 3224 cpm).

To further confirm that VA Qu Spez-treated DCs do not impart CD4+T cell anergy, we analysed for the secretion of T cell cytokines TNF- α and IFN γ in the DC-CD4+T cell co-cultures. As shown in Figure 4b, CD4+ T cells that were re-stimu-

lated/challenged during second cycle of stimulation with VA Qu Spez-treated DCs show increased secretion of above cytokines as compared to control DCs. These results suggest that maturation and activation of DCs induced by VA Qu Spez have functional repercussion on T cell activation and not T cell anergy.

VA Qu Spez-treated DCs stimulate melanoma specific M77-80 CTL clone

Since, VA preparations have been used as a complimentary therapy in cancer we examined whether VA Qu Spez- stimulated DCs facilitate anti-tumoral T cell responses. Therefore, HLA-matched VA Qu Spez-treated DCs were co-cultured with Melan-A/MART-1 specific M77-80 CTL clone (Figure 5). Strikingly, VA Qu Spez-treated DCs activated tumor antigen specific CTL clone as analyzed by the secretion of cytokines TNF- α and IFN γ .

Discussion

Although VA preparations are widely used in clinical practice and cancer therapy, their mechanisms of action are yet to be fully understood. In our previous studies, we have shown that in addition to cytotoxic properties, VA preparations have immunostimulatory effects that facilitate tumor regression in experimental models [13]. However, to mount an effective anti-tumoral immune response, an increased expression of co-stimulatory molecules on the DCs, the sentinels of the immune system, accompanied by an enhanced secretion of pro-inflammatory cytokines that culminates in T cell proliferation is necessary.

DCs found within the tumor microenvironment are found to have a relatively immature phenotype characterized by low levels CD86, and surface HLA-DR expression and inability to produce pro-inflammatory cytokine [30,31]. Clinical studies with mistletoe lectins have shown that VA preparations stimulate the cytokine secretion and function of monocytes, the precursors of DCs [32]. The previous studies by Stein et al demonstrated that mistletoe extract and their isolated components influences the maturation

of DC with an increased expression of co-stimulatory and antigen presenting molecules [33,34]. Furthermore, we found that the up-regulation of these molecules is accompanied by the induction of inflammatory cytokines by the VA preparations and stimulation of tumor specific T cells. Together these results suggest that induction of maturation and activation of human DCs is one of the mechanisms underlying the beneficial effect of VA preparations as complimentary therapy in cancer.

Previously, it has been demonstrated that VA lectin induces the gene expression of IL-1 alpha, IL-1 beta, IL-6, TNF- α , IFN- γ and GM-CSF from PBMC [35]. A recent clinical study has shown that the CD14+ monocytes from multiple myeloma patients could be induced to differentiate into functional DCs by culturing them with the cytokine cocktail consisting of GM-CSF, IL-4, IL-6, TNF- α and IL-1 β for use in cancer immunotherapy [36]. Our data demonstrates that VA Qu Spez-mediated maturation of DCs and secretion of pro-inflammatory cytokines (IL-6 and IL-8) has repercussion on the stimulation of CD4+ T cells and their cytokine secretion. It is interesting to note that VA Qu Spez-treated DCs do not induce anergy of T cells as shown by the induction of proliferation and the secretion of TNF- α and IFN γ by the CD4+ T cells. Thus, induction of DC-cytokines and T cell cytokines by VA Qu Spez represents a critical determinant in the development of effective innate immune responses against the tumor cells [37].

CD8⁺ cytotoxic T lymphocytes (CTLs) are critical for the elimination of tumor. Thus, therapies aimed at expansion of CTLs and their functions holds the key in mounting an effective anti-tumor immune response. The ability of the CTLs to recognize the processed peptides derived from the cellular genes, such as those encoding MART-1 or tyrosinase in melanoma, led to the recognition that protective immune responses are often directed towards tumor-associated, rather than tumor-specific, antigens [28,29]. Using Melan-A/MART-1 specific M77-80

CTL clone, we have shown that DCs "educated" by VA Qu Spez can mount an anti-tumoral immune response as suggested by the increased levels of secretion of TNF- α and IFN γ by the CTLs in the co-culture. Fur-

ther studies on the effect of the VA preparations on the DCs that have been subjected to inactivation by tumor factors, may provide strategies in dissecting the stimulatory effects of the VA preparations on the DCs.

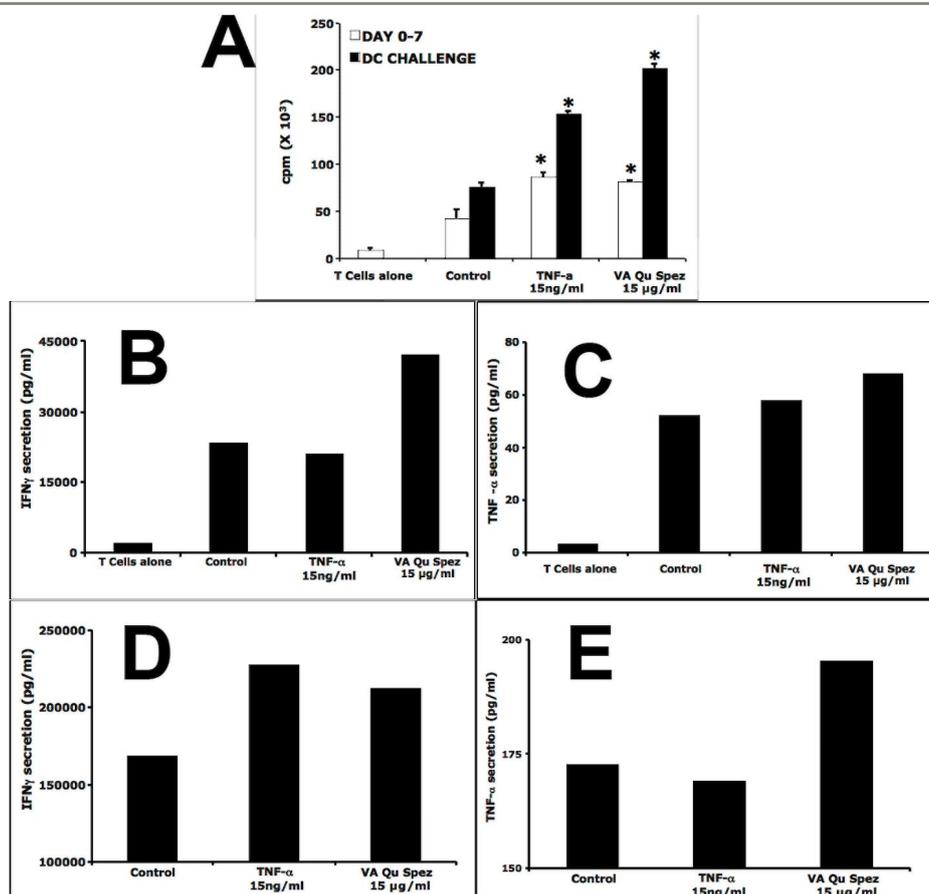


Figure 4. VA Qu Spez-treated DCs do not induce CD4⁺ T cell anergy. The 4-day-old DCs (0.5×10^6) were treated with medium alone (Control) or with 15 ng/ml TNF- α or with 15 μ g/ml of VA Qu Spez for 48 hours. The DCs were then co-cultured with the allogeneic CD4⁺ T cells at 1:10 ratio in a round bottom 96-welled plate for 72 hrs for the first cycle of stimulation. The T cells from in the co-cultures were then purified and were rested for 24 hrs in the presence of 2 IU/ml of IL-2. These CD4⁺ T cells were then subjected for second cycle of stimulation with similarly treated DCs from same donor. After 48 hrs of co-culture, the cells were pulsed overnight with 0.5 μ Ci (0.037 MBq) of (³H)thymidine to quantify T-cell proliferation (Panel A, filled bars). Radioactive incorporation was measured by standard liquid scintillation counting, and the results were expressed as counts per minute (mean \pm SEM of triplicate values). DC-T cell co-cultures of first cycle of stimulation that were maintained for 7 days were used for the comparison (Panel A, open bars). Statistical significance (*, $p < 0.05$) as analysed by Mann-Whitney test is indicated. The level of T cell cytokines IFN γ (Panels B and D) and TNF- α (Panels C and E) in the cell-free supernatants from above cultures were analysed by cytokine bead array. Panels B and C indicate the level of cytokines in DC-T cell co-cultures of first cycle of stimulation that were maintained for 7 days. Panels D and E present the level of cytokines in DC-T cell co-cultures of second cycle of stimulation

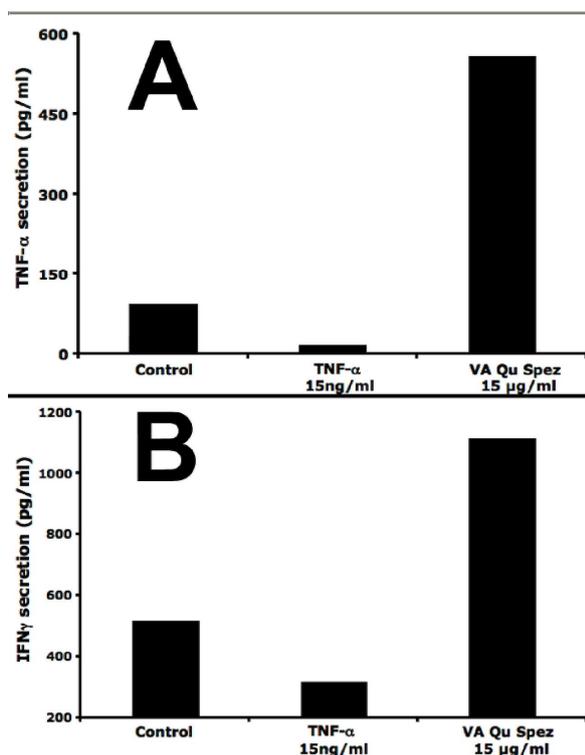


Figure 5. VA Qu Spez-treated DCs stimulate melanoma specific M77-80 CTL clone. The 4-day-old DCs (0.5×10^6) from HLA-A2 donor were treated with medium alone (Control) or with 15 ng/ml TNF-oc or with 15 µg/ml of VA Qu Spez for 48 hours. The DCs (10^4 /well/200 µl medium) were then cultured overnight with M77-80 CTLs (10^5) in 96 well round-bottomed plates along with the MART-1 peptide (1 µM) and 25 IU/mL rh IL-2. The activation of M77-80 was analyzed by measuring TNF α (Panel A) and IFN γ (Panel B) in the cell free-supernatants by using cytokine bead array

Conclusion

VA preparations are known to have cytotoxic properties towards the tumor cells. They are also known to improve the quality of life in the cancer patients. However, the mechanisms by which VA preparations stimulate the immune system and exert beneficial effects in patients are not yet clear. We have demonstrated the role of the VA preparations in stimulating the DCs with implications in the induction of anti-tumor immunity. However, these *in vitro* results need to

be validated further in the context of clinical studies. The elucidation of immunostimulatory mechanisms of VA preparations is critical in understanding their role as complementary therapy in cancer.

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IMMUNE SYSTEM STATE IN CHRONIC CHOLECYSTITIS AND METABOLIC SYNDROME PATIENTS

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On the ground of 127 chronic cholecystitis patients' examination results the immunological aspects of metabolic syndrome and chronic cholecystitis comorbid course were elucidated. The research results showed that in the patients with chronic cholecystitis the immune status changes take place together with the development of metabolic disorders (dyslipodemia, insulin-resistance) due to suppressing the cellular component of the immune system, nonspecific resistance factors' stimulation, cytokine level increase.

Key words: chronic cholecystitis, metabolic syndrome, immunity.

The development of chronic cholecystitis is conditioned, as a rule, by the bacterial flora, the penetration of which into the bile cyst happens by the enterogenous, hematogenous or lymphogenous ways [1]. The chronic inflammation at the chronic cholecystitis long course results in the metabolic and immune status disorders. In spite of the fact that cytokines are not specific factors of inflammation the determination of their concentration in blood gives the information about functional activity of various types of immunocompetent cells, the inflammatory process severity and disease prognostication [6].

The connection between the immune state and metabolic syndrome (MS), which often takes course against the background of chronic cholecystitis, is widely discussed in literature. At that, the data got by different investigators are rather contradictory [10].

Up to the present day the immunological aspects at the MS and chronic cholecystitis (CC) comorbid course remain one of the poorly studied problems.

The purpose of the research is to evaluate the immune system state in the patients with chronic cholecystitis at the MS formation.

127 persons aged from 20 to 55 years old, 39 men and 88 women, took part in the investigation. According to the research tasks three study groups were formed. The first group (control) was represented by 32 patients without chronic cholecystitis and MS; the second group – were 49 patients

with chronic cholecystitis without MS manifestations and the third group – 49 patients with chronic cholecystitis and MS. Diabetes was diagnosed in 15%, the overweight – in 30%, adiposis – in 65% of the third group patients, in 82% of the patients all these changes were combined with hypertension.

The chronic cholecystitis diagnosis was made on the basis of clinical, laboratorial and functional research methods. The chronic non-calculous cholecystitis was detected in 75 patients, the chronic calculous cholecystitis – in 20 patients. The metabolic syndrome was diagnosed according to the USA National Committee criteria on cholesterol (ATR, 2001) [5].

In blood serum the level of total cholesterol, high-density lipoprotein cholesterol, triglycerides («OLVEX DIAGNOSTICUM» sets), apo-A1 and apo-B («DiaSys» sets) were determined. The apo-protein atherogenicity coefficient was calculated on the quotient of apo-proteins – apo-B to apo-A1 [7]. The carbohydrate metabolism investigation included the detection of glucose content in blood serum on the empty stomach, insulin – by the enzyme multiplied immunoassay method («DRG Diagnostics» sets). To determine the insulin resistance the NOMA index was used [9]. For the purpose of inflammation markers detecting in blood serum the tumor necrosis factor level – alpha (TNF- α) and receptor to TNF- α (TNF RI), were determined by the enzyme multiplied immunoassay method (the chemical reagents of the “BD Bioscience” firm). The peripheral

blood immunocompetent cells phenotyping was carried out using monoclonal antibodies to the cells CD3, CD4, CD8, CD 16, CD 22, CD 25, HLA-DR (Vitebsk) [3]. To determine the nonspecific resistance of the body the immune system monocytic macrophageal element cells' functional abilities were investigated. The neutrophils' metabolic activity study was carried out by means of the Nitro Blue Tetrazolium Reduction Test (NTR-test), the Nitro Blue Tetrazolium Reduction Test reserve (NTRR), the neutrophils' activation index (NAI) and the neutrophils' activation index reserve (NAIR) on the method of Park B.H. in the modification of Shmelev Ye.V. [12]. The A, M, G immunoglobulines concentration was determined in blood serum by the enzyme multiplied immunoassay ("Vector-Best" sets). The detection of the circulating immune complexes (CIC) of large (C3) and small (C4) sizes was carried out by the method of M. Digeon, M. H. Jover, J. Rizo in the modification of Struchkov P.V. [9]. As the pathogenicity factor their quotient ($K = C4/C3$) was used. At the static processing of the data the Student's t-test was determined; the differences were considered authentic at $p < 0,05$.

In the patients with CC and MS the level of arterial blood tension, body-weight index, waist and thighs circuit, and also the studied factors of lipid and carbohydrate metabolism differed from the analogous factors in the first and second groups ($p < 0,05$).

The immunological status analysis revealed a tendency to the immune system imbalance formation in chronic cholecystitis patients at metabolic disorders augmentation. As it is seen from table 1, in the second group patients the T suppressors' quantity reduction, tellingly for the chronic inflammatory process, takes place against the background of the T helpers' quantity reduction. In the third group patients there was a tendency to the "adult" T lymphocytes' (CD3), T helpers' (CD4) quantity reduction and cy-

totoxic T lymphocytes' (CD8) quantity increase compared to the control group marked. The CD4/CD8 index fell in the third group patients compared to the 1st and 2nd groups.

In the third group patients there was a modest rise of the B "adult" lymphocytes' level against Ig G level increase ($p < 0,05$) registered compared to the 1st and 2nd groups.

The given changes testify to the immune resistance suppression in CC and MS patients. On the one hand, the humoral immunity activation happens in this group; on the other hand – the immune system cellular component's functional abilities decrease takes place.

In the patients of the 2nd and 3rd groups there was an increase of the level of the cells containing receptors to the interleukin-2 (IL-2) ($p < 0,05$) compared to the control group registered, that reflects the production stimulation of IL-2 promoting, in its turn, the activation and maturation of different subpopulations of T-cells, B-cells, natural killers and macrophages. The decrease of the "adult" T lymphocytes', T helpers' CD4/CD8 index', natural killers' (CD 16) level in the third group patients testifies to a negative activation of lymphocytes at the MS formation against the background of chronic cholecystitis [4].

The results of antigens' state study are of concern. The HLA-DR increase in the second and third groups compared to the control was registered ($p < 0,05$). There are no analogous investigations of the HLA antigens' state in the CC and MS patients described in the works of other authors. The findings, in the course of which the associative relations between the HLA antigens and various diseases were set, it letting high risk groups be emphasized, the preconditions for various pathological forms combination be found out and the course be prognosticated; are submitted in literature [4].

Table 1. Immunity factors in chronic cholecystitis patients

Factors	1 group, control, n=32	2 group, n=49	3group, n=46
Leukocytes, g/l	5,55±0,27	5,60±0,28	6,02±0,34
Lymphocytes, %	27,70±1,38	27,85±1,3	26,2±1,48
T – lymphocytes “adult” (CD3), %	33,39±2,19	30,24±1,55	29,97±1,55
T –helpers (CD4), %	33,30±1,85	29,42±1,66	27,83±1,57 <i>p</i> ₃₋₁ < 0,05
T –suppressors (CD8), %	21,35±0,91	19,42±0,93	23,53±1,47 <i>p</i> ₂₋₃ < 0,05
CD4/ CD8 index	1,50±0,06	1,55±0,08	1,24±0,07 <i>p</i> ₃₋₁ , <i>p</i> ₂₋₃ < 0,05
B – lymphocytes “adult” (CD22), %	24,26±1,9	24,18±1,33	26,03±1,79
Natural killers (CD16), %	19,74±1,43	20,33±1,13	19,8±1,34
IL-2-receptor bearing T- and B-lymphocytes (early stage of activation) (CD 25), %	11,26±0,86	18,09±1,39 <i>p</i> ₂₋₁ < 0,05	18,47±1,52 <i>p</i> ₃₋₁ < 0,05
Activated T- and B-lymphocytes (late activation stage), bearing receptors HLA-DR , %	13,61±0,81	18,55±1,44 <i>p</i> ₂₋₁ < 0,05	16,69±1,07 <i>p</i> ₃₋₁ < 0,05
Oxidative metabolism of neutrophils (NTR-test), %	10,14±0,8	12,94±1,55	16,55±1,48 <i>p</i> ₃₋₁ < 0,05
NTR reserve, c.u.	1,30±0,09	1,12±0,08	1,09±0,1
Neutrophils’ activation index (NAI), %	0,17±0,05	0,24±0,06	0,19±0,02
NAI reserve, c.u.	1,32±0,09	1,13±0,08	1,07±0,1
Ig A, mg/ml	1,63±0,1	1,88±0,07 <i>p</i> ₂₋₁ < 0,05	1,64±0,1 <i>p</i> ₃₋₂ < 0,05
Ig M, mg/ml	1,25±0,1	1,22±0,08	1,36±0,08
Ig G, mg/ml	9,70±0,2	9,84±0,18	10,41±0,2 <i>p</i> ₃₋₁ , <i>p</i> ₂₋₃ < 0,05
CIC: C3, c.u.	0,44±0,02	0,52±0,04	0,49±0,03
CIC: C4, c.u.	0,51±0,02	0,55±0,03	0,56±0,03
K, c.u.	1,17±0,04	1,12±0,03	1,15±0,04
TNF-α, pg/ml	4,88±0,17	5,68±0,38	6,62±0,35 <i>p</i> ₃₋₁ < 0,05
TNF RI pg/ml	1039,1±209,11	1926,35±132,7 <i>p</i> ₂₋₁ < 0,05	2520,2±123,36 <i>p</i> ₃₋₁ , <i>p</i> ₃₋₂ < 0,05

Note: *p*₃₋₁, *p*₂₋₁ –reliability of distinctions between factors in comparison with the control; *p*₂₋₃ – reliability of distinctions between the 2nd and 3rd group.

The state of non-specific resistance factors was characterized by the neutrophils' oxidative metabolism activity (NTR) increase with the decrease of neutrophilic granulocytes' reserve opportunities and increase of C3 levels by 11% and C4 CIC by 8% in the patients of the 2nd and 3rd groups compared to the control ($p < 0,05$). An authentic increase of the TNF- α factors and TNF- α receptors is registered in the CC and MS patients compared to the control ($p < 0,05$). The anti-inflammatory cytokines' level increase and neutrophils' oxidative metabolism activation is considered by many authors as the factor of vessels' endothelium injury through the intensification of oxidation processes resulting in nitrogen oxide inactivation, the release of the enzymes, which catalyze the formation of kinins, which promote vascular permeability and change the vascular wall structure [11, 2].

Thus, the research results testified that in CC patients together with the development of metabolic disorders (dyslipodemia, insulin-resistance) the immunological status changes take place due to the immunity due to suppressing the immune system cellular component, nonspecific resistance factors' stimulation, cytokine level increase. The revealed changes reflect systemic reactions of the body at chronic inflammation and are associated with metabolic disorders resulting in the development of MS clinical implications – hypertension, diabetes, in chronic cholecystitis patients.

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*Materials of Conferences***CLINICAL ASPECTS OF PNEUMOCONIOSIS AND CHRONIC OBSTRUCTIVE LUNGS DISEASE (COLD) AT ELDERLY AND SENILE AGE**

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Dust lungs diseases are one of most widespread forms of professional pathology, representing today medical and social problem. In spite of the irreversibility of the development of the pneumoconiosis and chronic obstructive lungs disease, there is a number of patients having sufficient everyday activity functional level of the respiratory system to get elderly and senile age.

The purpose of the investigation is to reveal factors providing the length of elderly and senile age patients life on the basis of the data about the prevalence and character of clinical evidence of professional pathology of lungs and analysis of clinical history.

In 2006-2007 in Kursk professional pathology center 276 people with the professional disease of the respiratory system were dispensarized. They included 120 patients (43,5%) of senior age. The group of gerontal patients consisted of 108 patients of elderly age, 12 – of senile age. The primary diagnosis was delivered for them in 1975-1985. They were foundry department workers, iron ore quarry workers, coal mine workers who had been working in dustiness from 10 to 17 years. The clinical aspect of pneumoconiosis primary diagnosis corresponded to Ips/ps on X-ray examination, the irritative bronchitis characterized with the light obstructive disturbances. At present time variants of professional disease of bronchial and lungs system in the group of gerontal patients are COLD- at 62 % of patients, COLD combined with pneumoconiosis - with 19,2 % of siked. It should be mentioned that combination of the two professional diagnosis was verified with 50% respondents of the senile age. Clinical and X-ray picture of pneumoconiosis corresponded to A,3r,3t,em/A,3q,3t, em. Clinical and functional disturbances of the COLD were at the rate of II-III stage. Chronic pulmonary heart with elderly patients was formed in 40,8% of the events, and with 50% of the senile patients.

At the analysis of clinical history of all the patients with the professional lungs pathology it is possible to select some factors, provided longer length of geront's lives, in spite of the evident development of pneumoconiosis and COLD on the background of the lungs involution. These are early disease diagnosis, rational job with the conservation of labor motivation and social activity, unceasing and long medical rehabilitation on the base of profpatology center recommendations, high social patients responsibility in re-

spect of the conservation of their own health (changing lifestyle, giving up of smoking, compulsory observance recommendation of the physician, etc.)

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EXPRESSION OF HLA-DRA,-DMA AND CIITA GENES IN BURN INJURY PATIENTS WITH SYSTEMIC INFLAMMATION RESPONSE SYNDROME

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Severe thermal injury causes immune dysfunctions and frequently accompanied by developing of septic conditions, which characterized by decreased monocyte human leukocyte antigen-DR measurements.

Expression of HLA-DR on immune cells is regulated by specific genes. HLA-DM and CIITA genes have a strong influence on molecules of adaptive immune response. It is known, that genes of DM locus provides correct transport of HLA II molecules from endoplasmic reticulum and stable connection alpha-beta heterodimers with specific peptides. CIITA (class II transactivator) controls cellular specificity and expression of MHC II genes.

The aim of our research is to estimate expression of HLA-DRA,-DMA and CIITA genes in burn injury patients with SIRS-III (Systemic Inflammation Response Syndrome).

Patients and methods: Samples from 8 patients with burn injury and 10 healthy donors were investigated.

Expression of messenger RNA(mRNA) HLA-DRA, -DMA and CIITA genes was measured by quantitative polymerase chain reaction in real-time with reverse transcription (qRT-PCR real-time) using specific primers (Pachot A, 2005). Comparisons between groups were made using a nonparametric Mann-Whitney U test.

Results: We observed significant differences ($p < 0,05$) of genes (HLA-DRA, -DMA, CIITA) expression levels from patients and controls. Patients with severe burn injury had significant lower levels of genes expression in comparison with healthy donors. As genes HLA-DMA and CIITA have a strong influence on immune response (they are essential to ensure MHC II protein structure, transport, and peptide loading), their low expression in patients with severe thermal injury with SIRS-III could lead to deficient expression HLA-DR molecules on immune cells and

could be a reason of developing immunosuppression. Decreasing expression levels of these genes can be used as a marker of developing immunodepression.

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INFLUENCE OF COMBINED EFFECT OF ASBESTOS DUST AND RADIATION IN DOSAGE OF 0,2 GY ON ENERGY METABOLISM IN LONG-TERM PERIOD

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The study of remote effects of radiation damage influence is one of important lines of radiation medicine as it touches such socially meaningful problems like longevity, reproductive function, genetic effects of radiation on posterity, blastomogenic and non-blastomogenic effects, etc. The living body's bioenergetic disorder is of great importance in the pathology of X-ray sickness. It has been established that during the exposure the electron transport process in the cytochrome system, in chondriosomes of cells is broken and the process of oxidative phosphorylation disunites. The metabolic process regulation failure in cells can be not only the result, but also the most important component of pathogenetic mechanisms of radiation damage. The purpose of the present research has been the experimental study of cytochrome oxidase (CCO) and succinate dehydrogenase (SDG) energy metabolism enzymes' activity in tissues of adrenal bodies and immunocompetent organs and cells in the long-term period after a combined effect of radiation and chrysotile-asbestos dust.

For the realization of the purpose 3 sets of experiments on 40 nondescript white rat males weighing 180 ± 20 g were carried out. I group – intact ($n = 10$), II group – poisoned with chrysotile-asbestos dust ($n = 15$) and III group – poisoned + X-rayed ($n = 15$). For the simulation of experimental asbestosis the chrysotile-asbestos dust was administered to the trial rats' lungs (intratracheally) by the method of Gorodetskaya Ye.N. in the modification of Parashina V.I.. The III group animals were exposed to the radiation of 0,2 Gy one time 90 days before the investigation on the radiotherapy unit Agat-PM⁶⁰Co. The animals were killed by an incomplete decapitation method in two months after the intratracheal administration. The animals were killed according to the International recommendations on carrying out medico-biological research using animals (WHO Chronicle, 1985). For the investigation lymphocytes were segregated from the peripheral blood and homogenates were prepared

from the liver, milt, and thymus, lymph glands of the small intestine and adrenal bodies. The research findings were analyzed by standard methods of variation statistics using Student's test criteria.

As the investigations showed, when affected with chrysotile-asbestos dust, the CCO and SDG enzymes' activity in the adrenal body decreased 1,6 times and 3 times ($p < 0,001$) accordingly. In the III group animals subjected to the combined effect a sharp decrease of the SDG activity up to $0,014 \pm 0,002$ ($p < 0,001$) was registered, and the CCO activity didn't differ authentically from the control parameter. In its turn, these enzymes' activity decrease was also registered in the peripheral blood lymphocytes: in the II group the SDG activity decreases twice ($p < 0,001$), and the CCO one – 1,4 times ($p < 0,05$). Proceeding from the findings one can resume that in the above-mentioned cells the energy metabolism enzymes' activity decrease in the long-term period takes place, when subjected to the combined dust-radiation factor.

In the thymus at the asbestos dust affect the SDG activity increase 1,8 times ($p < 0,01$) was registered, and the CCO activity decreased up to $0,117 \pm 0,011$ ($p < 0,01$). In the II group animals the CCO activity was fixed at the level of $0,259 \pm 0,027$, and in the control animals this factor was within the limits of $0,198 \pm 0,012$ ($p < 0,05$). From the side of SDG a tendency to increase compared to the control was depicted in the thymus. As the investigations showed, in the II group animals an authentic SDG activity increase was registered in the liver and lymphatic glands: 17 times and 8,5 times ($p < 0,001$). In this case after asbestic poisoning the SDG activity increase was attended by the CCO activity decrease 1, 8 times ($p < 0,05$) and 1,4 times ($p < 0,01$) accordingly. There were no significant changes in the liver and lymph glands of the small intestine registered in the animals after the dust-radiation factor from the side of the CCO activity, its content almost conformed to the control values. The SDG enzyme's activity increase 4 times in the small intestine lymph glands and 10 times in the liver ($p < 0,001$) was placed on record. The milt CCO activity in the animals after the dust pollution and combined effect didn't change authentically ($p > 0,05$), and from the side of the SDG activity the 1,9 times decrease compared to the control value ($p < 0,05$) in the II group, 2,1 times – in the III group ($p < 0,05$) was registered.

The found out many-valued enzyme activity changes substantiate the supposition about a varied level of metabolic cost associated with specific and non-specific responses of the body at the combined effect of the factors. The high energy metabolism activity degree seems probable to be associated with the concentration of catecholamines, glucocorticoids and the dehydrogenase change rate in the Krebs cycle at the radiation injury of the body as one of the compensatory responses of the body to noci-influences. It was found out in the experiment that in the long-term pe-

riod after the combined effect the SDG activity increase in the liver and lymph glands and its decrease in the milt, adrenal bodies and lymphocytes take place. The low CCO activity in the long-term period is registered in the peripheral blood lymphocytes.

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METALLIC MERCURY EFFECT ON THE INDICES OF OXIDATIVE STRESS IN PERSONS WITH NEUROLOGICAL DISORDERS

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Metallic mercury is known to be one of the more toxic nonradioactive substances. Its exposure leads to the disorders in psychical and neurological states. Thereby the role of oxidative stress in the pathology development of the central nervous system (CNS) induced by the exposure to metallic mercury is not full studied.

Purpose This investigation aimed to study some indices of the antioxidant system and lipid peroxidation in the worker with neurological disorders after occupational exposure to metallic mercury.

Material and methods The employees who worked under harmful conditions more than 10 years have been examined. The following groups have been choosed to study: the persons without the diseases of the nervous system formed Group I, the persons with the vegetative disfunction (VD) - Group II, the persons with the newly revealed diagnoses of chronic mercury intoxication (CHI) - Group III, the patients with the long lasting occupational diseases of CMI-Group IV and the control Group V.

Nitrogen oxides (NO) level was determined using the spectrophotometric method base on its stable metabolites - nitrates and nitrites in the blood sera by means of of the GRIESS reagent. The concentration of the reduced glutathione (RG) in the whole blood was determined using the ELMANN reagent (DTNB). The superoxidedismutase (SOD) activity in the whole blood was determined based on the delay degree of adrenalin autooxidation in the alkaline vehicle. The determination of ceruloplasmin (CP) is based on the turbidimetric specific reaction which occurs between the anticeruloplasmin polyclonal antiserum and its corresponding antigen in optimal pH conditions and in the presence of polyethyleneglycole polymer by means of the test kits "SENTINEL" (Italy). The uric acid (UA) level in the blood was meas-

ured using the fermentative colorimetric method based on the end point with the standard by means of the test kits "DIACON" (Germany) with the biochemical analyzer "CORMAY MULTY" (Poland). The active products of tiobarbituric acid (TBA-AP) the content of with was determined using the spectrophotometric method in the interaction between malon dialdehyde and tiobarbituric acid were used as second products of the lipid peroxidation processes. The statistical processing of the results was performed using the soft-ware "STATISTICA". The comparisons of the average values of the quantitative signs in the Groups were performed using the ANOVA method by Kraskel-Wollis with the following paired inter-group comparison of the values by means of the U-method Mann-Whitney with the use of the BONFERRONI correction. The statistically significant difference in the comperation in pairs was taken under $P < 0.005$. The study results are presented as the average and standard declinations.

Results and discussion The state of analysis of the antioxidant system indices has revealed the lower level of RG in the persons Groups III (0.76 ± 0.16 mkM/ml, $p = 0.000$) compared with the indices of the control Group (0.99 ± 0.17 mkM/ml). The decrease in this index (0.79 ± 0.21 mkM/ml, $p = 0.000$ and 0.84 ± 0.17 mkM/ml, $p = 0.000$ respectively) compared with the control values has been revealed in the worker of Groups I and II, too. The SOD activity study has revealed the decrease in this value in all groups of the persons exposed to mercury. The fermentative antioxidant activity in the persons of Groups II and III, approaching to the values, was 10.79 ± 3.45 U/mgHb and 10.20 ± 3.57 U/mgHb, respectively. The activity of this ferment (11.32 ± 4.56 U/mgHb) was higher than the values above and was lower than the control indices (14.91 ± 4.58 U/mgHb, $p = 0.000$) in the workers having no pathology of the nervous system. It should be note that a partial restoration of SOD activity up to 11.43 ± 4.46 U/mgHb, but not reaching the control level ($p = 0.001$) was observed to be in the persons with the revealed diagnosis of occupational disease after stopping the mercury exposure. The CP level in the blood of the workers of Group I was lower (33.48 ± 6.57 mg/dl, $p = 0.003$) compared with the control indices (36.61 ± 4.15 mg/dl). The level of this analyte in the persons of Groups II and III did not differ from the control values and was 35.25 ± 5.55 mg/dl and 36.83 ± 5.91 mg/dl respectively. Thereto, the trend to the decrease in the CP contents has been revealed in the persons of Groups IV (33.13 ± 5.29 mg/dl, $p = 0.011$) compared with the control values. The level of uric acid in the blood sera of the persons examined did not significantly differ from indices of the control Group. However, it should be noted that there was a trend to increasing in this analyte in the persons of Group IV (303.3 ± 83.7 mkM/l, $p = 0.023$) compared with the control values (263.4 ± 45.0 mkM/l). The alterations in the antioxi-

dant system were found to follow by the accumulation of the second products of lipid peroxidation (LPO) only in the persons of Group III (5.44 ± 3.46 mkM/l), thereby, there were no significant differences from the control values (4.43 ± 2.37 mkM/l, $p > 0.005$). As to studying the polyfunctional index level - nitrogen oxide it should be noted that there was a slight ($p > 0.005$) decrease in its level in blood sera of the workers of Groups I and II (35.33 ± 9.29 mkM/l and 34.34 ± 78.74 mkM/l, respectively) compared with the control values (39.23 ± 13.78 mkM/l). Thereby, the trend to increase in this index was observed to be in the persons with the diagnosis of occupational disease, revealed at present (38.41 ± 11.99 mkM/l), compared with the persons of Groups I and II ($p = 0.090$ and $p = 0.050$, respectively). Simultaneously, the long-term stopping the exposure to the toxicant in the workers with the revealed diagnosis of CMI was not found to lead to the alteration in the NO metabolite concentrations in the blood sera (38.95 ± 11.51 mkM/l), compared with the indices in the patients examined with the diagnosis revealed at a present. So, SOD activity index was found to be the most sensitive one to the mercury exposure in the workers of all the groups. This ferment is known to take part in the dismutation reaction of superoxide-anion radical and the decrease in its activity is observed in inducing the tumour process, in the case of metal intake deficiency entering the active ferment centre. In this connection, it may be supposed, that the exposure to metallic mercury leads to the disorders of metabolism of this metal or induces the inhibition of the active SOD centre. The decrease observed in the fermentative antioxidant function was found to follow by the decrease in the reduced glutathione concentration, giving together a more pronounced disorder degree of antioxidant systems: there is an opinion that the interaction between reduced glutathione and the radicals may be effective only under conditions of the removing O_2 , that's why glutathione may form with SOD an original antioxidant systems. The reactions with forming the reactive thyl radicals may be developed in the disorder of SOD activity. Thus, the restoration of the concentration of the reduced glutathione in the persons with diagnosis of occupational diseases having no exposure to metallic mercury at the background of the decreased SOD activity may lead to the intensification of oxidative processes. This fact, possible, plays a definite role in progressing the neurological disturbances observed in the persons of this Group. As to ceruloplasmin and uric acid, their participation in the oxidative stress processes in exposure to metallic mercury was not found to be significant, in all probability. The accumulation manifestations of active oxygen forms need to study not at the level of second products of lipid peroxidation, but in the form active radicals.

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DIFFERENCE IN RATIO OF "GROWTH" NITROGEN AND "MAINTENANCE" NITROGEN IN C_3 AND C_4 -PLANTS

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One way to promote plant productivity lies in nitrogen nutrition various level usage for photosynthesis intensity regulation. The C_4 - plants (amaranth, panic grass, etc.), due to their special type of photosynthesis, have arrange of advantages over C_3 -plants (wheat, celosia, etc.) in taking carbon dioxide and reaching high productivity (Magomedov I.M., 1988). Nevertheless, for C^4 -plants the searches of ways to promote the productivity are also important. In C_4 -plants the nitrogen intake photosynthetic efficiency (NIPE) defined as photosynthesis per nitrogen unit is significantly higher, than in C_3 -plants (Brown R.H., 1978). However, for not all research men stick to such point of view (Koshkin Ye.I. and others, 1955), clearing up the reasons underlying such a phenomenon is rather topical. The purpose of the present work has been the follow-up study with intent to test the hypothesis about the direct dependence of NIPA on the C_4 -photosynthesis intensity in amaranth leaves, and also the nitrogen status value clarification for the photosynthesis intensity. The study objects were – amaranth (C_4 -plant) and celosia (C_3 -plant) of the Amaranthaceae family. We supposed that in young leaves, where the protein synthesis was going on, the photosynthesis rate (PR) should be higher, than in old ones, where the protein synthesis was restricted. The findings testified that the PR of amaranth young and old leaves in nitrogen variant with an eye to 1dm^2 of the surface was high. At the irrigation with the nitrogen free solution the PR decrease occurred. The PR with an eye to dry weight with nitrogen supply remained at the same level in both young and old leaves; but with nitrogen lack a significant PR decrease took place, especially in lower leaves. The dry weight of both old and young leaves of amaranth was twice as high, than that of the C_3 -plant. The photosynthesis intensity per 1 mg of chlorophyll was higher in young amaranth leaves both with and without nitrogen; the excluding of nitrogen from the solution didn't change the amaranth PR. In old leaves it was lower, than in young ones. The amount of nitrogen in amaranth old leaves was by 20-25 % lower, than in young ones. The same picture was observed at the NIPE calculation. The value of this factor in amaranth, both in young and old leaves with and without nitrogen, was much higher, than in C_3 -plant. As it was shown in our previous work (Shumilova A.A., Magomedov I.M., 1994), indeed, in amaranth the NIPE is significantly higher,

than in C_3 -plants, that is consistent with the data of a range of authors (Wrown R.H., 1978; Oaks A., 1994). It is known that more than half of the cell's soluble protein falls to ribulosebiphosphate carboxylase/oxygenase (RBPC/O), especially in C_3 -plants. Amaranth contains significantly less RBPC/O, therefore the nitrogen demands for basic enzymatic proteins synthesis are considerably decreased as well, and its main part is used to new cellular structures formation. So, in response to nitrogenous fertilizers application in amaranth a more intensive biomass growth, than that in C_3 -plants, takes place and less nitrates, than in the last ones, is accumulated in leaves. In all probability, it is it that explains a high NIPE level in amaranth. On the ground of the results obtained it is offered to divide mineral nitrogen in plants into "growth" nitrogen, which is higher in C_4 -plants, and homeostasis "maintenance" one, which is considerably prevalent in C_3 -plants.

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CLINICAL-LABORATORIAL FEATURES OF ORAL HEALTH STATUS IN DIABETES AND HYPERTENSIVE DISEASE PATIENTS

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An early detection of an attendant physical pathology in dental patients becomes more and more actual one year by year in connection with constant occurrence frequency increase of somatic diseases with modifications of their clinical implications and penetration beyond the framework of typical age range. First and foremost it concerns the nosologies, the intrapopulation expansion of which has acquired a pandemic character – diabetes (DB) and hypertensive disease (HD).

It goes without saying that in those cases, when the patient is aware of a somatic disease presence in him, the dentist will get the information content sufficient for the choice of further treatment at the beginning of attendance already, when the anamnesis is correct. However, the problem is that only about 40% of DB and HD patients are aware of their suffering from these diseases, as a result, the anamnestic information will be inauthentic – the patient will merely not be able to tell the doctor about what he doesn't know himself.

The information about the presence of an attendant physical pathology is able to influence to a great extent on the stomatological tactics. So, the HD presence is a contraindication to the administration of anesthetics combined with adrenalin. A stomatological surgical intervention in the DB patient will require

an antibacterial cover in most cases, but at the same time a "blind" prescription of antibiotics will not be useful at an analogous intervention into the patient not suffering from DB. The establishment of an interconnect system between the doctors of various specialties and operative corresponding of patients to a required specialist allows reducing the terms of patients' profile observance beginning and optimal medicamental correction of their state. It improves the health care delivery quality, reducing non-profile expenditures associated with redundant diagnostics and diminishing the resulting losses due to the quality retaining and such patients' longevity increase.

The **purpose of the study** is to prove the possibility to define hypertensive disease and diabetes presence risk persons at a dental attendance on the basis of clinical and laboratorial evaluation of their oral health status.

General characteristics of the study material

The clinical research of the study participants was carried out in accord with a specially developed card. The persons corresponding to the fitting criteria were included into the study. In all the examinees the index characteristic of their oral cavity organs and tissues, the composition and main physicochemical properties of oral liquid, the elemental composition of dental deposits were studied. The clinical study was carried out by the unified dental practice methods. The elemental composition of dental deposits was studied on the facilities accredited by the RAS for the performance of scientific research of biological profile.

After the preliminary stratification the set sample was distributed into five samples randomized in sex and age depending on the kind of physical pathology, the presence or absence of hard dental deposits. The factors supposedly confirming the risk of a concrete somatic pathology were studied. Their individual and resultant value was defined quantitatively. In all the stages of the research the statistical significance of intermediated and ultimate results and the authenticity of the advanced hypotheses were tested by nonparametric statistic methods.

The course of a series of somatic diseases is attended by the oral cavity organs' and tissues' alteration being manifested by a more active course of the carious disease, oral mucosa and parodontium damages. As a result of the present research the index evaluation of oral cavity state in HD, chronic pyelonephritis (CP) and 2 type diabetes patients was studied.

All the research participants were divided into main groups (HD, CP and DB patients) and comparison ones (persons without the studied somatic pathology with dental calculus presence – DCP and with no hard dental deposits – NDC). In all the research stages the statistical significance of the intermediated and ultimate results and the advanced hypotheses' authen-

ticity were tested by parametric and nonparametric methods of statistics.

For the clinical evaluation of the research examinees' oral cavity organs and tissues state the unified indexes possessing the maximal information capacity were used: CPF (the quantum index of carious, pulled out and filled teeth – the tooth decay intensity factor), PMA (papillary marginal alveolar index), OHI-V (oral health index according to Green-Vermillion) and DCI (dental calculus index). After obtaining absolute values all the studied clinical factors were classified. After their comparative estimation the following results were obtained.

Among the persons with somatic pathology the less CPF index values were registered at nephropathy, and the greatest ones – in HD patients. In DB patients the tooth decay intensity on the studied factor differed insignificantly from the analogous one in the persons with nephropathy. Comparing the caries intensity at the somatic pathology with the analogous factor in the persons thinking themselves to be healthy, it is established that in the last this factor was statistically significantly less (Wald-Wolfowitz runs test, $p < 0,05$) than in the HD patients.

The most negative parodontium state on the PMA index was registered in the patient groups of any age at DB and HD. The least values of the PMA index were in the nephropathy patients. Statistically significant differences (Wald-Wolfowitz runs test, $p < 0,001$) between the patient groups with somatic pathology and the patients with NDC were established.

At the comparative evaluation of the OHI-V values the worst oral health was in the DB patients, the OHI-V factors in the DB and HD patients' samples differing from the rest samples statistically significantly (Wald-Wolfowitz runs test, $p < 0,01$). The oral health state in the comparison group both with DCP and NDC turned out to be considerably better in all the age groups.

The DPI and DCI values appeared to be the highest in the DB and HD patients, and the least ones – in the nephropathy patients, the patient group with DC on the DPI factor being compared to the nephropathy patient group. At the same time the DCI was statistically significantly greater (Wald-Wolfowitz runs test, $p < 0,05$) in the DB and HD patients compared to the CP groups and the control.

For the somatic pathology screening possibility estimation the laboratory factors of oral liquid properties were also studied. All the participants of the research were divided into main groups (HD, CP and DB patients) and comparison groups (persons without the studied pathology with dental calculus presence – DCP and with no hard dental deposits - NDC). In all the research stages the statistical significance of intermediated and ultimate results and the authenticity of the advanced hypotheses were tested by parametric and non-parametric statistic methods.

At the comparative estimation of the studied laboratorial factors it was established that the oral liquid release rate in the DB and HD patients was considerably less than in the comparison groups (Wald-Wolfowitz runs test, $p < 0,05$). In the CP patients the release rate was decreased in the first age group only.

The oral liquid stickiness in the DB patients exceeded the factors marked in all the rest samples, both of the persons with somatic pathology and in the comparison groups, statistically significantly (Wald-Wolfowitz runs test, $p < 0,05$), in the sample of the NDC persons the spread of values proving to be minimal. The oral liquid surface strain factors didn't differ considerably both in the samples of patients with somatic pathology and comparison groups.

The oral liquid pH values were neutral in the NDC persons, shifted to the alkaline side in the HD patients with DCP and reached maximal values in the CP and DB patients. However, the depicted tendency didn't reach the values of statistical significance (in all the cases - Wald-Wolfowitz runs test, $p > 0,05$).

The concentration of phosphor in oral liquid exceeded the values of the NDC persons sample in the DB patients only significantly (Wald-Wolfowitz runs test, $p < 0,05$). In the rest cases there were no statistically significant differences registered, though a statistically insignificant tendency to the phosphor content increasing in the CP patients was marked.

Among the persons with somatic pathology the least total calcium concentration values corresponded to the HD patients, and the greatest ones – to the DB patients, statistically significant differences being registered (Wald-Wolfowitz runs test, $p < 0,05$). A considerable spread of values was registered in the CP patients and persons with DCP. The values of active calcium concentration factors in the group of persons with NDC proved to be statistically significantly less compared to all the other groups (Wald-Wolfowitz runs test, $p < 0,05$). The same tendencies were traced while studying the active calcium concentration in oral liquid.

The potassium concentration in oral liquid in all the samples of somatic patients exceeded the factors of NDC persons considerably (Wald-Wolfowitz runs test, $p < 0,05$). At the comparative estimation of the content of sodium in oral liquid its significant difference from the control was registered in the HD patients only (Wald-Wolfowitz runs test, $p < 0,01$).

The hydroxyapatite solubility product in all the samples exceeded the values of the NDC persons sample differing considerably from those of the DB (Wald-Wolfowitz runs test, $p < 0,01$), CP patients and persons with DCP (Wald-Wolfowitz runs test, $p < 0,05$).

At the comparative estimation of the total protein concentration it was found out that among all the samples there were no statistically significant differences registered (Wald-Wolfowitz runs test, $p > 0,05$).

Conclusions: 1. The clinical DPF, PMA, OHI-V and DCI indexes characterizing the oral health status differ statistically significantly in HD and DB patients from persons without the specified pathology. In CP patients and persons without this pathology there is no statistically significant differences of the given clinical indexes established.

2. Separate laboratorial characteristics of oral liquid (stickiness, phosphor, total and active calcium, sodium, potassium, hydroxyapatite solubility product) differ statistically significantly in HD and DB patients and persons without the specified somatic pathology.

3. A method of HD and DB screening at a stomatological attendance has been developed. On the basis of clinical indexes' values defining with their further ranging the persons with a significant or high risk of the presence of the studied pathology stand out. For the persons referred to a risk group by this method the total calcium and sodium (and sodium Na^{++}) content in the oral cavity are determined in the laboratory. The content of total calcium less than 0,06 g/l, and sodium – more than 0,2 g/l is typical for HD patients, while the content of total calcium more than 0,07 g/l is common for DB patients.

To the evidence based medicine opinion a clinical-laboratorial characteristic of oral cavity organs and tissues status in hypertensive disease, diabetes and chronic pyelonephritis patients has been given. It has been proved that in the patients with the studied pathology there are statistically significant differences of the oral cavity status index characteristic and physicochemical properties of oral liquid from analogous parameters of the research participants without the studied pathology. It has been proved that the clinical indexes characterizing the oral cavity health status are statistically significantly different in hypertensive disease and diabetes patients.

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MORBIDITY WITH TEMPORARY DISABILITY IN COAL AND CHEMICAL INDUSTRY WORKERS

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The Kemerovo Region – is the region with a developed coal mining and chemical industries, thus the problem of workers' health formation in these branches is a topical one for public health service of Kuzbass. The purpose of the research is to study morbidity with temporary disability (MTD) of coalminers and workers of chemical enterprises (WCE) (2000-2006). The information about the MTD was got by

the method of excerption from disability certificates. The statistical treatment was carried out with use of application program package STATISTICA 6.0. The highest MTD case rate ($1435,2 \pm 0,01\%$ against $915,8 \pm 5,0\%$; $P < 0,001$) and disease duration ($20,0 \pm 0,3$ days against $14,0 \pm 2,1$ days; $P < 0,001$) are registered in coal producers' workers. Respiratory diseases rank first within the MTD of coalminers and WCE structure ($31,1 \pm 1,4\%$ and $29,1 \pm 1,8\%$), the apparatus system and connective tissue diseases take the second place ($24,9 \pm 1,3\%$ и $19,4 \pm 1,6\%$). Within the coalminers' MTD structure the third place is taken by traumas, intoxications – $20,6 \pm 1,2\%$, at chemical productions – blood circulatory system diseases – $11,6 \pm 1,3\%$, that is connected with the specificity of the productions. The prophylaxis remains one of the priority principles of the National public health service, so, a special topicality is acquired by the development of prophylactic and rehabilitation programs for coalminers, which seems to be practical only after the in-depth study of health status and life quality of the given social group. A perspective direction is an individual integrated assessment of the disease rise risk depending on the affecting factors totality, that will allow forming groups of dispensary observation and carry out dedicated medical and preventive measures in them.

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CONDITION OF COAL INDUSTRY WORKERS' HEALTH

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The progressing RF population health deterioration is the fact of common knowledge, that is to the full extent referred also to coal enterprises workers. Taking into account the functioning Concept of the Presidential Program “Health of Working Population” the problems of coalminers' health preservation and promotion are gaining the priority-oriented value. The purpose of the given research has been the study of coal industry workers' total morbidity (TM). The data excerption from workers' disability certificates for the period from 1985 to 2006 was carried out. The ratings were processed using variance analysis methods on personal computer with MS EXCEL and STATISTICA 6.0 application program package. The authenticity of the got factors was estimated using the T-criterion of Student. The post-event analysis of the Kuzbass coalminers' health status testified that the TM had increased by 119,1%, from $1677,8 \pm 49,6\%$

(1985) to $1998,2 \pm 0,01\%$ (2006). The TM level decrease was registered in 1999 ($1315,4 \pm 0,01\%$). The TM structure changes took place. In 2006 respiratory diseases ranked first - 28,0% (1985 - 27,0%), the apparatus system and connective tissue diseases ranked second - 26,2% (1985 - 16,5%) and the third place was taken by traumas, intoxications and some other after-effects of external causes action - 16,5% (1985 - 25,1%). Among the main reasons exerting influence on the coalminers' health state there are social-occupational factors and low medical activity. The effect of the given factors on the TM occurrence is proved statistically by the analysis-of-variance method ($P < 0,05$). The research results suggest the necessity of coalminers' health status in-depth study and the development, based on the findings, of targeted preventive measures and rehabilitation program.

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TOTAL NON-ELASTIC RESISTANCE AND ALVEOLAR-CAPILLARY PERMEABILITY OF LUNGS AT COMMUNITY ACQUIRED PNEUMONIAS

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The investigation of clinical-physiological manifestations of community-acquired pneumonias (CAP) quite allows characterizing the patient's state and forming the functional component of the diagnosis (Chuchalin A.G. and co-authors, 2006). In particular, it is spread to the determination of the external respiration apparatus, which remains insufficiently studied at CAP up to the present time. So, the total non-elastic lung resistance (TNR) defined at the respiration biomechanics investigation at pneumonias was studied in single works (Tetenev F.F., 1981; Marshall R., Christie R., 1954). There are no works found out by us on the CAP TNR of lungs and its component – tissular rub – on lung zones and compared to the alveolar-capillary permeability of lungs.

The **purpose** of the work is to study and compared the lung TNR and alveolar-capillary permeability (ACP) in CAP patients in the acute period of the disease.

Materials and methods

35 patients suffering from the medium severity level CAP were examined, among them 21 pa-

tients with the focalization of pulmonary infiltration in the inferior lobe of the right lung and 14 patients with that in the inferior lobe of the left lung in the disease acuity (2-3 days of hospitalization); all the patients being aged from 16 to 55 years old. All the CAP patients and 30 healthy volunteers (I control group) were subject to the lung TNR investigation, the last being carried out in the phase of inspiration (TNR_{insp}) and expiration (TNR_{exp}): integral and regional values. The integral TNR was measured by the method of transpulmonary pressure and spiogram simultaneous recording. The regional TNR values in the superior, central and inferior lobes of lungs were measured by means of the simultaneous recording of zonal ventilation rheograms by the method of Fringerman E.A. and transpulmonary pressure. The graphic recording of the curves and the computation of integral and regional TNR factors was performed by means of a special computer program. Also, the ventilating pulmonoscintigraphy was performed on all the CAP patients and 10 healthy volunteers (II control group). The nuclear medicine studies were carried out on the gamma camera "Omega 500" ("Technicare", USA-Germany). The image registration and processing was performed with the help of the computer system "Scinty" produced by the RDC "Gemos" (Russia). As the radiopharmaceutical (RPC) for the ventilating pulmonoscintigraphy the DTPA was used. The polypositional static pulmonoscintigraphy was carried out after finishing the RPC inhalation in four standard projections, then repeatedly on the 10th and 30th min in the posterior-frontal projection. In the CAP patients and II control group the ACP was determined on the 10th and 30th min: primarily in the affected and intact lungs, then additionally in every lung on the 3 lobes (superior, central and inferior) – so called regional factors. As there were no authentic ACP differences between the right and left lungs and also the superior, central and inferior lobes found out in the control group, the general ACP values for the corresponding lung lobes were used. The findings got were subject to statistical processing with the help of the program STATISTICA-6, for Windows.

Results

The integral TNR_{exp} values were higher in the CAP patients, than in the healthy persons ($0,540 \pm 0,049$ kPa·sec/l and $0,369 \pm 0,036$ kPa·sec/l; $p = 0,003$). As a result of the TNR regional values studies in the CAP patients it was found out that in the affection area the TNR_{exp} increased with the infiltration presence in the inferior lobe of the right lung, and the TNR_{insp} and TNR_{exp} increased, if the infiltration was focalized in the inferior lobe of the left lung. In the inferior lobe of the intact lung the TNR didn't change; in the central lobe of the right lung the TNR_{insp} and TNR_{exp} were increased at any focalization of the pathologic process; in the superior lobe of the intact lung the TNR_{exp} increased at the dextral CAP and the TNR_{insp} and TNR_{exp} increased at the

sinistral CAP. The lung ACP integral values increase was found out on the 10th and 30th min of the investigation in the affected (22,1±3,4% and 36,6±2,4%; p=0,007 and 0,003) and intact (20,4±3,8% and 33,9±3,5%; p=0,003 and 0,006) lungs at the lung infiltration focalization in the inferior lobe of the right lung, and also in the affected (20,4±3,2% and 35,2±3,8%; p=0,005 and 0,002) and intact (7,4±2,4% and 32,4±2,4%; p=0,004 and 0,005) lungs at the lung infiltration focalization in the inferior lobe of the left lung. In the CAP patients (irrespective of the lung infiltration focalization) an ACP increase for radioaerosol was registered, first, ambilateral – both in the affected and in all intact lobes of both lungs, second, both on the 10th and 30th min of the investigation. Thus, at the CAP acuity a diffuse increase of the lung alveolar-capillary structures' permeability was found out.

Conclusions

The obtained results of the lung TNR and ACP regional values changes say apparently for an increased genuine mechanical lung activity in these lobes, due to the action of which a significant part of the lung TNR is worn down.

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PERVERSION OF REGIONAL RESPIRATORY LOOPS OF LUNGS IN HEALTHY PERSONS AND BRONCHOPULMONARY SYSTEM DISEASE PATIENTS

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Nowadays, lungs are considered as a passive elastic body, the respiratory movements of which are conditioned by the effect of forces on the part of the chest wall, respiratory musculature and diaphragm. In the process of respiratory movements the changes of transpulmonary pressure anticipate the changes of lung volume. The phase shifting between these processes is called hysteresis, it manifests itself in the form of a respiratory loop reflecting the amount of breathing work to wear the total non-elastic resistance of lungs down. However, a paradox was found out, when the lung volume changed earlier, than the transpulmonary pressure did, that was called the respiratory loop perversion or negative hysteresis of lungs. According to the first law of thermodynamics such a phenomenon is only possible in the case of action of intrapulmonary source of mechanical energy

performing the inspiratory and expiratory volume change besides the effect of the forces on the part of the thoracic cage and diaphragm. The paradoxical facts described referred to the integral pulmonary mechanics, whereas the regional pulmonary mechanics remained practically unexplored.

The **purpose** of the investigation is to study regional respiratory mechanics in healthy persons, community-acquired pneumonia (CAP) and chronic obstructive pulmonary disease (COPD) patients and find out, if the phenomenon of the respiratory loop perversion takes place on the regions of lungs.

Materials and methods

92 patients were examined, among them there were 30 male volunteers (aged 19,78±1,35), 31 patients with chronic obstructive pulmonary disease of I-II stage in the phase of fading acuity with the duration of the disease from 7 to 20 years, 19 men and 7 women (aged 43,93±3,03) and 31 – the community acquired patients in their acuity, 28 men and 3 women (aged 40,76±2,23). The regional respiratory mechanics factors were determined by means of simultaneous recording of zonal ventilation rheograms on six zones of lungs and transpulmonary pressure. The graphic recording of the curves and the computation of integral and regional TNR factors was performed by means of a special computer program. The graphic recording of the curves and the computation of regional factors of respiratory mechanics was performed by means of a special computer program.

Investigation results

There was found the respiratory loop perversion phenomenon, which is described for the first time ever. The perversion of the mechanical hysteresis of lungs is a fundamental contradiction in the paradigm of Donders. In our investigations of the regional respiratory loop perversions were registered in 15 healthy volunteers, in 9 CAP patients, in 7 patients with chronic obstructive pulmonary disease. The average values of negative regional hysteresis of lungs (non-elastic breathing work) in healthy persons made 1,692±0,266 Om·m/min, in CAP patients - 1,077±0,237 Om·m/min, at COPD - 0,672±0,211 Om·m/min. The presence of negative regional hysteresis in healthy persons testifies to significant functional possibilities of lungs and also to the fact that in normal conditions at spontaneous breathing a more or less participation of lungs in pulmonary mechanics is possible, that is manifested in lung mechanical properties discontinuity on regions. The negative regional hysteresis is a positive qualitative characteristic of the mechanical system of lungs. This supposition was based on the fact that the regional respiratory loops perversion was illustrative of healthy persons in a greater degree. Besides, the detectability of negative regional loops reduced with the increase of load on the external respiratory apparatus under the effect of pathological factors (regional respiratory loops perversions occurred 1,7 times as seldom in CAP pa-

tients, and twice as seldom in COPD patients, than in healthy persons). It, in its turn, said for the fact that as distinct from healthy persons a smoothing of lung mechanical characteristics on regions was registered in the CAP and COPD patients. Evidently, it was associated with the fact that at the pathology, when there is a disturbance of pulmonary mechanics and the load on the external respiration increased, the degree of separate regions' participation discontinuity in the pulmonary mechanics reduced, that was considered by us as the manifestation of lung regional homeostasis support mechanism action. The strain of the system supporting mechanical homeostasis resulted in leveling of lung mechanical characteristics on regions,

their mechanical discontinuity reduced and the perversions of regional respiratory loops were found out more seldom.

Conclusions

While studying regional pulmonary mechanics the phenomenon of regional respiratory loop perversion was found out in healthy persons in 50% of the cases, in CAP patients – in 29% of the cases, in COPD patients – in 23,8% of the cases.

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Short reports

PLASMATIC LEVEL OF THROMBIN-FIBRINOGEN INTERACTION MARKERS IS CONNECTED WITH LIPID PEROXIDATION IN THROMBOCYTES, LEUCOCYTES AND ERYTHROCYTES (PART IV)

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Blood cells supposedly implement the connection between lipid peroxidation (LPO) and hemostasis [1, 2]. For the participation degree valuation of thrombocytes, erythrocytes and leucocytes - the cells, the role of which in the relation between LPO and continuous intravascular blood clotting has been established [3, 4], we studied the dynamics of the LPO shifts' nascence and intensity in these cells in vivo, and found out if the LPO shifts in the cells were con-

nected with the shifts of thrombin-fibrinogen interaction (TFI) markers' level, practically, the markers of continuous intravascular blood clotting (CIBC) [5-9].

While planning the experiments, we chose the actions promoting a slowly developing effect, that allows solving two problems: 1) to elicit the fact of the change nascence priority order, 2) to evaluate the degree of changes taking place in various cells under the same conditions of the experiment (i.e. in one experimental group of animals). Taking into account the fact that a large volume of blood is needed for the cells' separation, there were so many rats included into the groups, that the number of laboratory definitions (n) after pulling of individual blood samplings were not less than six: the groups usually including 6 rats were expanded to 30 (in the group of 30 rats the blood of 5 rats was combined into one batch, the value of n was equal to 6). Totally 600 nonlinear white rats (170±10 g) were used.

Table 1. The content of plasmatic markers of CIBC, LPO and AOP in thrombocytes, monocytes, neutrophils and erythrocytes in different terms after 6-MTU administration, 150 mg/kg (n = 6)

Factors	Control	20 th day	25 th day	30 th day	35 th day
P ₃ , %	85.2±2.0	87.1±2.1	85.2±1.4	79.1±1.2* ⁺	74.7±1.3* ⁺
P ₄ , sec	3.3±0.06	3.1±0.03	2.8±0.06	2.1±0.04* ⁺	1.8±0.04* ⁺
FSP, mg%	16.8±1.1	16.2±0.5	15.5±0.07	13.0±0.04* ⁺	12.1±0.04* ⁺
SFMC, mcg/ml	25.4±1.1	24.2±1.1	23.2±1.0	20.1±0.4* ⁺	18.3±0.3* ⁺
D-D, mcg/ml	0.20±0.007	0.18±0.010	0.17±0.007	0.15±0.002* ⁺	0.13±0.006*
DC, A/mg LP	0.045±0.004 0.032±0.003 0.027±0.002 0.021±0.002	0.044±0.004 0.029±0.003 0.030±0.003 0.022±0.003	0.031±0.0005* ⁺ 0.027±0.003* ⁺ 0.029±0.002 0.022±0.019	0.024±0.0005* ⁺ 0.019±0.0003* ⁺ 0.022±0.0002* ⁺ 0.017±0.0001* ⁺	0.020±0.0003* ⁺ 0.016±0.0002* ⁺ 0.019±0.0003* ⁺ 0.016±0.0004* ⁺
TBA, units/mg LP	0.76±0.056 0.54±0.004 0.33±0.003 0.29±0.002	0.71±0.029 0.55±0.005 0.35±0.005 0.39±0.003	0.55±0.031* ⁺ 0.49±0.004* ⁺ 0.30±0.003 0.27±0.003	0.48±0.012* ⁺ 0.43±0.007* ⁺ 0.27±0.004* ⁺ 0.20±0.002* ⁺	0.39±0.024* ⁺ 0.38±0.025* ⁺ 0.23±0.006* ⁺ 0.19±0.03* ⁺
IP, min/ml	48.5±2.3 48.5±2.3 46.4±2.1 47.3±2.0	53.9±1.0* 48.1±2.1 47.4±2.2 49.9±2.1	59.9±1.3* ⁺ 50.9±1.9* ⁺ 49.4±2.3 51.9±2.3	64.8±1.4* ⁺ 56.7±1.5* ⁺ 54.1±2.1* ⁺ 52.8±2.0* ⁺	67.2±1.3* ⁺ 59.3±1.4* ⁺ 56.1±2.0* ⁺ 53.9±1.8* ⁺
OR, MM ³ /min	0.69±0.04 0.64±0.03 0.61±0.04 0.63±0.05	0.65±0.03* 0.62±0.05 0.59±0.03 0.60±0.03	0.60±0.02* 0.58±0.03* 0.57±0.04 0.59±0.04	0.48±0.03* ⁺ 0.56±0.03* ⁺ 0.55±0.04* 0.57±0.04*	0.39±0.02* ⁺ 0.54±0.03* ⁺ 0.51±0.02* ⁺ 0.56±0.03*

Symbols: P₃ – P₃ factor, FSP – fibrin split products, SFMC – soluble fibrin-monomeric complexes, TBA – products reacting with thiobarbituric acid, IP – induction period, OR – oxidation rate; * - authentic difference from the control, + - authentic difference of the 4th, 5th and 6th columns from the 3rd one. **Note:** the LPO factors represented in the 2-6th columns were determined in thrombocytes (upper line), monocytes (2nd line), neutrophils (3rd line) and erythrocytes (4th line).

For the LPO inhibition 6-methylthiouracil (6-MTU) and an antioxidant dimephosphon (DM) were used, for the LPO activation thyroxine (T₄) and lead acetate were used (sampling dosage and terms – in the tables). The TFI markers (factors P₃, P₄ FSP, SFMC and D-dimers) were defined according to the description [10, 11], the LPO and antioxidant potential (AOP) were controlled as it is shown [12, 13]. DM, 6-MTU, thyroxine (T₄) or lead acetate were administered to the rats daily.

From the table 1 it is clear that the LPO activity is gradually decreasing and the antioxidant potential (AOP) is growing in thrombocytes. The TFI markers' level decrease happens later: only on the 30th and more noticeable – on the 35th day the level of FSP, SFMC and D-dimers fell down. In thrombocytes and monocytes there appeared a tendency to the LPO inhibition and AOP growth on the 20th day; on the 25th day these shifts became authentic; on the 30th day they enhanced and by the 35th day became still more significant.

In neutrophils the changes were of the same directivity (gradual LPO lowering and AOP growth), but authentic shifts appeared by the 30th day only. In erythrocytes, monocytes and neutrophils the shifts are the same, but by the 35th there were no shifts registered.

Similar experiments were carried out with DM – the LPO inhibitor varying from 6-MTU by the action mechanism. On the data of table 2, on the 5th day of the DM administration the AOP (IP elongation and OR reduction) was increased in thrombocytes and to a less extent – in monocytes. In the other cells the factors didn't differ from the control values. On the 10th day the LPO inhibition and AOP growth were detected in thrombocytes and monocytes. On the 15th day these shifts were enhanced in thrombocytes and monocytes, and in neutrophils and erythrocytes the LPO slowed down and the AOP grew (the DC and TBA level decreased, IP elongated and OR reduced).

Table 2. The content of plasmatic markers of TFI, LPO and AOP in thrombocytes, monocytes, neutrophils and erythrocytes after DM administration, 1.0 g/kg, (n = 6)

Factors	Control	5 th day	10 th day	15 th day	20 th day
P ₃ , %	84.9±1.7	85.2. ±1.2	81.9±1.9	77.2±1.1* ⁺	72.1±1.2* ⁺
P ₄ , sec	3.3±0.05	3.1±0.05	2.9±0.02*	2.0±0.03* ⁺	1.6±0.03* ⁺
FSP, ml%	15.9±1.1	15.8±1.1	16.5±0.08	13.1±0.02* ⁺	11.0±0.03* ⁺
SFMC, mcg/ml	26.0±1.2	24.7±1.2	22.8±1.1	19.0±0.3* ⁺	16.7±0.3* ⁺
D-D, kg/ml	0.18±0.007	0.21±0.012	0.17±0.012	0.15±0.003* ⁺	0.12±0.008*
DC, A/mg LP	0.044±0.003	0.043±0.005	0.029±0.0006* ⁺	0.019±0.0007* ⁺	0.016±0.0003* ⁺
	0.034±0.003	0.034±0.006	0.0.27±0.004* ⁺	0.021±0.0003* ⁺	0.016±0.0004* ⁺
	0.028±0.002	0.030±0.003	0.026±0.004	0.020±0.0002* ⁺	0.018±0.0002* ⁺
	0.020±0.003	0.022±0.003	0.021±0.019	0.016±0.0001* ⁺	0.015±0.0003* ⁺
TBA,units/mg LP	0.73±0.050	0.72±0.030	0.51±0.032* ⁺	0.46±0.011* ⁺	0.36±0.022* ⁺
	0.54±0.003	0.52±0.006	0.47±0.003* ⁺	0.42±0.004* ⁺	0.39±0.026* ⁺
	0.32±0.003	0.32±0.004	0.28±0.004	0.28±0.003* ⁺	0.22±0.004* ⁺
	0.31±0.002	0.33±0.004	0.26±0.004	0.21±0.003* ⁺	0.18±0.02* ⁺
IP, min/ml	48.1±2.2	54.6±1.1*	61.3±1.2* ⁺	65.9±1.3* ⁺	69.3±1.4* ⁺
	48.4±2.2	48.4±2.2	53.8±1.1* ⁺	56.9±1.3* ⁺	59.9±1.3* ⁺
	47.8±2.1	47.9±2.3	48.9±2.4	55.3±2.0* ⁺	56.5±1.9* ⁺
	47.2±2.3	49.1±2.0	50.1±2.2	52.9 ±1.9* ⁺	54.8 ±1.7* ⁺
OR, mm ³ /min	0.71±0.03	0.63±0.03*	0.58±0.03*	0.48±0.03* ⁺	0.36±0.03* ⁺
	0.65±0.02	0.57±0.06*	0.56±0.02*	0.54±0.02* ⁺	0.52±0.03* ⁺
	0.60±0.03	0.58±0.04	0.57±0.03	0.53±0.03*	0.50±0.03* ⁺
	0.62±0.04	0.61±0.04	0.58±0.05	0.54±0.03*	0.54±0.04*

Symbols: like in table 1; * - authentic differences from the control; + - the difference of the 4th, 5th and 6th columns from the 2nd one. **Note:** like in table 1.

On the 20th day all the enumerated shifts in all the cells, especially in thrombocytes, enhanced.

The TFI markers' level shifts are as follows: on the 10th day only the P₄ factor level decreased, on the 15th day all the other factors decreased, the shift became still more noticeable by the end of the observation.

Hence, as in the experiment with 6-MTU, the LPO and AOP change earlier than the TFI markers' level shifts appear (according to the CIBC). The fact that according to the ability to react on the LPO changes the investigated cells are ranged in the following succession:

thrombocytes > monocytes > neutrophils > erythrocytes.

Further on, T₄ or lead in the dosages changing the LPO and AOP [14, 15] were used in the experiments, and the following was found out (table 3): on the 5th day of T₄ administration the signs of LPO acceleration in thrombocytes, monocytes and erythrocytes appeared (DC and TBA level growth), the AOP decreased (the IP shortening in thrombocytes and neu-

trophils, and OR growth in thrombocytes, monocytes and neutrophils). All the shifts are little, but authentic ($p < 0.05$); by the 7th day, and especially by the 9th one, the shifts enhanced (exclusive of neutrophils and erythrocytes, wherein the shifts on the 7th and 9th day were practically the same).

Table 3. The content of plasmatic markers of TFI, LPO and AOP in thrombocytes (upper line), monocytes (2nd line), neutrophils (3rd line) and erythrocytes (4th line) in various terms of T₄ administration, 8.0 mg/kg (n = 6).

Factors	Control	3 rd day	5 th day	7 th day	9 th day
P ₃ , %	85.4±1.4	86.0±1.7	89.0±1.1	91.6±1.0*	98.2±1.3*
P ₄	3.2±0.02	3.4±0.06	3.5±0.05	4.1±0.05*	4.6±0.02*
FSP, mg%	15.8±1.0	16.1±0.8	16.9±0.09	18.3±0.06*	23.8±0.06*
SFMC, mcg/ml	26.4±1.5	25.9±1.2	28.1±1.3	27.9±1.5	32.4±0.6*
D-D, mcg/ml	0.21±0.005	0.22±0.014	0.22±0.011	0.23±0.010	0.29±0.004*
DC, A/mg LP	0.050±0.002	0.051±0.003	0.064±0.001*	0.072±0.003*	0.081±0.005*
	0.031±0.002	0.033±0.004	0.037±0.003*	0.040±0.004*	0.044±0.003*
	0.024±0.003	0.025±0.002	0.029±0.003*	0.031±0.003*	0.036±0.004*
	0.021±0.003	0.020±0.003	0.024±0.004	0.028±0.003*	0.032±0.002
TBA, units/mg LP	0.75±0.051	0.79±0.021	0.93±0.031*	0.99±0.039*	1.21±0.039*
	0.52±0.004	0.50±0.005	0.55±0.002*	0.62±0.005*	0.68±0.006*
	0.33±0.004	0.31±0.002	0.35±0.005	0.38±0.002*	0.40±0.003*
	0.28±0.003	0.29±0.004	0.34±0.002*	0.36±0.003*	0.37±0.002*
IP, min/ml	48.1±2.2	46.1±1.5	42.0±1.3*	40.1±1.2*	36.0±1.3*
	48.4±2.2	48.0±2.0	47.0±2.4	44.2±2.0*	42.5±2.1*
	47.8±2.1	49.7±2.2	44.8±1.8*	43.1±2.2*	44.1±2.0*
	48.2±2.3	47.6±2.4	46.2±2.2	44.2±2.3*	44.9±2.2*
OR, mm ³ /min	0.71±0.03	0.76±0.07	0.82±0.03*	0.88±0.05*	0.94±0.04*
	0.64±0.03	0.66±0.03	0.68±0.02*	0.71±0.03*	0.72±0.02*
	0.59±0.03	0.61±0.04	0.66±0.02*	0.68±0.04*	0.69±0.04*
	0.64±0.04	0.65±0.03	0.67±0.04	0.69±0.03*	0.89±0.03*

Symbols: like in table 1; * - authentic difference from the control

The TFI markers' (FSP, SFMC, P₃ and P₄ factors) level increase was detected on the 7th day of the experiments already. On the 9th day the shifts were more noticeable, plus the D-dimers' level increase.

In the experiments with the administration of lead – a pro-oxidant, (table 4) differing from T₄ on the action mechanism, the following was found out: on the 10th day already the LPO and AOP shifts were detected (the TBA and DC growth in thrombocytes and monocytes, and DC growth in neutrophils as well), the IP shortening in all the cells (excepting erythrocytes) and OR increase (exclusive of neutrophils). By the 12th day the shifts became more significant and spread onto all the cells, enhancing by 15th and 18th days.

The content of TFI markers didn't change on the 10th and 12th days of the lead administration, but somehow increased (excepting SFMC and D-dimers) by the 12th day. On the 18th day the content of all the TFI markers was increased.

Thus, while being administrated in comparatively small doses, lead and T₄ cause the progressing growth LPO intensity and the AOP reduction. These shifts are ahead of the TFI markers' level change in time.

The data got allow coming to the following conclusions:

1. The LPO activation or inhibition and the conforming to them decrease (or increase) of the AOP are attended by a decrease (increase accordingly) of the TFI intensity, i.e. the intensity of the continuous intravascular blood clotting.

2. The LPO and AOP changes in thrombocytes preface the changes of continuous intravascular blood clotting intensity.

3. Simultaneously with the LPO and AOP changes in thrombocytes, while affected with pro- and antioxidants, the LPO and AOP in monocytes, heterophilic leukocytes and erythrocytes change in the same direction.

In connection with this it seems to be advisable to control the content of plasmatic TFI markers at the diseases attended with the activation of free-radical processes.

Naturally, the investigations aimed at the specification of the character of the relation between the LPO intensity in blood cells, especially in thrombocytes, and the CIBC markers' content make sense.

Table 4. The content of CIBC markers in plasma, LPO and AOP in thrombocytes, monocytes, neutrophils and erythrocytes (1st, 2nd, 3rd and 4th line accordingly) in various terms of lead acetate administration in the dosage of 50 mg/kg (n = 6 in every stage).

Factors	Control	10 th day	12 th day	15 th day	18 th day
P ₃ , %	85.3±1.4	86±1.5	87.8±1.1	101±1.4*	122±1.7*
P ₄ , sec	3.1±0.02	3.3±0.03	3.5±0.05	4.1±0.03*	5.0±0.04*
FSP,mg %	17.0±1.0	16.9±0.8	16.8±0.1.0	19.9±0.7*	24.2±0.06*
SFMC, mcg/ml	25.4±1.3	25.9±1.2	26.4±1.3	29.1±1.4	36.8±0.7*
D-D, mcg/ml	0.18±0.003	0.20±0.014	0.19±0.011	0.27±0.034	0.35±0.011*
DC, A/mg LP	0.048±0.003 0.033±0.002	0.057±0.003* 0.039±0.001*	0.064±0.004* 0.042±0.002*	0.072±0.003* 0.048±0.005*	0.083±0.006* 0.05±0.002*
TBA, units/mg LP	0.76±0.052 0.51±0.003	0.83±0.022* 0.56±0.002*	0.94±0.033* 0.59±0.002*	0.98±0.032* 0.64±0.005*	1.25±0.041* 0.69±0.005*
IP, min/ml	48.5±2.1 47.1±1.9	44.1±1.1* 45.0±0.4*	41.1±1.1* 44.1±2.0*	39.6±1.2* 42.1±1.2*	35.2±1.3* 41.3±2.0*
OR, mm ³ /min	0.70±0.03 0.65±0.02	0.76±0.03* 0.69±0.01*	0.83±0.04* 0.67±0.02*	0.89±0.04* 0.72±0.04*	0.96±0.04* 0.73±0.03*

Symbols: like in table 1; * - authentic difference from the control.

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PLASMA INTACT FIBROBLAST GROWTH FACTOR 23 LEVELS IN WOMEN WITH ANOREXIA NERVOSA

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Background: Fibroblast growth factor (FGF)23 is a novel phosphaturic factor associated with inorganic phosphate homeostasis. Previous human studies have shown that serum FGF23 levels increase in response to a high phosphate diet. For anorexia nervosa (AN) patients, inorganic phosphate homeostasis is important in the clinical course, such as in refeeding syndrome. The purpose of this study was to determine plasma levels of intact FGF23 (iFGF23) in restricting-type AN (AN-R) patients, binge-eating/purging-type AN (AN-BP) patients, and healthy controls.

Methods: The subjects consisted of 6 female AN-R patients, 6 female AN-BP patients, and 11 healthy female controls; both inpatients and outpatients were included. Plasma iFGF23, 1,25-dihydroxyvitamin D (1,25-(OH)₂D), and 25-hydroxyvitamin D (25-OHD) levels were measured. Data are presented as the median and the range. A two-tailed Mann-Whitney U-test with Bonferroni correction was used to assess differences among the three groups, and a value of $p < 0.017$ was considered statistically significant.

Results: There were no differences between AN-R patients and controls in the iFGF23 and 1,25-(OH)₂D levels. In AN-BP patients, the iFGF23 level (41.3 pg/ml; range, 6.1–155.5 pg/ml) was significantly higher than in controls (3.8 pg/ml; range, not detected–21.3 pg/ml; $p = 0.001$), and the 1,25-(OH)₂D was significantly lower in AN-BP patients (7.0 pg/ml; range, 4.2–33.7 pg/ml) than in controls (39.7 pg/ml; range, 6.3–58.5 pg/ml; $p = 0.015$). No differences in plasma 25-OHD levels were observed among the groups.

Conclusion: This preliminary study is the first to show that plasma iFGF23 levels are increased in AN-BP patients, and that these elevated plasma FGF23 levels might be related to the decrease in plasma 1,25-(OH)₂D levels.

Findings

Fibroblast growth factor (FGF)23, a circulating 26 kDa peptide produced by osteogenic cells, is a novel phosphaturic factor. It is important for the regu-

lation of inorganic phosphate homeostasis and for vitamin D metabolism [1]. FGF23 inhibits renal proximal tubule phosphate reabsorption, increases renal phosphate excretion, and reduces serum phosphate without affecting serum calcium. FGF23 also strongly suppresses 1,25-(OH)₂D production [2,3].

Anorexia nervosa (AN) is an eating disorder characterized by decreased caloric intake, low weight, and reduced body fat. To date, two subtypes have been identified: restricting-type (AN-R); and binge-eating/purging-type (AN-BP). AN is diagnosed by weight loss and refusal to maintain a minimal normal body weight, an intense fear of gaining weight or becoming fat, a self-evaluation unduly influenced by body shape and weight, and amenorrhea [4]. AN-R patients restrict food intake, while AN-BP patients regularly engage in binge-eating and/or purging.

In patients with AN, refeeding syndrome is a well-known phenomenon that occurs during the course of nutritional rehabilitation; it is characterized by hypophosphatemia, which may result in serious consequences, such as cardiac dysrhythmia, delirium, and even sudden death [5]. Although inorganic phosphate homeostasis is important in AN patients, no previous studies have examined plasma FGF23 levels in AN. Therefore, the present study determined plasma FGF23 concentrations in AN-R patients, AN-BP patients, and healthy controls.

The subjects included 12 female AN patients who met the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV) [4] and 11 healthy female controls. The 12 AN patients included 6 patients with AN-R and 6 patients with AN-BP. No patients had a previous diagnosis of bulimia nervosa. The study's cases included outpatients and inpatients of the University of Tokyo Hospital. Except for proper doses of antidepressants, anxiolytics, hypnotics, laxatives and stomach agents, patients with AN-BP were treated with lactomin (3 g/day; $n = 1$), lomerizine (10 mg/day; $n = 1$) and pantethine (300 mg/day; $n = 1$), and AN-R patients and controls did not receive drug therapy. Premorbid renal dysfunction was an exclusionary criterion.

Blood samples were collected from all subjects after overnight fasting. The protocol was approved by the Institutional Ethics Committee of the University of Tokyo, and written informed consent was obtained from all subjects prior to enrollment in the study.

All blood samples were drawn into chilled tubes containing EDTA-2Na (1 mg/ml) and were then immediately centrifuged at 4°C. Plasma portions were stored at -70°C prior to analysis. Plasma concentrations of intact FGF23 (iFGF23) were measured using an ELISA kit (Immutopics, San Clemente, CA, USA) (6,7), with a sensitivity of 1.0 pg/ml, intra-assay variability of <4.4%, and inter-assay variability of <6.5%. All samples were analyzed in duplicate. Plasma 1,25-(OH)₂D and 25-OHD concentrations

were measured using RIA (SRL, Tokyo, Japan). Plasma calcium and phosphate concentrations were measured using standard laboratory methods (SRL).

A two-tailed Mann-Whitney U-test with Bonferroni correction was done after Kruskal-Wallis testing to assess differences among the three groups. A usual two-tailed Mann-Whitney U-test was used to assess differences between AN-R patients and AN-BP patients when healthy controls were missing data points. Values of $p < 0.05$ were considered statistically significant on the Kruskal-Wallis test and on the usual two-tailed Mann-Whitney U-test, and values of $p < 0.017$ were considered statistically significant on the two-tailed Mann-Whitney U-test with Bonferroni correction. Spearman's rank-correlation coefficients (ρ) was used to assess the relationship between iFGF23 and age and body mass index (BMI) for AN patients. All statistical calculations were performed using SPSS for Windows version 10.0 (SPSS, Chicago, IL, USA). All data are presented as the median and range.

Clinical profiles and biochemical data are summarized in Table 1.

Plasma calcium levels in AN-R patients were significantly increased when compared with controls

($p < 0.001$), while there were no differences between AN-BP patients and controls ($p = 0.350$). No statistically significant differences in plasma phosphate levels were observed among the groups.

Plasma iFGF23 levels were significantly greater in AN-BP patients than in controls ($p = 0.001$); there was no difference between AN-R patients and controls ($p = 0.149$; fig. 1). Plasma iFGF23 levels tended to be higher in AN-BP than in AN-R patients, but this difference was not statistically significant ($p = 0.041$). For AN patients, iFGF23 values did not correlate significantly with age ($\rho = 0.181$, $p = 0.574$) or with BMI ($\rho = -0.112$, $p = 0.728$).

No differences in plasma 25-OHD levels were observed among the groups. Plasma 1,25-(OH)₂D was significantly lower in AN-BP patients than in controls ($p = 0.015$) and in AN-R patients ($p = 0.015$); there was no difference between AN-R patients and controls ($p = 0.733$).

This is the first study to show that AN-BP patients have elevated plasma iFGF23 levels. Plasma iFGF23 levels were significantly greater in AN-BP patients than in healthy controls, while there was no difference in plasma iFGF23 levels between AN-R patients and controls.

Table 1. Clinical profiles and biochemical data of women with anorexia nervosa and healthy controls

	AN-R (n = 6)	AN-BP (n = 6)	Controls (n = 11)	P
Body Mass Index (kg/m ²)	16.0 * (13.8–17.4)	13.8 * (13.0–15.5)	19.7 (18.5–23.7)	<0.001
Age (years)	19 (17–32)	31 (19–38)	27 (21–32)	0.034
age at the time of disease onset (years)	17 (16–30)	24 (14–34)		
disease duration (years)	1.8 (0.5–3.0)	5.0 § (2.0–11.0)		
frequency of binge eating	None (none-none)	3.5/week (none–2–3/day)		
frequency of vomiting	None (none-none)	1/week § (none–2–3/day)		
Ca (mg/dl)	10.2 * ‡ (9.5–10.7)	9.1 (7.9–9.4)	8.9 (8.4–9.6)	0.018
P (mg/dl)	3.4 (3.1–4.2)	3.5 (3.0–4.0)	2.9 (2.0–3.7)	0.029
1,25-(OH) ₂ D (pg/ml)	34.4 (19.0–51.5)	7.0 * † (4.2–33.7)	39.7 (6.3–58.5)	0.023
25-OHD (ng/ml)	26 (19–30)	18 (11–31)	20 (12–28)	NS

All values are described as median (minimum-maximum).

P values in the rightmost column were calculated using Kruskal-Wallis tests.

* $p < 0.017$ vs. controls, using a two-tailed Mann-Whitney U-test with Bonferroni correction.

† $p < 0.017$ vs. AN-R, using a two-tailed Mann-Whitney U-test with Bonferroni correction.

‡ $p < 0.017$ vs. AN-BP, using a two-tailed Mann-Whitney U-test with Bonferroni correction.

§ $p < 0.05$ vs. AN-R, using a usual two-tailed Mann-Whitney U-test.

Previous reports showed that phosphate restriction significantly reduced FGF23 concentrations in healthy men and women [8-10]. In patients with severe malnutrition and a very limited phosphate intake, phosphate restriction is considered to be responsible for decreased FGF23 levels. In this study, the AN-R patients were all being treated as inpatients or outpatients; therefore, they might have had a certain amount of phosphate intake. This fact might have

contributed to the lack of a difference in iFGF23 levels between AN-R patients and controls in the present study.

Interestingly, plasma iFGF23 levels were significantly higher in AN-BP than in healthy controls, while there were no differences in plasma phosphate levels among the groups. During binge eating, AN-BP patients eat a large quantity of food at once, including foods such as chocolates, cakes, snacks, and sweet

buns, which generally contain moderate to large amounts of phosphate. In other words, binge eating in AN-BP patients might be regarded as acute phosphate loading. Previous reports found that, in healthy men and women, FGF23 concentrations were significantly increased by phosphate loading [9,10]; in healthy men, serum iFGF23 increased significantly 8 h after intake of 1,200 mg phosphate, compared to 8 h after intake of 400 mg and 800 mg phosphate [11]. Thus, our findings support the idea that AN-BP patients, most of whom have regularly engaged in binge eating, have increased plasma FGF23 levels due to the acute phosphate loading that occurs with binge eating. No previous reports have described the effects of binge eating on plasma FGF23 levels.

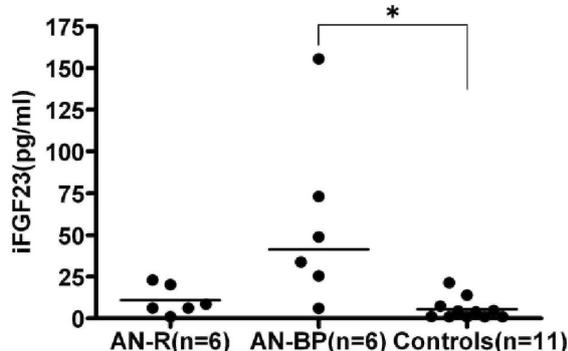


Fig. 1. Dot plots of plasma iFGF23 levels in AN patients and healthy controls. The graphs depict median values (bars). Two-tailed Mann-Whitney U-tests with Bonferroni correction were used to assess differences among groups. A value of $p < 0.017$ was considered statistically significant. * $p < 0.017$ vs. controls

An earlier report showed that frequent vomiting increased serum amylase levels in AN patients [12]. The serum amylase level is an established indicator of vomiting behavior in AN patients. However, currently there is no established indicator for binge eating behavior. This preliminary study implies that plasma FGF23 levels might be a suitable candidate as an indicator of binge eating in AN patients.

The present study also found that AN-BP patients had a significantly lower plasma 1,25-(OH)₂D level than both healthy controls and AN-R patients. Injection of recombinant FGF23 into normal and parathyroidectomized animals caused a reduction in serum 1,25-(OH)₂D levels [2]. Elevated plasma FGF23 in AN-BP patients might decrease plasma 1,25-(OH)₂D levels.

Conflicting results have been reported regarding 1,25-(OH)₂D levels in AN patients. Some reports have shown significantly lower serum or plasma 1,25-(OH)₂D levels in AN patients [13,14], while others have reported that AN patients have normal 1,25-(OH)₂D levels [15]. However, in these previous re-

ports, the subjects were not categorized into AN-R and AN-BP groups. In the present study, plasma 1,25-(OH)₂D levels in AN-BP patients were significantly lower than in AN-R patients. Our results indicate the need for investigations that differentiate between AN subtypes.

The present study has three limitations. First, the number of AN patients was extremely small. Second, the volume of binge eating and purging in the AN-BP patients before participation in the study was not available. We were therefore unable to completely assess whether binge eating primarily affects plasma FGF23 levels in AN patients. Third, inorganic phosphate intake prior to participation in the study was not assessed in AN-R patients. In future studies, in addition to plasma FGF23, 1,25-(OH)₂D and 25-OHD levels, inorganic phosphate intake, and the volume of binge eating prior to participation in the study should be determined.

This preliminary study showed for the first time that plasma iFGF23 levels are increased in AN-BP patients, and that these elevated plasma FGF23 levels might decrease plasma 1,25-(OH)₂D levels. In AN-BP patients, plasma FGF23 levels might be an indicator of binge-eating behavior, which is characterized by acute phosphate intake.

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*Materials of Conferences***SYSTEM AND ACTIVITY APPROACH TO MINERAL SUBSTANCES' CHEMICAL PROPERTIES LEARNING**

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The paramount task of present-day education, when the amount of knowledge subjected to adoption develops rapidly, is the one of the formation of an integral system approach to the apprehension of natural and social world's phenomena.

In connection with this a primary concern is being acquired by the academic activity projecting on the activity theory principles and system-structural approach, which allow forming a system mode of thinking, opening new cognitive opportunities of learners, growing their creative potential.

The developed by us an inorganic chemistry school course model based on the ideas of system-activity approach constructs the school subject newly – it appears as a research program of the specified subject, wherein the system-analysis method is laid; it organizes the cognitive movement in the subject and it is it that becomes a scheme of the advisory activity reflecting mentally the subject's image in its system-structural framework. Necessary knowledge properties as the advisory basis of the formed skills are laid in it: their fullness, consistency, generalization and, the main thing – the future mode of thought.

The consideration of the studied object as a system allows treating the selection and content structuring of the school subject differently and, therefore, its expression by the education program. The content includes: integral system properties, levels of its structure, structures of various levels, intra- and inter-level relations, the variety of system options and their features.

At the system approach to the variety of particular phenomena of the studied area it is necessary to mark an invariant of the system and then to consider separate cases as individual variants. So, we suggest studying chemical properties of mineral substances in the direction "from general to particular" – towards greater differentiation, specification of chemical properties. Such an order of studying provides a successive refinement and supplement of the studied earlier, allows adding on the relations within the system, and forms the seeing of more and more "fine" relations between various substances.

According to the suggested logic the educational material of the course is divided into levels in such a way that every next one "cut out" a more and more deep layer of the subject material specifying and concretizing the previous knowledge:

1 level – Principal genetic series of metals and non-metals.

2 level – Genetic series of metals forming soluble and insoluble alkalis.

3 level – Relations between the classes of substances, which are in the principal genetic series of metals and non-metals.

4 level – Characteristics of acid-base properties of oxides and corresponding to them hydroxides.

5 level - Relations between the classes of substances from the acid, basic and amphoteric series.

6 level – Neutral, acidic and basic salts and methods of their formation.

7 level – All variants of genetic series for different chemical elements.

8 level – Relations between different genetic series of one and the same element.

We have also composed the schemes demonstrating genetic relations and the relations of transformation between the classes of substances in each level and being used in the academic activity as the schemes of advisory activity base, a system of exercises having been developed. While fulfilling these exercises relying on the represented schemes of relations between mineral substances, a complete generalized advisory base of the abilities to compose all possible genetic series of an element in various oxidation degrees; equations corresponding to changes within these series and also the equations of interaction between the compounds of various elements is formed in learners.

As the experimental approbation of the developed materials showed, due to the training organized in this very way not only the system of subject knowledge and skills is formed in learners, but also the development of intellectual abilities takes place and the system-based orientation in the studied subject is formed as well.

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GRAPHIC PRESENTATION REFINEMENT BY GDDR5 VIDEO MEMORY AND DIRECT X 10 PROGRAM INTRODUCTION

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The use of the "quickest" types of video memory, i.e. the memory with minimal access time, allows refining the quality of graphic presentation of a computer essentially. At the present time the quickest memory in the world GDDR5 with the capacity of 6 Gbps has been developed. A new 512 Mb capacity microchip is able to process up to 16 video signals of DVD-quality simultaneously. To compare, the data

transfer rate of the DDR2 computer RW memory makes 667 Mbps, i.e. 10 times less, and GDDR4 – about twice as less. The new graphic memory chip of the fifth series with data interchange dual-speed (Graphics Double Data Rate 5, GDDR5) is meant for powerful personal computers, workstations and electronic gaming machines of the new generation. The new 512 Mb capacity microchip (16 Mb X 32) is able to broadcast a mobile picture and the information attached to it at the rate up to 24 Gbps or process up to 16 video DVD-quality signals simultaneously. The microchip functions from the voltage of 1,5V and consumes the electric energy almost by 20% less than today's popular chips of video memory, GDDR3. A mass production of Samsung GDDR5 memory on the basis of 60 nm technology started in 2007. The GDDR5 chips had become a standard in the segment of high-performance decisions. Using DirectX9.0 it is possible to create high-quality three-dimensional scenes with a high degree on-line detailing. One of the main possibilities of this set of functions is the one to program graphics using shaders. Shaders use special programmable display card registers to create various graphic effects. The Shader Model 2.0 support begins with the DirectX9.0; earlier DirectX versions have no such a support; then more advanced kinds of shaders Shader Model 2.0b were developed, wherein the instruction length was extended and some advanced features were added. For this model of shaders a refreshed package DirectX9.0b was released. Then Shader Model 3.0 was elaborated, which considerably extended the graphics programmability, with this shader model there appeared a possibility of dynamic branching and the instruction length was extended essentially. For this programmable graphics model support an update version of the DirectX9.0c. In the DirectX10 there appeared an update shader model, Geometry Shader. For the tridimensionality effect creation on a plane surface two textures are necessary, the surface normal map and the normal map properly, i.e. the normal texture. One of the most virtual effects in terms of rendering is the Parallax Occlusion Mapping; its meaning is the same as in Bump Mapping, i.e. to create a fine surface with many small details on a multipolygonal model. The main difference of this effect from the Bump Mapping lies in the presence of the parallax effect. To create such an effect, three textures, the normal map, the map of normals and the height map, which creates a more real three-dimensional surface, are needed. For the efficient use of this effect it is necessary to combine the Bump Mapping and Parallax Occlusion Mapping. The DirectX10 is supported only by the operating system Windows Vista. In the DirectX10 there appeared a new conveyor (pipeline), which includes: an orthographic frame buffer; geometry shader; stream out.

Various kinds render possible to plug-in resources to various parts of the conveyor. They enable recirculating data; perform the access to the textures

VS, GS and PS. The constant buffer makes possible to store more data, performs a quicker updating of constants; there appeared an opportunity to group constants into various buffers for more efficient servicing, thus, the DirectX9.0 restrictions vanish. The new possibilities involve a more efficient multipass delineation, for example, the animation computation is performed once, and the delineation on these data is performed a required quantity of times, that enables to reduce the load on the graph and data processors greatly as the calculations are performed only once. Also a so-called displacement mapping, which renders possible to create non-recurrent objects in the game; also this possibility enables creating vast landscapes and realize some other solutions. One more interesting feature is an alternative interpretation data. And, finally, a possibility to create effects on the basis of GPGPU methods, which allows performing simple physical calculations, has been added. It makes possible to retain the results of the GS (geometry shader) output operation, works with a variable quantity of entities. At the output operation all topologies are converted into primitive lists, into so-called "triangle list" entity and other lists. An alternative method of output into the structure/VB besides the delineation. The calculation of implications for entities is referred to new interesting possibilities in this area; for example, the triangles' normals. The extrusion of shades' sizes enables the animation on the GPU with stream out (impossible in the DirectX9), the extrusion is performed in the GS – generation of sides of shades' sizes, the extrusion in the DirectX10 works by 20% quicker than in DirectX9.0.

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THE INVESTIGATION OF NEGATIVE CONSEQUENCES INDUCED BY ELECTRIC SYSTEM FLOWS OF REACTIVE POWER

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Reactive power must be generated immediately near its consumers, i.e. it is necessary to install compensating devices step-up a power factor of loads. An electric system elements transfer of reactive power is accompanied by watt losses, cause inadmissible supply voltage derating or supply voltage rise, account for reduce of electric system capacity.

In order that make sure that a setting of compensating devices is necessary negative consequences induced by electric system transfer of reactive power must be estimated.

Electric system element watt losses are found by the expression:

$$\Delta P = \frac{P^2 + Q^2}{U^2} \cdot R = \frac{P^2}{U^2} \cdot R + \frac{Q^2}{U^2} \cdot R = \Delta P_a + \Delta P_r, \quad (1)$$

Where U – the voltage of transmission network; R – the resistive impedance of the transmission network element; ΔP_a and ΔP_r - respectively losses specified by the active P and the reactive Q power.

Watt losses are directly proportional to the resistive impedance of the transmission network element. That means that watt losses depend on the

$$\Delta P_r \% = \frac{\Delta P_r}{\Delta P} \cdot 100\% = \frac{tg^2 \varphi}{1 + tg^2 \varphi} \cdot 100\% . \quad (2)$$

For example, the natural weight-average power factor of industrial consumers is $\cos \varphi = 0.7 \div 0.75$ ($tg \varphi = 0.88 \div 1.02$) [1], therefore relative watt losses are equal to $\Delta P_r \% = 44 \div 51\%$. Whereas the economic value of power factor is equal to $\cos \varphi = 0.93 \div 0.94$ ($tg \varphi = 0.35 \div 0.4$) and corresponding relative losses of it is equal to $\Delta P_r \% = 11 \div 14\%$.

$$\Delta S = S_n - S_e = P \left(\frac{1}{\cos \varphi_n} - \frac{1}{\cos \varphi_e} \right) \quad (3)$$

Where $\cos \varphi_n$ and $\cos \varphi_e$ are natural and economic values of the power factor.

I.e. the complementary load of electric system elements vary depending on the relation of natural and economic power factor values. Analysis shows

$$\Delta S \% = \frac{\Delta S}{S_e} \cdot 100\% = \left(\frac{\cos \varphi_e}{\cos \varphi_n} - 1 \right) \cdot 100\% . \quad (4)$$

Electric system load was increased by 24-35% when the transmitted reactive power is more then its economic value.

One of electric system reliability criterions is the voltage of network nodes. Inadmissible supply voltage derating is produced by considerable consumption of reactive power during hours of the peak electrical demand. And vice versa reactive power generation during hours of the small load results in a considerable supply voltage rise. That decreases the work reliability of electric system and the quality of electrical energy.

Thus reactive power compensation is necessary in electric systems. That permitted to reduce relative watt losses ΔP by 33-37%, to increase the network throughput by 20-25%.

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that power factor of industrial consumers much less then the economic value of it [1].

The relative complementary load of electric system is:

Reactive power flows are the complementary load of electric system elements. Therefore when reactive power is transmitted quantity of electrical energy transmitted to consumers must be restricted. That opposes to the connection of new consumers and may result in serious power failures.

The complementary load of electric system elements ΔS induced by reactive power transfer is can be judged by the expression:

RANGE EXTENSION OF LOADS FOR HALF-BRIDGE THYRISTOR INVERTERS

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Circuits with half-bridge thyristor inverters are well known and used in different secondary power supplies with the transformer load power to 3 – 4 kilowatts [1].

Range extension of powers to hundreds of kilowatts is urgent proposition. It enables to use such inverters to supply of energy-intensive customers. For example, such inverters are used to supply of electric-arc furnaces, plasmatrons, high-power welding sets and other devices demanding a stabilization of load power.

Half-bridge thyristor inverters are preferable used at high power loads. Such inverters must have two condensers in-series and two thyristors in-series. Running ends of those thyristors are must be connected to the dc source moreover thyristors are must be switched to a current conducting direct.

A transformer type loads are usually switched to the diagonal of alternate current [2]. The deficiency of such inverters is impossibility theirs commutation over the small current range, that is at the quiescent condition and light loads. When load is equal the half rated load and higher the thyristor current will break after total condenser discharge of "working" arm takes place.

The complementary commutating choke 1 works in the inverter circuit (fig. 1 [2]). The mid point

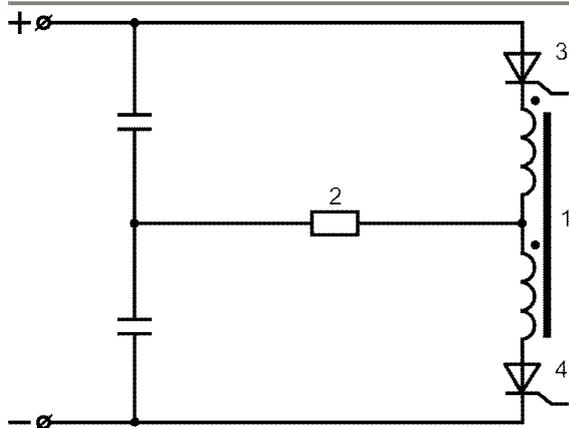


Fig. 1

of it is connected to the load contact 2 and running ends of it are connected between the cathode of first thyristor 3 and the anode of second thyristor 4 of half-bridge arm. That permitted to increase the range of inverter loads that a thyristor commutating is possible.

Though this variant have sequent grave disadvantages:

1) The coil (half-winding) of choke 1 must be meant for the root-mean-square of current "half-wave", i.e. for the 70 percent of load ampere rating;

2) The choke must be unsaturable;

3) The thyristor commutating is possible over the small current range subject to condenser voltage of the turned on arm is more then condenser voltage of the turned off arm. It is impossible over the light load and quiescent condition.

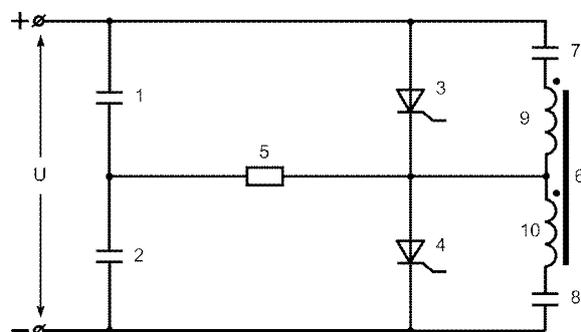


Fig. 2

Thus disadvantages of the circuit (fig. 1) are great mass and overall characteristics of the choke and this device is efficient over the bounded range of load.

Two complementary commutating condensers work in the inverter circuit (fig. 2 [3]). That permitted to make the commutating choke is quickly saturable and designed only for switching currents, i.e. to decrease steeply copper and iron bulks and as a whole to decrease choke gabarits. Besides that permitted to ensure an operability of a half-bridge thyristor inverter all over the load range that is from the quiescent condition to the maximum load.

The circuit (fig. 2) works in the following way.

Commutating condensers charged to half of source voltage U when source voltage turn on. Let enable pulse arrive at the thyristor 3 from the control system that is standard and don't shown at fig.2 for simplicity. Condenser 1 was running down to load 5 and commutating condenser 7 was running down simultaneously through the unblanking thyristor 3 and the half-winding 9 of the commutating choke 6 when thyristor 3 open. Capacity of commutating condensers 7, 8 is selected such that blanking time of thyristors 3,

4 was assured. These capacities are considerably smaller then capacities of condensers 1, 2 therefore their discharges were rapidly occurred. After the commutating condenser 7 had uncharged the commutating condenser 8 should charge to the supply voltage U . If load current is small condenser 1 uncharged slowly and voltage of it don't have time to decrease to zero. The commutating condenser 8 was charging through half-winding 10 of the commutating choke 6 and the thyristor 4 when the thyristor 4 open. Here voltage equal to voltage of half-winding 10, i.e. voltage U , is induced in the half-winding 9 of the commutating choke 6. This voltage has plus on the cathode of the thyristor 3 therefore thyristor 3 was blocking up. Then the commutating process will repeat similarly.

Condenser 1 or 2 was uncharged total during the half-period of inverter voltage and currents of thyristors 3, 4 decreased to zero when load current increase to an appointed value that is near (0.4 – 0.5) of the load ampere rating according to inverter parameters. Commutating elements (commutating choke 6 and commutating condensers 7, 8) don't influence to commutating process at this operation.

Since half-windings 9, 10 of the commutating choke 6 transmit only short-time current impulse, overall sizes of the commutating choke 6 are small in comparison with overall sizes of the choke 1 (fig. 1).

The positive circuit singularity attached to half-bridge inverter is a coercive switching is necessary over the small current range therefore blanking times of thyristors 3, 4 and gabarits of commutating component part would decrease.

Thus the half-bridge thyristor inverter can be used at wide power range particularly if supply is the three-phase rectifier.

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TECHNOLOGICAL ADVANCEMENT OF FILLED GARMENT PRODUCTION

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One of the major tasks rising at garments designing is the development of their production technology. Especially it concerns the garments with various fillings, the structure of which is complex and multilayer.

Depending on their designation the filled garments can perform different functions: for example, the heat-protective one, if an insulant appears as a filling; or the sorption one, if chemical agents - sorbents appear as a filling. Such products are very popular at the moment, so there is a need to produce them.

However, when manufacturing such goods there emerges a range of difficulties, one of which is that the filling compounds inside the garments are necessary to be distributed and fastened so that under the effect of its own weight the filler wouldn't shift into the lower part of the garment. Special compartments are made for the filler to be put in there for this purpose.

Some filled compartments form the product packet, which can differ with its construction, form and components. The whole garment production technology depends largely on the construction of such a packet.

Nowadays, the most applicable constructions of the filled packets are the versions of two-layer

packet constructions. Such constructions consist of the shell material's inner and outer plies fastened against each other forming compartments wherein the filler is put. Also there are three- and four-ply packet constructions, though they haven't become common use owing to their manufacturing high labour intensity.

The two-ply packet constructions production technologies can be various. Traditionally the layers are connected by means of through stitching, but this way of layers interconnection has some disadvantages, so the layers bonding techniques by means of various supplementary elements were developed. Such elements can be resilient members and partitions. At the garment production enterprises the rectangular shape partitions are used, but using such partitions we often have appearance defects in final products. To avoid such defects the filled packets layers connecting technology with formed partitions will allow. This technology allows avoiding appearance defects and guaranteeing high quality shrink in the complete product with their manufacturing minimal labour intensity.

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IMPLEMENTATION OF "WASTE MANAGEMENT" MA DEGREE COURSE AT TECHNICAL UNIVERSITIES IN BAIKAL REGION – ONE MORE STEP TOWARDS THE

EUROPEAN UNIVERSITY SYSTEM IN ENGINEER-ECOLOGICAL EDUCATION

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Russian University system needs harmonizing with the higher education systems of the EU member states in order to become competitive in the world economy.

In postindustrial society the raising standards in engineer-ecological education were particularly stimulated by Bologna declarations as the consequence of the changing society requirements. They

include new working conditions, an increasing demand for highly qualified and successful professionals and a consequent demand for the relevant training. Engineer-ecological standards specially adapted to European university system (degrees and qualifications) should be based on state-of-the-art, environmental and IT technologies.

Training of engineer-ecologists at technical universities in Baikal region has become a vital issue for both educational establishments and industrial enterprises. Such specialists should not only be able to improve the ecological situation in the region, but also promote its sustainable development. Creative and flexible thinking together with high professional knowledge is vitally important for engineer-ecologists in today's swiftly changing world to make a greater contribution to their communities.

The new international ecological educational project "The development of a MA degree course "Industrial and municipal waste management" at technical universities in Baikal region" has been successfully carrying out in ISTU since 2007. It has been a part of TEMPUS-TASIS programme within a "Course Development" category. The ISTU partners (department of Mineral Processing & Environmental-Engineering) are three major European universities: Dresden Technical University, Germany; Vienna Agriculture University, Austria; Copenhagen Technical University, Denmark and two Eastern Siberia universities: SibGTU, Krasnoyarsk and BSGTU, Ulan-Ude.

Long-term objectives of the project include an introduction of a new specialization – sustainable management of industrial and municipal waste - at

technical universities of the Russian Federation in the sphere of engineer-ecological education. This coursework and training strategies aim to be accepted at European universities and to comply with the regulations of Bologna declaration. Short-term objectives are to provide development and implementation of "Waste Management" MA degree course at three technical universities in Baikal region.

Realization of the project will provide increased funding and improved training facilities at technical universities. It will also be unable to work out and implement new methods of teaching, ECTS and e-learning systems and to facilitate teachers' and students' mobility with the consequent acquisition of higher levels of language and professional competence. An important part of the project will include sharing successful experience with other technical universities in Siberia, organization of relevant seminars and conferences, development of the project site and working out of the teaching materials.

The implementation of this educational project within the framework of TEMPUS-TASIS programme should not only increase the training standards of engineer-ecologists according to European requirements, but also establish ecological education as one of the most vital and prestigious university qualifications in Baikal region.

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Short reports

**SINGLE-PHASE HALF-BRIDGE THYRISTOR
INVERTER**

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Single-phase half-bridge inverters are widely used in secondary power supply mainly with transformer load, for example, in small-scale inverter type devices [1].

The power part of such inverters represents an “artificial” bridge, two arms of which consist of two series-connected condenser groups, and the other two ones – of two series-connected thyristors or transistors in forward direction [2]. Together with the main circuit simplicity (two semi-conductor elements only) a high merit of the half-bridge inverter is the absence of the DC voltage component in the diagonal line of alternating current, i.e. under a load, at any unbalances and component values. It is this very merit that allows using a closed core transformer made of high induction material with rectangular hysteresis loop, for example, of anisotropic steel (“mopermalloy”).

The demerit of the transistor variant of such inverters is the limited capacity (current). Thus, the inverter type welding units are produced for the current up to (150÷160) A. The welding process high-amperage currents require parallel joint of transistors, that complicates the inverter and reduces its reliability.

There is no such demerit in the thyristor half-bridge inverter; however, the known thyristor half-bridge inverters on one-operation (usual) thyristors are able to work only in a limited range of loads: from about 0,3 of the nominal one and higher. At light loads the cross-plugging of one-operation thyristors becomes impossible. To extent the operability zone is possible using the forced commutation or two-operation (gate-controlled) thyristors, but it complicates and makes the inverter more expensive as a whole; the losses growing as well.

In the power circuit the classical single-phase half-bridge thyristor inverter contains a half-bridge in the form of series-connected thyristors and another half-bridge in the form of series-connected condensers, which is hooked up by means of the DC current diagonal to the power supply shunted with smoothing condenser and hooked up by means of the alternating current diagonal to the load, and also containing a standard control system as part of active oscillator and the inverter control system, the output of which is connected with the control inputs of the inverter thyristors, one input is hooked up to the output of the abovementioned active oscillator, and the second one – to the comparer, to the inputs of which the definition and feedback signals are hooked up on the principle of degenerative feedback.

It is offered to introduce a supplementary half-bridge in the form of two series-connected transistors and two bypass diodes into the inverter circuit, which is hooked up parallel with the thyristor half-bridge and loaded by the diagonal of the alternating current to the restrictor; the common point of the transistors, bypass diodes and restrictor of the supplementary half-bridge being not connected with the common point of the thyristors; the restrictor loose end being connected with the common point of the condensers and the control inputs of the supplementary half-bridge transistors being hooked up to the supplementary output of the abovementioned active oscillator [3].

As the capacitor voltage has an intermittent nature, by the end of every half cycle the corresponding thyristor manages to switch off, and the transformer core hysteresis loop rectangularity provides a rapid excitation current fall-off of the transformer within the circuit of the corresponding thyristor. At the load current appearing the on-load voltage integral begins decreasing. The restrictor current decreases accordingly, i.e. the current hogging takes place: the more the load – the less the restrictor circuit current. It should be noted that the energy circulating within the restrictor circuit has a purely reactive nature and, with the neglect of the resistance losses in the capacitors, restrictor and transistor half-bridge this energy doesn't practically magnify the current consumed from the net. If the device is used, for example, as an electric welding bug, then the transformer secondary is connected to the load (electrode – weldment) through the rectifier and current filter. Then the voltage regulation characteristic of the device guarantees welding at constant power, that is ideally suited for a welding process in the air. So, the supplement of the single-phase half-bridge thyristor inverter “classical” circuit with a restrictor and transistor half-bridge for the current of not more than 30% of the load current allows providing the workability of the device through the whole load range and also lifting the current restrictions imposed by the parameters of the existing transistors in transistor inverters (avoiding the necessity to shunt connection of transistors in the devices with the current of more than 200A).

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WOUND-ROTOR SLIP RECOVERY SYSTEM EFFICIENCY UPGRADING

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The asynchronous motor rate control in the valve stage and double-fed motor schemes is performed by the sliding motion change of the motor at the constant electromagnetic field rotation rate. The main idea - is a beneficial use of the slip power stepped in to the rotor circuit. In the valve stage schemes the wound-rotor induction motor rotor current is rectified by means of the uncontrolled rectifier and a supplementary electromotive force of the DC current from the inverter is introduced into the rectified current circuit of the rotor. For the circuit and rotor voltage concord an impedance-matching transformer is used.

A wound-rotor slip recovery system [1] containing a wound-rotor induction motor, diode three-phase bridge connected by the alternating current outputs to the rotor rings and by the DC current outputs through the series-connected restrictor – to the corresponding outputs of the bridge thyristor inverter DC current outputs, is known. The abovementioned inverter is connected with the AC network through the impedance-matching transformer, and the inverter thyristors are controlled by the system of the pulse-phase control.

The demerits of this wound-rotor slip recovery system are in the following:

1. To increase the phase factor coefficient 4 the impedance-matching transformer 5, the relative capacity of which is equal to the motor speed relative control range, is needed. For example, if the rotation frequency is controlled within the range from the nominal to 70% of design the impedance-matching capacity will make some more than 30% of the motor output. At a wider control range the impedance-matching transformer capacity increases accordingly. It is for this very reason that the wound-rotor slip recovery system utilization area was traditionally restricted by turbo-mechanisms, wherein the required rotation frequency range is not that large.

2. Even in the presence of the impedance-matching transformer in the area of motor speed close to the nominal, when the inverter 4 electromotive force decreases with the sliding motion reduction, the phase factor decreases accordingly.

For diminishing the enumerated demerits it is offered [2] to perform the pulse control of the rotation frequency at small sliding motions of the motor by a short-time translating of the inverter into the mode of deep conversion, however, this very method is applicable in a small speed range only and, besides, results in torque pulsations of the motor and low-frequency harmonics production into the feeder line.

The author offers a scheme [3] quoted in Fig.1 allowing excluding the abovementioned demerits.

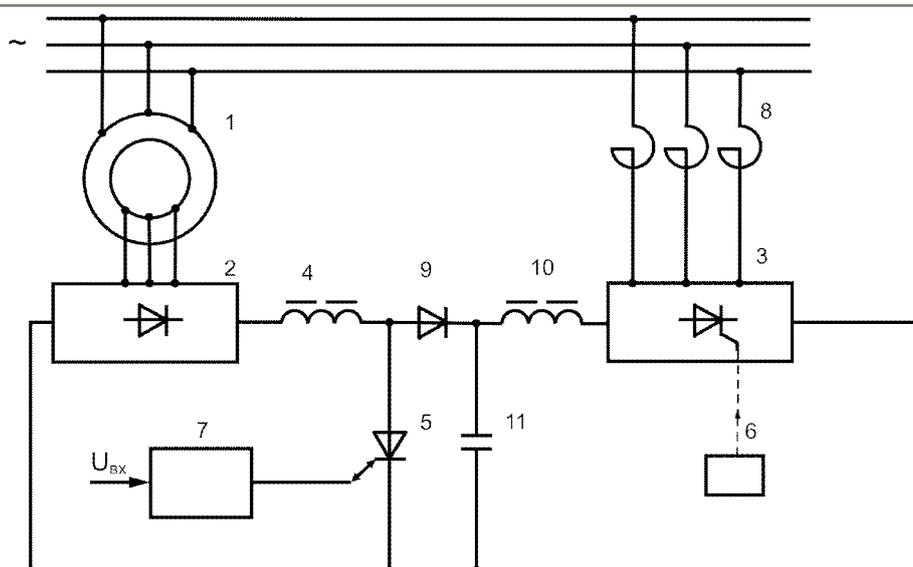


Fig. 1. 1 - asynchronous motor, 2 - three-phase diode bridge, 3 – thyristor inverter, 4-10 – smoothing inductors, 5 – key, 6 – pulse-phase control system, 7 – key 5 control system, 8 – current-limiting reactors, 9 –cut-off diode, 11 - capacitor.

The device functions as follows. At the input signal absence, i.e at $U_{in} = 0$ the key 5 is locked. The electromotive force of sliding motion of the blocked asynchronous motor 1 is maximal, but it is much less, than that of the back electromotive force of the bridge

thyristor inverter 3, as the system of pulse-phase control 6 provides the minimal and constant switching on advance angle of the bridge thyristor inverter 3. This angle $\beta_{min} \approx 20^\circ$, therefore, the bridge thyristor inverter back electromotive force

$$E_{dmax} \approx 1,35U_{\pi} \cdot \cos \beta \approx 1,27U_{\pi}, \quad (1)$$

wherein U_{π} – is the line voltage of the supply main, 1,35 – the coefficient for the three-phase bridge, $\cos \beta = \cos 20^{\circ} = 0,94$. At the same time the rotor EMF in the wound-rotor induction motors is much less, it means that there is no current in the rotor circuit, and the capacitor 11 is charged up to the rectified diode three-phase bridge 2 EMF magnitude. At $U_{bx} > 0$ the key 5 begins to unlock periodically in the mode of pulse-time modulation. In the “on” condition moments of the key 5 the current through the restrictor 4 grows. At the key 5 break the restrictor 4 gives the condensed energy to the capacitor 11. When the capacitor 11 voltage exceeds the bridge thyristor inverter 3 back EMF the sliding motion energy output into the supply main starts. The smoothing inductor 10 provides the current continuous character, and the presence of the intermediate storage of energy in terms of the capacitor 11 allows refusing of the impedance-matching transformer and performing the slip energy inversion into the high and constant phase factor network irrespective of the asynchronous motor 1 rotation frequency.

Thus, the offered device makes the wound-rotor slip recovery system use efficient at any adjustable speed range of the asynchronous motor 1.

The device contains some supplementary elements; however, the current-limiting reactors are incomparably less both in price and mass-size factors compared to the impedance-matching transformer in the schemes of the known analogs, the cut-off diode 9 doesn't cause significant losses, and the mass-size factors of the restrictor 4 and capacitor 11 at the modulation frequency of 500 Hz already are rather small. The smoothing inductor 10 only is comparable on its parameters to the restrictor 3 in the “classical” wound-rotor slip recovery system, but the advantages of the offered device compensate this disadvantage.

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WELDING CURRENT THYRISTOR SWITCHES FOR CONTACT WELDING

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The duration of spot and seam welding fluctuates from several seconds to centiseconds, and the number of switching the welding transformer on and off can reach several thousands for one working shift. For such switching frequency the power contactors turn out to be unfit on their mechanical strength, and their own action time proves to be more than that necessary for one unit point welding. The requirements of practical non-persistence and high switching frequency were met by ignitron current switches, but they are of considerable gabarits, poor efficiency and need water cooling. So, it is advisable to use a thyristor commutation switch in the primary coil circuit of the welding transformer feeding the load. The use of the transformer load thyristor commutation switch has its own features, and the optimization of such controlling systems for the purpose of their work reliability enhancement is topical.

It is known that the cutting a transformer into mains is attended with magnetizing current inrush, the amount of which reaches a tenfold value from the current rating. For the minimization or virtual elimination of the current rush at the moment of the transformer switching on the thyristor commutation switch controlling system is synchronized with the feeder line, and the on-off trigger included in this system in the known devices [1] provides “remembering” the sign (plus or minus) of the last current half-period. The next switching on the transformer is possible only in the half-period reversed in sign. Thus, through the transformer an even number of current half-periods passes, and magnetic biasing of the transformer is excluded. The controlling system synchronization with mains guarantees also an optimal start switching angle of the thyristor commutation switch.

The analogous thyristor commutation switches controlling systems are used in developments of recent years [2]. Particularly, in the FORWEL firm catalogue, 2004, pp.1-6, there is a resistance (i.e. contact) welding machine control system given, the simplified functional scheme of which is given in Fig.1.

A disadvantage of the abovementioned controlling systems is the memory loss by the on-off trigger at the loss of voltage in mains owing to accidental or operational cutting off and, as a consequence, the magnetizing current inrush possibility, when the device is cut into mains after the interval in feeding.

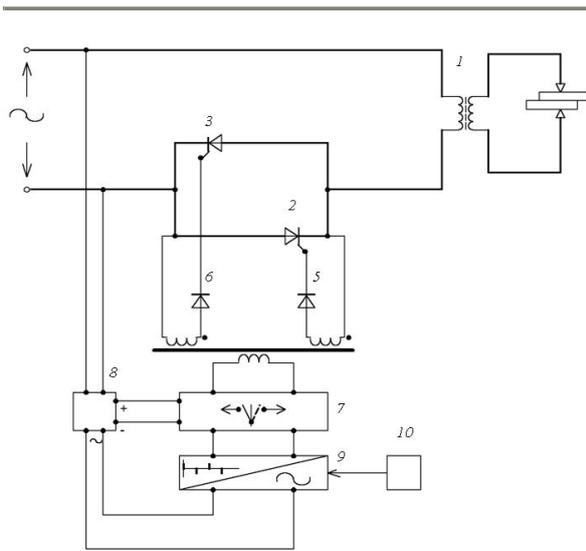


Fig.1. 1 – single-phase power transformer; 2,3 – thyristors; 4 – pulsing transformer; 5,6 – diodes; 7 – on-off trigger; 8 – power box; 9 – pulse-phase controlling system; 10 – automatic control system.

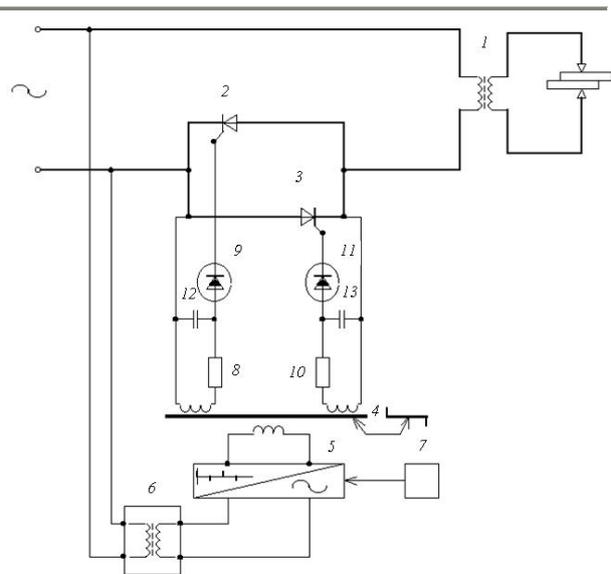


Fig. 2. 1 – welding transformer; 2,3 – thyristors; 4 – pulsing transformer; 5 – pulse-phase controlling system; 6 – power box; 7 – automatic control system; 8,10 – resistors; 9,11 – dynistors; 12,13 – capacitors.

A new thyristor commutation switch controlling system enabling to eliminate this significant disadvantage is offered [3].

The system represented in Fig. 2 functions as follows.

When cutting the device into the supply main through the power block 6 the voltage (with the corresponding transformer ratio) converted into the sequence of heteropolar pulses (the diagram of the pulsing transformer magnetic reversal – the change of its voltage U in the function ωt and induction B in the function of ampere-winding iW of the pulsing transformer wind are represented in Fig. 3) is given to the system of pulse-phase control 5. The necessary start angle of these impulses' lagging is provided by the automatic control system 7, as in all known devices of analogous destination. The very first pulse, depending on its polarity, switches one of the thyristors on, for example, thyristor 2. Simultaneously with that the pulsing transformer 4 is transferred by this pulse into the saturation mode, for example, into the point 1 in Fig.3. After the impulse loss the transformer core remains magnetized in the point 2, i.e. remains unsaturated due to the rectangularity of the hysteresis loop. This state will be retained by the pulsing transformer by the opposite polarity pulse arrival, which will transmagnetize the transformer core into the point 3 and at the same time will switch the thyristor 3 on, and the transformer core will remain magnetized in the point 4. At the voltage loss in the supply main the pulsing transformer core will retain the final pulse magnetic moment density as long as desired, so, at the voltage recovery the pulse with the polarity opposite

to the last pulse before the mains cutting off only can be first to pass on the thyristors. In other words, if the thyristor 2 (Fig. 2) was switched on the last, then after the voltage recovery the thyristor 3 only can be the first to switch on in any random time interval. Thus, an even number of current half-periods will always pass through the transformer 1 (Fig. 2) as well, i.e. it will be transmagnetized on the symmetrical hysteresis loop, whatever the cutting-off intervals could be.

Therefore, even a short-run magnetizing of the power (in the considered example welding) transformer is excluded and the magnetizing current inrushes after time gaps in power supply of the device are excluded as well.

As the hysteresis loop rectangularity of the known ferromagnetic cores is not ideal, the passage from the saturation point to the remanent magnetization point (Fig. 3) is attended by a little induction drop ΔB and, therefore, a short duration interference pulse in the pulsing transformer winds, which is able to switch on "falsely" one of the thyristors of the commutation switch. Not to miss the interference pulse on the thyristor control input, there are the abovementioned interference-suppressing networks: at the occurrence of such a "false" pulse, it is shunted by the capacitors 12 and 13. Due to the little induction drop ΔB (Fig. 3) the "false" pulse voltage integral is negligible and the voltage value (amplitude) of these pulses is little and insufficient to changeover the dynistors 9 and 11 into the conducting state. It excludes the "false" switching the commutation switch thyristors on. At the same time the "working" pulses have a large enough width required by the load. The

devices providing the necessary width of the working pulses are widely known, come with the system of pulse-phase control and are not given in Fig. 2 for the sake of simplicity.

Finally, it should be noted that the offered controlling system not only excludes magnetizing current inrushes after intermittent electrical power, but renders possible to somehow simplify the scheme by eliminating the on-off "memory" trigger from it.

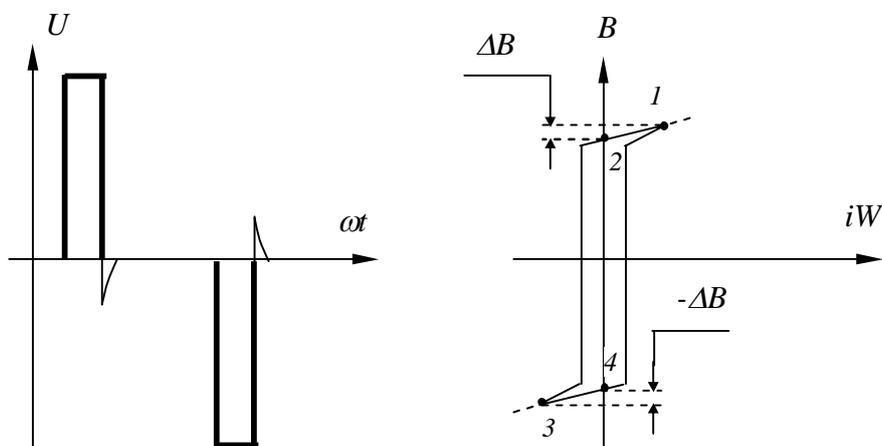


Fig. 3. Diagrams of pulsing transformer transmagnetizing

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THE ETHNIC PECULIARITIES TO ADAPTATION OF THE CARDIOVASCULAR SYSTEM OF STUDENTS LIVING IN TUVA REPUBLIC

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The study demonstrates the adaptation processes of the cardiovascular system of students of tuvinian and russian nationalities at period of the education in high school. It is shown that the adaptation processes to education are affected not only by age, gender, but also by ethnic peculiarities of the students, living in extreme climate-geographical conditions. At the first course the tuvinian students have lower adaptive possibilities to education, than Russian ones, but at the last course they perform more adaptive response to education.

The students present the special social group characterized by young age, specific conditions of the labor and lives. They present the group of elevated risk because of high and extensive emotional tension [7,9,19], which differs from other social groups [1,8,14]. Education in high school demands the activation of adaptive and compensatory mechanisms in their organism [11]. The literature data are indicated that during training in high school the students reveal homeostatic shifts in different physiological systems of the organism, including cardiovascular system that is accompanied with the negative results in the education [10,12,20].

Adaptation processes in student's organism alongside the mental load are caused by the influence of climate-geographical conditions of the residence [6,12,13,15, 20,23,27]. Moreover, the nature of adaptive response depends on ethnicity of the population [2]. The functional reserves of the organism of the scolded population are indicators of the best adaptation to extreme natural-climatic conditions in contrast to Russians, living in given region [5,15,17,21, 22,25]. In this connection the study of the adaptive peculiarities of students of the different nationalities, living in severe climate-geographical region of Russia, is of great interest.

The subjects of the study were formed from the students of original nationality and stranger of the population (Russians in the 2-3-d generations) from the 1-st till the 5-th courses. The next parameters of the cardio-

vascular system (CVS) were determined: the heart rate/min (HR), systolic (SBP) and diastolic (DBP) blood pressure by Korotkov (mm Hg). Using standard methods [7,24,26] of calculation we determined the pulse pressure (PD), the average dynamic pressure (ADP), the stroke volume (SV, mL), the cardiac output (CO, L/min), and their indexes per m^2 body surface (SVI and COI). To evaluate the balance of vegetative nervous system we used the vegetative index Kerdo (VIK) [8,16]. For estimation the level of regulatory mechanisms controlling the cardio-vascular system it was used the adaptation potential (AP) [4]. The level of physical condition (UPC) was defined by E.A. Pirogovova [18]. As a criterion of the CVS functional condition was used the factor of the double product (DP) [3].

The benchmark analysis of the main indexes of CVS between national groups have shown that at the 1-st course both groups did not have an essential difference on SBP, DBP, ADP. However, the variety of factors characterizing the adaptive possibilities of CVS (SV, CO, PD, HR) among tuvinian students on the 1-st course was worse than among russians. On the 3-d-5-th courses the adaptation possibilities of tuvinian students, particularly girls, were developed that expressed in significant lower contribution of HR in CO (table 1). According to age changes, the the reduction of HR was noted in all investigated groups from the 2-d course. But, the HR elevation in Russian students at the 5-th course could indicate the

reinforcement of the sympathetic influence on cardiac function.

Table 1. The main cardio-vascular system parameters of investigated students

Course / group	1	2	3	4	5
n	422	130	311	100	161
HR, per /min					
Tuvinian youths	73,5±1,0	80,2±2,3	72,8±1,7	74,2±1,5	71,6±1,8**
Tuvinian girls	76,2±0,7*	75,9±1,9	74,7±1,2*	74,0±1,9*	71,4±1,2
Russian youths	74,1±1,8	77,1±3,7	75,4±3,5	74,3±2,9	81,7±4,5
Russian girls	72,5±1,4	84,2±3,3	82,1±2,9	81,6±2,9	70,2±1,9
SBP, mm Hg.					
Tuvinian youths	116,7±1,2 ##	122,7±4, 5#	116,4±1,5*** ###	111,7±1,6*** ###	119, 8±2,4####
Tuvinian girls	110,7±0,8	112,9±1, 5	110,0±1,1	107,7±1,5*	110,6±1,4
Russian youths	117,6±2,5	129,5±4,8	128,5±4,2	130,3±2,4	119,2±2,0
Russian girls	111,8±2,0	119,0±2,9	110,5±1,6	114,1±1,9	112,5±2,7
DBP, mm Hg					
Tuvinian youths	74,3±0,9	75,1±2,1	76,9±1,5	66,4±2,0**	78,2±2,1#
Tuvinian girls	73,5±0,7	73,4±1,2	77,0±1,2	67,0±1,1*	74,0±1,2
Russian youths	74,7±2,0	74,6±4,1	83,7±2,5	74,4±2,1	80,0±3,7
Russian girls	70,6±1,7	74,7±2,1	75,5±1,8	78,0±1,8	75, 9±3,0
PD, mm Hg					
Tuvinian youths	42,4±1,1# ##	47,6±4,5# #	39,5±1,9####	49,3±3,8####	42,0±2,1#
Tuvinian girls	37,0±0,9	39,5±1,5	32,7±1,2	40,9±1,5*	36,5±1,4
Russian youths	42,6±2,3	50,2±2,6	40,5±2,6	55,9±4,3	39,4±1,3
Russian girls	41,1±2,0	43,9±1,7	35,0±1,9	36,1±1,3	36,6±3,0
ADP mm Hg					
Tuvinian youths	88,5±0,9# #	91,0±2,6	90,1±1,3* #	80,5±2,1***	92,2±1,9####
Tuvinian girls	85,9±0,6	87,0±1,3	87,8±0,9	80,6±1,0***	86,2±1,1
Russian youths	88,7±2,3	88,8±2,4	98,7±0,6	93,1±1,0	94,3±1,2
Russian girls	84,3±1,5	86,6±2,2	87,2±1,5	87,2±1,5	88,1±2,5
SV, mL					
Tuvinian youths	66,3±1,0	68,2±2,6	62,4±1,72	70,8±2,2##	61,89±1,87
Tuvinian girls	64,2±0,8*	64,8±1,0	59,4±1,4	68,3±1,2***	61,4±1,2
Russian youths	66,6±2,0	71,3±2,2	61,4±1,7	71,7±3,3	59,1±1,3
Russian girls	68,3±1,7	66,9±1,7	60,9±1,8	59,8±1,4	60,2±1,9
CO, L/min					
Tuvinian youths	4,9±0,1	5,5±0,3	4,5±0,2	5,3±0,2	4,4±0,1
Tuvinian girls	4,9±0,1	4,9±0,2 **	4,4±0,1 *	5,0±0,2	4,4±0,1
Russian youths	4,9±0,2	5,5±0,2	4,5±0,2	5,3±0,3	4,9±0,5
Russian girls	4,7±0,2	5,6±0,2	5,0±0,2	4,9±0,2	4,2±0,2
UPS, conventional units					

Tuvinian youths	0,666±0,0 1	0,588±0,0 3	0,660±0,02**	0,712±0,02*	0,642±0,03* ###
Tuvinian girls	0,660±0,0 1 **	0,666±0,0 2 *	0,658±0,013	0,712±0,02 ***	0,692±0,01
Russian youths	0,670±0,0 2	0,612±0,0 3	0,572±0,02	0,626±0,030	0,572±0,015
Russian girls	0,744±0,0 2	0,589±0,0 3	0,591±0,04	0,575±0,03	0,688±0,03
SVI, mL / m ² .					
Tuvinian youths	2,9±0,1##	3,2±0,1	2,6±0,1###	2,9±0,13#	2,5±0,1###
Tuvinian girls	3,7±0,1	3,2±0,1*	2,9±0,1	3,3±0,1*	2,8±0,1
Russian youths	2,7±0,11	3,11±0,1	2,4±0,1	2,9±0,2	2,5±0,1
Russian girls	3,6±0,2	3,6±0,2	3,2±0,1	3,0±0,1	2,7±0,2
COI, L/min*m ² .					
Tuvinian youths	38,7±0,6# ##	39,5±1,5# #	36,3±1,0###	39,1±1,5	34,1±1,1##
Tuvinian girls	48,8±0,8	42,3±0,8	38,9±1,0	44,5±0,9	39,7±0,8
Russian youths	37,0±1,3	39,2±1,4	31,7±0,7	38,7±2,1	30,9±0,5
Russian girls	52,4±2,0	42,8±1,3	39,1±1,4	36,6±10,	38,4±2,2
VIK, conventional units					
Tuvinian youths	-3,7±1,9#	4,8±3,6	-8,4±3,8	11,3±3,6*	-11,4±3,8
Tuvinian girls	1,4±1,5	0,2±2,4	-6,8±3,0***	7,1±3,0	-5,9±2,7
Russian youths	-2,6±4,4	9,1±2,8	-13,7±4,6	-2,7±4,5	-4,5±3,7
Russian girls	0,7±2,7	5,7±4,7	7,1±2,2	2,2±4,0	-9,6±5,7
DP, conventional units					
Tuvinian youths	85,7±1,5	98,3±4,7#	84,7±2,2#	82,3±1,85**	87,5±3,3###
Tuvinian girls	84,0±1,1	86,3±2,6	82,0±1,6*	79,7±2,3**	78,9±1,7
Russian youths	85,6±2,5	97,6±4,5	96,0±3,5	97,0±4,5	95,3±2,0
Russian girls	76,6±3,3	96,6±3,6	91,2±4,1	93,7±4,4	79,0±3,0
AP, conventional units					
Tuvinian youths	2,1±0,0	2,2±0,1	2,1±0,04*** ###	2,0±0,1*** #	2,2±0,1###
Tuvinian girls	2,0±0,0	2,1±0,1	2,1±0,0	1,9±0,0**	2,0±0,0
Russian youths	2,1±0,1	2,1±0,1	2,4±0,0	2,3±0,0	2,4±0,0
Russian girls	1,9±0,1	2,2±0,1	2,1±0,1	2,15±0,1	2,0±0,1

Annotation: significant differences of the average values between tuvianian and russian youths and girls - * $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$; between youths and girls - # $p < 0,05$; ## $p < 0,01$; ### $p < 0,001$.

Analysis of VIK indicated that in tuvianian youths the dominance of sympathetic activity was registered at the 2-d and the 4-th courses, while in russian youths - at the 2-d course only. Increasing of the parasympa-

thetic tone of the vegetative nervous system in tuvianian youths was found at the 5-th course, and in russian ones - at the 3-d course (-11,4 ±3,8 and -13,7 ±4,6 c. u. accordingly). In group of russian girls the sym-

pathetic activity was dominated at the 1-st – 4-th courses and only at the 5-th course the tone of the parasympathetic nervous system increased that indicated in the value of VIK - $9,6 \pm 5,7$ c.u. (table 1). Consequently, Russian girls demonstrated during four years of education the higher level of sympathetic activity unlike Tuvan girls which had more stable vegetative balance at the same period.

CO increase in Tuvan youths at the 1-st course was provided by HR increase ($r=0,6$), but in Russian youths - by SV elevation ($r=0,9$) while relationship between HR and CO was weak ($r=0,3$). Cardiac output increase in Russian youths at the 5-th course occurred due to significant HR rise ($r=0,8$), but in Tuvan ones it was resulted in SV elevation ($r=0,7$). Thereby, one can suggest that mechanisms controlling the heart work had the higher tension in Tuvan youths at the primary courses, but in Russian students a most disadvantage state of cardiac mechanisms was noted at the 5-th course that was indicated in significant increase of HR and reduction of SV and CO.

The CO value demonstrated the more economical working state of the heart in Tuvan girls, because the CO increase was correlated with the SV change while HR reduced during the period of study. In Russian girls at the 2-d – 4-th courses the CO change occurred due to the HR increase. The most efficient state of working heart in Russian students was demonstrated at the 1-st and 5-th courses, when CO rise was correlated with high SV ($r=0,7$; $r=0,9$, accordingly) and was not dependent on HR ($r=0,5$).

Conclusion

Thereby, one can conclude that the adaptation processes of Tuvan students to education developed from primary to senior courses, demonstrating the improvement of reserve possibilities of their organism. At the 2-d and 5-th courses the students regardless of nationalities had the negative trend of hemodynamic mechanisms. The deterioration of the main hemodynamic indexes at the 2-d course indicated on tension of organism functional state, connected with period of the

sloppy adaptation to mental load. The weakening of cardiovascular homeostatic mechanisms in students at the 5-th course, probably, was caused by reinforcement of emotional load, due to soon coming completion of the high school and prospect to further vital activity.

The mentioned periods of the deterioration of the adaptation possibilities indicated that adapting processes in the student's organism did not realized through determined straight, but run through phases depending on length of education, gender and nationality.

The girls possessed the more high adaptability, than youths of both national groups.

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*Materials of Conferences***IMPROVEMENT OF CHILDREN'S LIVING ACTIVITY AND DEVELOPMENT OF FLEXIBILITY AND CREATIVITY**

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We can select several aspects of improvement of children's living activity and development of flexibility and creativity.

The first aspect of the improvement of student's living activity is the need in the realization of his own adequate self-appraisal, self-confidence and the personal involvement in creative activity. It includes the formation of the flexibility and creativity. The former implies a mental flexibility and consideration, the latter implies an efficient creative activity as a product of activity in the mental and material form.

A specific character of the subject, e.g. Physics and Astronomy, enables students to show the cognition, to generate ideas, to develop the intelligence and to integrate the knowledge of all divisions of Physics solving nonstandard problems. It involves the second aspect of the improvement of a student's living activity. It also includes extracurricular activities: elective courses, optional classes and such practical work as making reports, conducting experiments, presenting projects, taking part in conferences and school, regional and federal contests in Physics and Astronomy.

The third aspect implies a specific creative atmosphere of trust and collaboration of a student with the teacher, the other schoolmates, parents and authorities of the school. This joint creative work is based on the premeditated program of teaching methods and this educational model has been successfully carried out for years.

The fourth aspect implies the voluntary choice of students for extracurricular activity. These students demonstrate interest in the subjects and creative activity. The students tend towards exact science.

The fifth aspect is the comfortable atmosphere for children. It means to encourage even a very slight creative achievement of a student. It is important to maintain the tempo of a student's self-development and the level of challenge in individual rate that depends on age-related and individual peculiarities of a student.

The sixth aspect is that teaching challenge could contradict the process of education as a subjectively objective reflection of the positive and negative teaching goals. On the one hand it is the source of a functioning activity and progress embodied as a positive dominant component of the educational process. On the other hand the current challenge stimulates new opportunities.

Formation of the creativity and flexibility in optional classes in Physics and Astronomy at school enables to students to develop stable practical skills good for any future job of students. Consequently it also ensures the improvement of students' living conditions in future.

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THE PECULIARITIES OF AGGRESSION DISPLAY AMONG PRIMARY SCHOOL AGE STUDENTS IN MULTINATIONAL GROUPS

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The changes in economic, political and spiritual fields in post-soviet era have lead to the transfer into new stage of public and social development, which is characterized by internationalization enforcement. National and cultural isolation is getting impossible. Migratory and demography processes enforcement have been mentioned. Therefore, people's mutual adaptation is taking place, as well as behavior correlation according to traditions and habits of foreign environment. Multinational phenomenon is becoming a peculiarity of social environment transformation.

Multinational phenomenon is a common thing for many territories in Irkutsk region, which are located not far from the oblast center. This phenomenon is a mode of existence and people's interaction, who live constantly on this area and near foreign countries visitors. Due to the social problem's complication, multinational phenomenon is accompanied by future uncertainty and cross ethnic intolerance. Intolerance is created on the basis of ignorance and the fear of the unknown, different culture and way of live of other nations. Sometimes intolerance appears under influence of envy, i.e. nations who live better and make more money. Creation of such senses is provoked by information which is spread by Mass Media.

Like in prism, this phenomenon is focused on contemporary school of general education, which is becoming multinational. The role of education cannot be underestimated. Moreover in one particular case the role of educational institution which provides information exchange, permanent and direct interrelation of different nationalities before the fact when a child is able to identify his or her national belonging. It is necessary to talk about cross cultural relationships problem in children's multinational groups, about the psychological discomfort condition which children have. Having this discomfort, children usu-

ally display aggression. The number of children with aggression and self-aggression display is higher in multinational group than in ethnic homogeneous groups.

We supposed that, the behavior of primary school children in multinational classes is under influence of culture's acceptance – non-acceptance, appearance of the classmates belong to another nationality. This happens due to certain values frustration, such as aesthetic, cultural, natural, etc.

As a result of conducted research, it was discovered that 61 % of children from multinational groups have a high level non-acceptance of foreign culture, foreign nature, foreign climatic environment and other foreign peculiarities in appearance. 22% of children display an average level of foreign nation's features non-acceptance. Only 13% of children show a low level of non-acceptance. Due to lack of logic, it was impossible to identify the level of non-acceptance among 4% of children.

Two out of three children who live permanently in our local area prefer the nature of their home region and contacts with people who do not have different features in their appearance. So they have a high level of foreign nation's non-acceptance. 22% of local children have an average level. 2.6% of local children have a low non-acceptance level.

45% of local children have aggressive display of non-acceptance. 32% have a self-aggression tendency. 23% have a normal level. More than a half of local children with a high level of foreign non-acceptance have aggressive tendencies. 88% of local children with an average foreign non-acceptance have self-aggressive tendencies. Local children with low level of foreign non-acceptance have normal display of aggression. Local children with unidentified level of foreign non-acceptance displayed self-aggression tendency.

Considering separately migrant children, we see that only 19 % have a high level of foreign non – acceptance. 25% of children have an average level. 47% of migrant - children have a low level of foreign non-acceptance. It was impossible to identify the level of foreign non-acceptance among 9% of children that had come from other territories. The data which we have discovered coincides with the facts described by E.N. Korneeva, who points out that, adult settlers strive for contacts, try to adapt to a new environment, self-assert into new surroundings and they form their children's behavior with the help of their own behavior. (E.N. Korneeva "Non-standard children" Yaroslavl. Akademya razvitiya 2007 page 49.)

Children who have come from other territories have a low level of foreign non-acceptance. They are more tolerant to foreign culture and the necessity to socialize with people of different appearance. However, due to discomfort practically every child has aggressive and non-aggressive display afterwards. 32% of migrant – children have aggressive tendencies.

54% of migrant children have self-aggressive tendencies and 13.5 % have normal tendencies.

Our conducted research showed, 79% of schoolchildren have discomfort in multinational collective and it does not matter whether they are local or migrant. They have aggressive displays as well as self-aggressive. Taking into account the extracts, both of them prevail as a tendency.

An average index of aggressiveness of all examined children, local as well as migrants is on the level of deliberate self-control with predominance of aggressive tendencies. The aggression display is possible due to suddenly appeared circumstances, and also with existence of mental disorders. It is possible to suggest the possibility of aggression enforcement with the appearance of stimulus.

Not more than 20% of children in non-multinational groups have aggressive tendencies.

Self-aggression (autoaggression) can be stipulated by personal peculiarities and by the condition of psychological discomfort, anxiety, depression. Taking into account the age of children, and their socialization in multinational environment, we inclined to link the existence of aggressive and self-aggressive tendencies in their behavior with discomfort which they have and connected with it the condition of frustration.

Hence, man's reaction on frustration depends on personal values hierarchy, i.e. how important to him/her the range of interests which is under impact. We should point out essential peculiarities of these connections among children with different levels of foreign non-acceptance.

Children with a high level of foreign non-acceptance appeared to have aesthetics-natural values frustration as the most significant, children with an average level of foreign non-acceptance have cultural values, and children with low level of foreign non-acceptance have values connected with health and physical development.

Conducted research allowed us to discover peculiarities of aggression display among primary age schoolchildren educated in multinational groups, to define the degree of its manifestation in connection with frustrated values including ethno – cultural.

The results have showed, most children had an aggression but with different extent of evidence and display intensity. In a number of cases, as its well-known fact, children's aggression can indicate on a positive ability for development, on a certain vital powers and energy, on capability to resist negative external distractions, etc. Abnormal aggression display indicates the problems in child's behavior, possible social and personal disadaptation. It gives grounds to research thoroughly and to conduct a possible correction of aggression display among primary age schoolchildren, educated in multinational groups.

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MOTIVATION DEVELOPMENT OF STUDENTS AS MEANS OF IMPROVING EFFECTIVENESS AND QUALITY OF FOREIGN LANGUAGES LEARNING

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New technologies and techniques that are practiced in education at the present moment increase the process of learning and its effectiveness, but they work best when students are motivated. Computers, smartboards, Internet, that are used in language learning lead to increase of tuition fees thus economically are ineffective and the quality of education gets only a little bit better. Besides teachers have to spend much more time preparing classes being very pressed for time. So they do not jump into using modern computer technologies.

The aim of this paper is to show the role of motivation in learning the second language at the university. Here we understand motivation as an incentive, which drives a person to obtain a class of stimuli such as achievement, curiosity, prestige etc. Nobody questions the fact that high motivation increases learning. The one who is not motivated to learn a foreign language will probably end up nowhere. We must admit that language learning proceeds at different rates for different persons under the same conditions. For learners of a foreign language (for example English) outside an English-speaking environment the process of learning slows down and successful communication becomes a problem.

Our study and experience allow us to conclude that students learning foreign languages have to overcome at least two critical moments. The background of it lies in fundamental psychological and physical mechanisms of perception and reproduction of new information by people. It is necessary to mention that learning a second language is more than learning a description of it. This process combines linguistic and psychological as well as other elements (R.Lado). It is also important to bear in mind that when a person speaks the decision to speak is made through motivation.

At the beginning students get enthusiastic about learning, they try to memorize new words, structures, phrases and expect to use them freely soon. But first two months is the so-called latent period, when they accumulate knowledge, learn the rules of language usage, but are not able to use them. There is fear to make mistakes while speaking. They lack confidence in coping with a foreign language. So they become disappointed, lose interest and hope to master

the language and drop out of the class or stop doing homework. This is the first critical moment.

If students overcome these obstacles they enter the second stage of learning a language where comprehension should come. They understand teachers and students in the class, but speaking is still a problem because they cannot communicate knowledge, information, ideas, opinions, feelings in English to people. This is the second critical moment.

If students have classes two or three times a week this period lasts for about one or one and a half year when the communicative competence is not developed and students are not able to use the language in an English-speaking environment and it is another disappointment.

There is another problem involved in language learning effectiveness. Foreign language teachers are tied to a specific book and aimed to get their students through an exam which tests specific items in that book (Jane Ravell). Communicative activities in which students can transfer their learning to real situations are not practiced regularly then.

The major questions arising from these issues are how to motivate students, develop linguistic and communicative competences and make the process of learning more effective.

There exist many ways of increasing motivation.

In our opinion while choosing them the following should be taken into consideration.

1. The tuition process starts with environment in the classroom. As John Bushman states positive classroom climate almost certainly will not happen by chance. It may develop without intervention by the teacher but usually it is negative and does not produce a setting for effective learning (J.Bushman).

2. Since man is social, the urge to communicate is a force that increases language learning (R. Lado).

3. The Needs-Satisfaction Cycle is of paramount importance (Louis Imundo). When a person wants to achieve or maintain something he or she will engage in activities to achieve the desired goal. In our case it is to use English to accomplish a certain function or goal.

4. While planning classes teachers are recommended to use the following models: ESA (engage, study, activate), ARC (authentic, restricted, clarification), deep end, jungle path (Harmen, Scrivener), role-play, dramatization.

5. Communicative Approach works well and preference should be given to activities involving simulation and role-play in the classroom and outside it.

We believe that the following extra-curriculum activities in developing motivation are effective: Reader’s Theater and Group Presentation Show. These shows are pretty much challenging and enjoyable especially for technical students.

Every semester students of International Centre of Kazan State Technical University who are getting the qualification of a translator in professional communication perform in front of the students, teachers, guests. There is a competition among classes. They work hard to be nominated for "Outstanding acting skills", "The best sense of humor", "The best English", "The most professional performance", "The most friendly group", "The most patriotic performance", "The most stylish performance".

The aim is to get students together outside the classroom to use English, to build up a relationship among students, to increase motivation in learning. The following things seem especially noteworthy here. It is important to mention that activities outside the class save time for class activities, which is restricted by curriculum.

All these activities first help to achieve maximum communication, because they have some stimulus to get them going and second, they communicate more freely because they have a role to hide behind. Besides the vocabulary increases greatly, barriers to learning are reduced, students become self-confident. What else is important is that students do not lose hope in becoming fluent in English, thus spend more time studying themselves at home.

Participation in the Reader's Theater is very effective even for beginners. While reading the script and acting out at the same time students have a feeling of communication in the language. It allows them to overcome imperceptibly both critical moments in learning foreign languages mentioned above. As a result students who study at International Centre of Kazan State Technical University in the third semester could communicate with their teachers and even foreigners in foreign languages quite freely. Thus our graduates become much more prepared for their professional activity and career.

We would like to state very clearly that language learning effectiveness increased in the groups where these activities had been practiced regularly. As a result students became highly motivated not only as individuals but as a team and got much better results on tests.

We can make the following conclusions:

1. Participation in Reader's Theater and Group Presentation Show helps to build up a relationship with and among students which is of a paramount importance in language learning.

2. Dramatization is an extremely valuable way of activating the material. It reduces barriers to learning. When students act out they enjoy it, thus interest to learning increases.

3. Learning by doing is extremely effective, students feel successful and it also facilitates learning which takes place in a relaxed and comfortable environment in the classroom and outside it.

So, as Chinese proverb says "What I hear I forget, what I see I remember, what I do I under-

stand". As a result while learning new skills students learn new motives.

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INFRASTRUCTURE TRANSFORMATION AND TRANSFORMATION OF FUNCTIONS OF HIGHER EDUCATIONAL INSTITUTION SUBDIVISIONS IN RUSSIA WHILE INTEGRATING INTO EUROPEAN HIGHER EDUCATIONAL AREA

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At the beginning of the 21 century the world developed powers entered the postindustrial epoch. The period of transition from economy of resources to economy of knowledge has been almost completed for them. Thus the Russian system of education is faced with several very urgent issues that are to be sorted out immediately.

At the present moment science and engineering have been developing very fast. Information technologies and high technologies are introduced everywhere. The society is in great need of highly qualified specialists. Thus the quality of education should become much better to meet the modern demands. The personnel needs to get special training to be able to work effectively using new technologies. Thus continuous professional development programs become of a paramount importance.

So higher education becomes a very important branch of economy in developed countries. Income from educational services becomes comparable with income from tourism. Those countries that lead in the field of education can influence on world processes decisively.

The level of tourism industry in the country shows the quality of infrastructure and social and political stability there, as well as the quality and the scope of the country higher educational system shows to what extend the pretension to be a leader in science, technology and ideology is proved.

The analysis of the educational system in Russia shows that export of educational services makes only 0,3 % of the world one and mainly thanks to the CIS countries (to compare: in the USA it is 30%). So we can say that Russian export of educational services is in an embryonic state.

The Russian society had changed drastically for the last two decades. At the same time we have to mention that the university infrastructure and functions of university subdivisions have not changed at all. As a result there comes a contradiction between

reality of life, needs of the society and an ineffective university infrastructure.

It is true to say that since Russia has become part of the Bologna process there have been made some necessary changes: the system of quality management as well as Bachelor and Master Degrees have been introduced (training of specialists is remained). There appeared new subdivisions at higher educational institutions.

Since innovations and new technologies have become crucial for universities there appeared a necessity in having subdivisions able to do and develop business such as techno-parks and “business – incubators”. But it should be said here that changes in the university infrastructure and functions of university subdivisions are still an issue.

Let us consider the main prerequisites of inevitable transformations of university infrastructure and its subdivisions which will have to happen due to marketing economy and Bologna process recommendations.

1. Common European system of evaluation and accreditation of all European (including Russian) universities, credit system that takes into consideration students workload are introduced.

2. All universities introduce Bachelor’s and Master’s Degrees.

3. Educational institutions are transformed into research training centers where research is carried out in the fields of cutting edge technologies. Academic people do research and teach at the same time. There appear new forms of scientific work. Student’s scientific work becomes a very important part of training. Students are involved in real projects.

4. Focus should be made on practical issues. Students should be prepared to work in real life situations. Project based learning becomes very crucial.

The university administration has to deal with two related issues: quality of education and its effectiveness, because graduates of Russian universities have to be competitive both in Russia and abroad. Management in education should be significantly improved.

It is very well known that if you want to increase stability of any organization it is necessary to create effective communication system according to new goals.

So, to increase competitiveness of an organization you have not only to found new subdivisions and change their functions but to concentrate on the system of organization management. Besides you have to think of new organizational and financial structures, clearly define rights, duties and responsibilities of these subdivisions.

In our opinion the subdivisions that need to go through changes are the following:

1. Dean’s Offices.
2. Post-graduate Departments.
3. Research Department.

4. Departments of Practical Training.
5. Law Service Departments.
6. Personnel (or Human Resource) Departments.
7. PR – Departments (Image – Centers, Advertising Agencies).
8. Department of Quality Managements.
9. Outsourcing Departments.
10. Monitoring and Controlling Departments.
11. Departments of IT Service.

We believe that Dean’s Offices should have the following new functions:

- a) Student’s Assessment. Student’s final and intermediate tests should be provided not by teachers (teachers give paper – based or computer - based tests on different subjects to Dean’s Offices) but by invigilators, appointed by the Dean’s Offices. On one hand it is the way to protect corruption, on the other hand professors and teachers will have more time to concentrate on research and methodological work.

- b) There is a necessity to have invigilators. Teachers, professors who teach a subject, should not be in the class during the test (they can only check the results).

- c) Web sites should be created and maintained where teachers could place materials for students to help them learn better and have some feedback from the students during the semester. There should be more qualified people (IT – specialists, engineers, programmers) working in the Dean’s office. As a result they would be more responsible for the tuition process, and it’s effectiveness, using IT in practice.

Post-Graduate Departments should deal not only with those who study for PhD, but for Master’s Degrees as well. As we know very well Bachelor’s and Master’s Degrees are scientific degrees while the qualification of a specialist is not. Those who study for the Master’s attend classes, do research intensively and write dissertation at the same time. We must admit that at the present moment there is not much difference in the way undergraduate students and Masters are taught. Quality of education of students is provided by specialized departments. Dean’s offices are responsible for the quality of Master’s training now. The problem is they can not provide the marriage of requirements in this particular field.

We have mentioned that the number of students getting Master’s Degrees is relatively small (for example at Kazan State Technical University it’s about 100 people, and some schools have only 4 – 5 Masters).

Taking into consideration what has already been said we believe that Masters should be trained in the way Doctors of Philosophy are trained. It should be done under the umbrella of the Post-Graduate Departments.

Research: new approaches

Let us remind that support and development of research and innovations at the universities are aimed

at the in-depth tuition process, professional development of the academics, creation of new technologies to be used in economy, accumulation of knowledge and information to be spread and applied.

How is research financed, what are the sources of financing? They are various: grants, scholarships, fellowships on one hand and agreements, contracts with different institutions and organizations, bank credits, sales of technological – scientific products, on the other hand.

There exist different organizational forms of carrying out research : temporary research teams, business contracts, research centers, associations and etc. Some divisions are totally dependent on university administration while others get a power of attorney and have the status of juridical persons.

As experience shows the effectiveness here depends on financial independence and independence of making decisions.

The law department of the university should work out all internal normative acts and direct agreements that regulate the relationship between the university and its subdivisions and take the responsibility for it.

University Law Service

It is obvious that people who are in business take certain risks. When business is done by academic people it is even more risky, because it is new, the legal acts and documents have not been worked out yet in Russia. Marketing relations are new as well.

In conditions of effective management every staff member should have very clear duties according to their job content instructions which are written professionally and legally correct. Besides personnel should live these instructions and it should be controlled.

Taking into consideration what has been mentioned above, law service should not only consult the university administration on economic disputes with economic agents but help university subdivisions work out and write local normative acts and founding charters.

Besides the law service should edit and double check all the agreements (for example between the university, a student and an enterprise), orders, instructions and directions.

Quality and Innovation Management.

The major goal of the university executives is effective functioning. We understand functioning as maximization of quality of knowledge and skills with minimization of resource expenses that provide effective tuition process.

To provide quality and control of learning there should be an effective system of educational marketing, university advertisement. Personnel potential should be also strengthened. It is pretty much reasonable to concentrate all these functions in public relations centers or image-centers.

The missions of these centers are:

- current and future perspective assessment of labour market;
- web-site updating;
- annual publication and presentation of the university prospectus.

HR Department should be responsible not only for personnel files but for screening and hiring personnel.

At the moment it is done only by Heads of Departments and Subdivisions. In future it should be delegated to HR Department.

What else is of essential value is information support of all university subdivisions: dean's offices, specialized departments, Controller's Department, libraries, HR department, the system of electronic flow of documents and stuff. To save money and increase productivity and effectiveness of work in general it is reasonable to have a special division in charge of computer and equipment maintenance and supply of consumable materials.

Department of Practical Training

At the moment the responsibility of Departments of Practical Training is not only to sign up agreements and set up relationships with industrial enterprises but to research possibilities of students in real-life conditions and at the university. At the same time they have to care about students employment and work out the curriculum with the industrial enterprises. Practical Training should be a very significant part of the syllabus.

University international activity plays an important role at the present moment. It makes sense to consider an export of educational services as one of the major rating indices of the university.

International Office should concentrate on lining up international students and teachers. The reality is that now it is not enough to work within the frame of government agreements and contracts. It is reasonable to found agencies abroad and launch courses of Russian, Mathematics, Physics abroad, to take part in different international educational fairs and to publish promotional materials (promo).

We think that there is one more department or service, which should be of a paramount importance at the university. It is outsourcing.

Outsourcing means delegation of non-core functions of the organization to an outside contractor.

Outsourcing service provides the expenses decrease on maintenance of non-core subdivisions by introducing self-recoupment (self-repayment). The idea of outsourcing is very simple. Having delegated associated functions to a reliable and professional partner, the university can concentrate on its major activity.

Outsourcing Department should determine which university activities could be considered non-core (cleaning, construction, repair, publishing, camps and etc.).

Decentralization of management, monitoring of subdivision activities and outsourcing should be-

come major factors of effectiveness of internal personnel and financial management.

Sorting out problems of decreasing expenses and increasing the effectiveness of the university at the same time by improving internal management will solve the problem of adapting Russian universities to modern social and economic conditions.

Having analyzed the system of higher education in Russian we can state that the infrastructure of the universities changes very fast. It is probably true to say that the structure of subdivisions in some cases has been modernized or changed but the job being done by them remains the same.

To sum up our views and ideas we would like to say that management is not only science but art. So the effectiveness of the universities pretty much depends on talented, creative, unique specialists involved in the university management.

We should bear in mind that personnel plays a decisive role everywhere: "everything depends on personnel".

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**NECESSITY OF ACADEMIC CREDITS
TRANSFER SUBSYSTEM APPROBATION AND
DEVELOPMENT IN EDUCATIONAL
AUTOMATED INFORMATION SYSTEMS
WITH ACCOUNT OF BOLOGNA
DECLARATION**

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The integration of the higher professional education system of the Russian Federation into the world's system within the framework of the Bologna declaration statements implementation stipulates the creation of a credit system analogous to the European credits transfer system, as a means of students', teachers', research workers' and universities administrative personnel's mobility promotion.

The change to the system of credit units requires the academic activity organization change in higher educational institutions (HEI) of Russia from a traditional to a credit-modular circuit, the development of new principles of curricula scheme and national educational standards content.

To provide the process of coordination and interaction of HEIs the automated information systems (AIS) on the basis of network-enabled computer technologies are used. The peculiarity of such systems is the presence of modular subsystems having their own tasks and purposes, and the hierarchic relation struc-

ture provides the unity of the whole system functioning.

The academic process and training quality management subsystem at a HEI may include a forming unit of specialties curricula, the analysis for their conformity to the national standards, and also the parameter setting of academic schedules and disciplines. The curricula comparability allows students to choose programs corresponding to the qualification being got. The given AIS subsystem contains the taken elective courses accounting units and the students' special curriculum performance control unit as well.

However, the automated information systems used nowadays have no subsystems allowing the transfer of credit units in their structure. Using the data of other units the academic credits subsystem will be able to do such a recalculation on the basis of carrying out the quantitative assessment of the training load intensity and quantitative training results determination without breaking the traditional system in the transient phase.

The AIS integrity makes possible the interaction of various functional units both on the data and their processing procedures. The functional system adjustment means suppose the AIS adaptation to every specific institution and support the technology of solution transfer from one database to another.

The availability of technologic methods of integration with other applied systems, the application of Internet technologies as means of information resource use provide the use of AIS for the data exchange and processing. The renewed HEI data bursts with the description of courses, their content, training methods, evaluation system, the attachment of a complete curriculum on the given training level; and also other necessary information will allow making clear the educational programs and curricula.

The variation of the existing automated information systems including the credit units' recalculation subsystems can promote the unification of educational institutions systems into a single educational milieu without education quality and integrity violation, and foresee the possibility of credit transfer accounting within the framework of a sequential training programs, reflecting a definite successfully completed work volume at a certain level for the qualification acknowledgement.

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CONTRADICTIONS OF LEGISLATIVE BASE IN EDUCATION

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Our country has been going through never-ending reforms for nearly 20 years already. Some of them follow the others resulting from the previous ones, complementing each other but more often ruling each other out. This reforming wave inevitably carrying us to the socio-economic and political prosperity couldn't help but touch such an important issue as the system of education.

Putin's period which has undoubtedly become "The Golden Age" in the history of new Russia, is marked by been adoption of three programs: "The Program of Development of Education in Russia", "The State Program of Patriotic Education of the Citizens of the Russian Federation", and the Federal target program "The Youth of Russia". Actually, all these programs are directed towards the new, spiritually moral education of the youth, formation of patriotic consciousness of the citizens and creation of the conditions to implement idyll into life. It is specified that studying the history of Russia and its culture plays a special role. The new concept of spiritually moral upbringing of the Russian citizens, not the Soviet, is based on both universal and domestic traditions and values. As a result, a new word in the system of our education (to be more exact, a well-forgotten old word) is coming up onto the surface. It is religion, that is a basis of the national culture and the national values. Clause 14 of the Constitution of

the Russian Federation reads: The Russian Federation is a secular state. No religion can be established to be the state or obligatory. Religious associations are separated from the state and are equal under the law. It means that no religion or a religious association can interfere with the government affairs. But at the same time this clause doesn't regulate the public life or national traditions that naturally have roots in religious traditions, values and ideas.

Item 5 of Clause 1 of The Education Act, forbids creating organizational structures of religious movements or associations in municipal and state educational institutions. But the law does not forbid to study and know the culture that has a religious basis.

Clause 13 of the Constitution reads that "no ideology can be established as state or obligatory".

These contradictions in the system of modern education deprive it of basis, the pivot that should implement and stabilize the functionality of the state machinery. All the global reforms of the educational system have always led to aspiration to change the human consciousness, his views and values. They've tried to bring up a person of the new formation leading him from orthodoxy to atheism, further to humanism, and to ...nowhere. The basic problem of the modern education is in Education itself. One can teach anybody to do anything, but it will yield fruit only when we are able to bring up the Person, the Citizen.

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STATE AND TRENDS OF THE URANIUM SECTOR IN THE WORLD FUEL-ENERGY COMPLEX

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The paper present statistical material and analysis of one of the natural fossil power resources – uranium. A situation of uranium stocks in various regions and countries, dynamics of its extraction, consumption, export, import and average annual prices have been analyzed for the past several years. In addition trends of the world uranium sector for the nearest future have been considered.

Uranium is a strategic type of raw stock and the most important energy carrier.

It is mainly used in the atomic power engineering that at the moment is producing about 17% of the world capacities of electricity, while nuclear sources cover 7% of the world energy resources [1].

World resources of natural uranium according to [2] make up 17 million tons, 21% of which are profitably mineable total reserves with the basic price of USD 80 per kg maximum (including 2,6 million tons of confirmed reserves).

Table 1. Confirmed reserves of uranium, dated of 01.01.2005. (thousand tons) [2]

	Europe and Asia (incl. Russia)	Asia	Africa	America	Oceania and Australia	Total
Reserves (t.t.)	212,0	570,34	560,91	613,4	714	2670,74
World quantity (%)	7,9	21,4	21,0	23	26,7	100

According to [3] dated 01.01.2005 the world reserves of uranium make up over 14,8 million tons. A part of them is total reserves (profitably mineable) make up slightly over a quarter, probable reserves – 68%, and a reminder, 6,3 %, is the below-balance reserves, the waste cost price of which is USD 80-130 per kg.

About 80% of reserves are in seven countries. The largest reserves of uranium are in Australia (26,7%), Kazakhstan (14,2%), Canada (12,9%).

The share of Australia makes up over a quarter of the reserves, and 97 % of them are characterized by an extraction cost price of USD 40 per kg maximum. 67 % reserves of Kazakhstan, 84 % of Canada, 77 % of Niger and 100 % of Uzbekistan are of the same category. This type reserves in Russia make up 46 % [3].

Brazil, Uzbekistan, Namibia and Niger have got a significant total stock of 9,5%.

During 2003 to 2005 a small stock and probable addition of uranium took place. Its total reserves increased by 7,6 % (basically at the expense of increase in the confirmed reserves – 7.5 %). Volume of probable reserves – by 2,7 %, addition of below-balance reserves made up 1% [3].

This addition was mainly provided by Niger and Australia, while reserves in the rest of the countries are of the same level, or are decreasing as a result of the deposits' spent [2].

Rise in the world reserves during the mentioned period took place not so much due to exploration work, as a result of recalculation of reserves with the reduction of uranium cutoff grade made tanks to a sharp increase in its price.

Uranium concentrates from the extracted ores are produced in 18 countries with the capacity of over 40 thousand tons converting to uranium (table 2) [2,4].

Table 2. Dynamics of uranium concentrates' production (t), converting to uranium

	1995	1996	1997	1998	2001	2002	2003	2004	2005
Europe (incl. Russia)	4991	4668	4477	4057	4460	4524	4565	4615	4668
Asia	4159	3549	3493	3973	4923	5658	6095	6760	7475
Africa	7031	7777	7974	8186	6059	7268	6562	7062	7248
America	13029	14237	14234	12831	13586	12796	11555	12743	12803
Oceania and Australia	3712	4974	5520	4885	7652	6854	7633	8982	9516
Total	32922	35205	35698	33932	36680	37100	36410	40162	41610

In 2005 the biggest capacity of uranium production was in Canada (27,9%), Australia (22,8%), Kazakhstan (10%). These countries together with Russia, Niger, Namibia and Uzbekistan (where extraction capacity is over 2 thousand tons) provided 89% of the world production.

A basic part of uranium is extracted on a Canadian deposit – McArthur River, brought in operation in 2000. An underground pit of the deposit is the largest on the world – its annual capacity is 7,2 thousand tons of uranium. The second biggest metal extraction deposit is an Australian deposit – Ranger, with 0,5 thousand tons, the third biggest deposit is one more Australian deposit, a complex copper-gold-uranium object – Olympic Dam, with 3,69 thousand tons [5].

An Australian company BHP Billiton is working on a feasibility study of the project on enlarging of Olympic Dam. This project requires from 7 to 10 milliard dollars. As a result of its implementation an annual production of uranium will be tripled and make up 12,7 thousand tons [5].

Plants producing uranium hexafluoride from natural resources are operating in six

countries and over a third of the total production capacity is in Russia (24 thousand tons), France (14,4 thousand tons), the USA (14,0 thousand tons), Canada (10,5 thousand tons), Great Britain (6 thousand tons), China (0,4 thousand tons). A total world capacity makes up 69,53 thousand tons of uranium hexafluoride per year [6].

Further processing of natural uranium hexafluoride and secondary raw materials are realized by isotope-separation plants in a limited number of countries: the USA (34%), Russia (28%), France (20%), Great Britain, the Netherlands, China, Germany and Japan (total capacities – 18%). [6].

At the moment 440 nuclear power plants are operating in the world that annually consume over 60 thousand tons of uranium (table 3) [2,4].

The largest consumption of uranium falls to the share of the USA CIA (32,45%), France (15,29%) and Japan (11,99%). Germany consumes 5,4%, Russia 5%, South Korea 4,4%, Great Britain 3,5%. [7].

Exporting data are illustrated in table 4 [2,4].

Table 3. Annual consumption of uranium for nuclear power engineering (thousand tons)

	1995	1996	1997	1998	2001	2002	2003	2004	2005
Europe (incl. Russia)	29,34	30,08	32,01	29,88	29,95	29,89	28,35	28,44	29,03
Asia	11,46	12,15	11,08	11,88	11,83	12,11	12,99	13,02	13,97
Africa	0,28	0,29	0,3	0,31	0,36	0,36	0,36	0,36	0,36
America	20,33	21	24,46	20,73	22,81	22,98	24	24,72	24,88
Total	61,41	63,52	64,84	62,81	64,96	65,43	65,7	66,53	68,23

Table 4. Dynamics of export of natural uranium from the countries, leading manufacturers (tons)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Australia	3727	5424	6916	5553	6426	7436	7834	6476	8151	8181
Canada	16404	16326	11127	9984	7146	10966	10029	11543	11741	9719
Namibia	2007	2452	2905	2762	2689	2714	2231	2346	2039	3039
Niger	2970	3160	3497	3731	2918	2895	2923	3077	3154	3269
USA	3783	4424	6534	5798	3272	5222	4512	5919	5072	5081
NIS	12100	17600	12200	11600	9400					
Russia							2780	3900	3444	2336
SAR	1424	1436	1100	962	981	878	885	808	769	769
Total	42415	50822	44279	40390	32832	30101	31194	34060	34370	32394

Major exporters of uranium are Canada, Australia, SAR, the USA and Russia [2,4].

Table 5. Dynamics of import of natural uranium to countries of EU and the USA (tons)

	1995	1996	1997	1998	1999	2000	2001	2002	2004	2005
EU	16250	15814	15625	15588	16857	15909	13784	16900	14600	17600
USA	15884	17469	16538	16810	18297	17273	17953	17887	19910	21056
Total	32134	33283	32163	32398	35154	33182	31737	34787	34510	38656

Under the conditions of high prices on oil and severe air pollution control advantages of nuclear power engineering have recently becoming more obvious and a demand for uranium products has a growth trend.

Uranium market has been scarce for a number of years. In 2004 a supply deficit was 14,7%. From year to year a market deficit of uranium products has been covered from the commercial stocks that are quite difficult to estimate.

By analyst calculations uranium stocks accumulated from all available resources are enough to satisfy needs of nuclear power engineering of the world up to 2010. [8].

This means that owners of nuclear power plants will soon face a real deficit of uranium.

As a result price growth has been increasing: 2004 – wholesale price was increase by 74%, its maximum was USD 45,5 per kilo. By November 2005 the price made USD 73 per kilo of uranium concentrate.

Among raw products, prices on which are controlled by Reuters/JefferiesCBR Index, in 2005 a uranium price was the second highest after a sugar price [90].

Thus, a new relationship between uranium products' manufacturers and their consumers has been developed. The market has been transformed from "the consumers' market" to "the sellers' market".

As a result of recent changes in the market conditions manufacturing companies

has become more active in investing in expansion of uranium production and projects providing stock addition.

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STATE AND PERSPECTIVES OF THE WORLD FUEL-ENERGY SECTOR OF ECONOMY

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The article presents statistics and analysis of one of the major secondary energy sources – electric power. The state of the world generated power sources, demand, production and supply of electric power to countries and regions has been analyzed. Perspectives of the world power engineering sector for the nearest few years and its relation to primary fuel energy resources have been also considered.

Electrical power industry is a leading part of the power industry producing electricity for countries on the basis of manufacture and distribution of electric power.

Analysis of the state-of-the-art in this sector shows that consumption of electricity in the world is constantly rising (table 1).

Table 1. Dynamics of the world electricity consumption (milliard kilowatt-hour) [1]

1995	1996	1997	1998	2000	2001	2002	2003	2004
11742,2	12109,4	12426,6	12751,3	13592,1	13802,4	14285,5	14802,9	15441,3

The world figures of electricity consumption are as follows: the USA (24,1%), China (12,5%), Japan (5,9%), Russia (5,2%), India (3,8%), Germany (3,4%), Canada (3,38%), France (2,9%).

Analysis of Table 1 shows that during 9 years, within the period from 1995 to 2004

consumption increased by 32% which on average makes up 3,5% a year.

If this growth rate of consumption remains at the same level, by 2030 the world consumption of electricity will have made up about 30 milliard kilowatt/hour (Table 2). The bottom line of the table illustrates the forecast [2].

Table 2. Forecast for the world consumption of electricity (milliard kilowatt/hour)

	2005	2010	12015	2020	2025	2030
Our forecast	15971	18766	221561	24356	27151	29946
[2]	15766	19045	21699	24371	27133	30116

By 2030 an annual gain of the electricity consumption in countries of Economic Cooperation Organization (ECO) will have made up 1,5% on average. It should be mentioned that rise in consumption by 50% will be mainly stipulated by increasing use of consumer electronics, equipment for offices and telecommunication technology.

One of the most rapid growth rates of electricity consumption (on average 3,9% a year) within the mentioned period is the share of the countries that are not ECO members.

The most rapid growth rate is expected to be in Asia - 4.7% annually, then in the Central and South America - 3.7%, Middle East - 3.0%, Africa 2.9%, Europe and Asia - 2.8%. In 2003 the countries, that are not ECO members, consumed 40% of the world electricity; by 2030 their share is most likely to make up 56%. The forecast of electricity consumption growth by these countries is mainly explained by estimation of gross domestic product, population growth and increase in life level.

Growth of electric power consumption naturally requires increase in a fixed generating supply (Table 3).

Table 3. Dynamics of total fixed electric power supply in the world, (million kilowatt/hour) [3]

1995	1996	1997	1998	2000	2001	2002	2003	2004
2929,0	2982, 5	3060,4	3120,9	3279,5	3392,5	3511,6	3631,5	3726,3

The largest production capacities for electric power production are allocated in the USA (24,1% out of the world fixed supply), China (10,5%), Japan (6,5%), Russia (5,8%), India (3,5%), Germany (3,2%), Canada (3,17%), France (3%).

During nine years from 1995 till 2004 an average annual growth of generating power supply made up 2.7% (Table 1.3).

Thus, there is an obvious tendency of decrease in the growth rates of the fixed power supply in the world.

Taking into account this annual growth of generating power supply (2,7%) we can present a forecast of production capacity in electric power industry (Table 4). The bottom graph of the table illustrates the forecast [4].

Table 4. The forecast of the fixed generating power supply of electricity recourses in the world (million kilowatt/hour)

	2005	2010	12015	2020	2025	2030	2035
Our forecast	3819	4335	4850	5366	5881	6397	6912
[4]	3903	4656	4981	5413	5850	6349	7174

Dynamics of electric power production is naturally close to the dynamics of the fixed generating power supply growth [5] (Table 5)

Table 5. Dynamics of electric power production (milliard kilowatt/hour) [5]

1995	1996	1997	1998	2000	2001	2002	2003	2004
12624,6	13010,2	13345,6	13681,6	14595,8	14799,8	15342,3	15883,5	16599,1

Leaders in electric power production are the USA (24% of the world production), China (12,5%), Japan (5,9%), Russia (5,3%), India (3,8%), Canada (3,5%), Germany (3,4%), France (3,3%).

Table 6. Dynamics of export (a) [6] and import (б) [7] of electricity in the world (milliard kilowatt/hour)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
a	399,1	418,0	419,6	407,9	446,7	489,5	487,7	516,5	546,6	553,3
б	397,0	420,4	418,6	407,8	445,5	490,0	486,9	519,0	546,0	552,5

Leaders of electric power production are France (12,4% of the world export), Germany (9,2%), Paraguay (8,1%), Canada (6%), Switzerland (5%), Russia (4,9%), Czech Republic (4,4%), the USA(4,1%).

The largest importers of electric power are Germany (8,7%), Italy (8,4%), Brazil (6,8%), the USA (6,2%), Switzerland (5%), Canada (4,1%), the Netherlands (3,9%).

Since a number of primary energy sources is used for electric power produc-

tion, consideration of a certain contribution of each of these sources into the world electric power production is of doubtless interest. Such data are given in Table 7. [8].

Table 7. Share of primary resource in milliard kilowatt-hour (A) and in % (B) in the world electric power production

		Oil	Coal	Natural Gas	Renewable Energy Sources	Uranium	Total
2004	A	937,2	6722,8	3230,5	3085,5	2619,2	16595,2
	B	5,7	40,5	19,5	18,6	15,7	100
2010	A	987,9	8073,8	4281,5	3666,2	2722,3	19731,7
	B	5,0	40,9	21,7	18,6	13,8	100
2015	A	1064,8	9378,3	5154,9	3920,6	2972,3	22491,1
	B	4,7	41,7	22,9	17,4	13,3	100
2020	A	1106,2	10711,4	5914,3	4199,4	3255,2	25186,6
	B	4,4	42,5	23,5	16,7	12,9	100
2025	A	1149,1	12101,6	6580,9	4503,8	3472,0	27807,3
	B	4,1	43,5	23,7	16,2	12,5	100
2030	A	1178,3	13649,6	7423,3	4803,9	3618,7	30637,8
	B	3,8	44,5	24,2	15,7	11,8	100

A historical retrospective in the world electric power production is interesting to consider. Combination of primary types of fuel in this sphere during the previous decades changed essentially (even greatly). Coal has always been a dominating fuel. Production of electric power at nuclear stations significantly increased from 1970th till the middle of 1980th. During 1980th and 1990th natural gas was a priority for electric power production. From the middle of 1970th high world prices for oil stimulated replacement of oil by natural gas and coal at electric power production. Thus, relatively high prices for fossil fuel have recently raised interest to nuclear power and renewable energy sources.

Let us consider a ratio of primary sources at electric power production at present and the forecast for the nearest decades.

It is seen from Table 7 that the oil share in the world electric power production is not large at the moment (less 6%) and is

likely to decrease in the nearest future. It can be easily explained since oil is a too valuable raw material for oil and petrochemical industry to burn it in electric station furnaces and use in diesel-generator sets.

For example, in the Middle East and China electric station power capacity is likely to increase since demand for electric power in these regions surpasses electric power production and industry has to prefer selection of diesel-generator sets to overcome a deficit in energy.

At the moment coal has got the biggest market share in the world electric power production (about 40%) and the situation is likely to remain the same in the future.

Capacity of the world electric power stations used coal is about 30% and increases by 2.2% annually.

Regional differences in coal use for electric power production are mainly stipulated by differences in coal resources of the region. Regions with rich coal resources

have to use coal for electric power production since coal has got a lower energy density and in comparison with oil and natural gas is more rarely used for other purposes.

No wonder that such countries as the USA, China, India and Australia with the largest world coal supply widely use this source (50-80% of electric power).

The share of natural gas in electric power production made 19.5% in 2004 in the world, and it is likely to increase by 24.2% in 2030.

Today capacity of electric power stations used natural gas makes about 20% and in the nearest 20 years will increase by about 2.7% annually. The share of the fixed capacity of the world electric power stations used natural gas will make up 33% in 2030 as compared to 27% in 2004.

Almost half of the total growth of generating power capacity of electric stations used natural gas is the share of European countries. The share of natural gas in this region in electric power production will double and over (from 15% to 39%) from 2004 till 2030. Because of the planned step-by-step cease of nuclear generator use in Belgium, Germany and Sweden and ecological limitation of building of new coal electric power stations, natural gas has got the biggest share on the electricity market in the countries of Economic Cooperation Organization (ECO).

In the USA the share of electric power produced at electric power stations used natural gas is gradually reducing. These electric power stations providing about 50% of the total electric power supply in the USA, will increase its share up to 20% in 2015, and then will decrease it again up to 15% in 2030. This increase is stipulated by construction of new and more efficient electric power stations, while the further decrease is a consequence of a constant rise of the gas price. A similar situation is likely to take place in Asia. In Canada and Mexico capacity of electric power stations used natural gas and electric power production have a stable growth (4.5% annually in Canada and 6.9% annually in Mexico).

Capacity of electric power stations used natural gas is growing most rapidly in Asia (especially in China and India). Natural gas consumption in electric power sector is now growing and will grow on average by 7% annually in China and 7.1% annually in India.

In Asia production of electric power based on the use of natural gas will on average increase by 7.2% annually in comparison with 4.7% annually in the world.

Nuclear power is an important source of electric power in the majority of the world countries. In 2005 16 countries depended on nuclear power since 25% of electric production was provided by nuclear power stations.

In December of 2005 443 nuclear reactors were in operation and 24 were in the process of construction. Construction of a few new electric power stations is planned in Finland, France, Japan, South Korea and the USA. Despite an obvious tendency of reduction of the nuclear energy share in electricity production, it will remain an important electric power source. Production of electric power at nuclear power stations all over the world made 2619.2 milliard kilowatt/hour in 2004 and is likely to increase up to 3618 milliard kilowatt/hour in 2030.

Recently perspectives in nuclear power have grown. Rising prices for fossil fuels, issues of energy supply safety and opportunity of construction of new, cheaper nuclear reactors might foster new capacity of nuclear power as well.

However, perspectives in nuclear power can be limited due to various political and social reasons. This causes a certain doubt concerning its application forecast.

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*Materials of Conferences***NETWORK EDUCATIONAL COMMUNITY LIFE CYCLE BASED ON “INCREASE” POINT***Badluev A.I., Frolov D.G.**Buryat Scientific Centre of Russian Academy of Science, Siberian Department, Ministry of Education and Science of Buryat Republic Ulan-Ude, Russia*

In the root of any activity alteration the innovation process lies, which is built on the basis of life cycle of the activity and characterizes its development dynamics. According to Senge P., first, an accelerated growth, then – the acceleration lag and reproduction at another qualitative level [1] are observed. The life cycle curve of educational structures built on the basis of network interconnection is characterized by the structure's existence terminable depending on the factors' set. Such a limitation is most often associated with the high rate of information accumulation resulting in information redundancy and recessionary state of any alteration taking place in the organized structure.

The network communities' activity conditions in all stages of their life cycle differ. The existing communities' analysis testifies that depending on purposes, directions and interests they have various kinds of life cycles, among which the most popular are classical (traditional) and “rocket-like” ones. The traditional network community life cycle kind differs with high enough requirements and purposeful directivity. The “rocket-like” network community life cycle supposes a model of quick loss of the community participants' interest; most often such communities are created for the purpose of short-term objectives solution. Besides, in the nature of network communities a life cycle, in the root of which there is an oscillating process, can exist; such communities, as a rule, either work or “die out”.

The necessity of investigation of the network educational community creation mechanism on the basis of life cycle theory is conditioned by the problem of the network community development by means of “increase” points introduction and by the opportunity of integration processes management for the purpose of positive development dynamics support. Various kinds of life cycle allow using them for the formation of various organized structures and integration of scientific and educational activities into a single unit. More over, there appears an opportunity to define the network community “increase” point, the point of “dying” and the point of possible revival of the network community by means of the life cycle mechanism. At that, the factors, which the duration (life cycle period) and points of the network community life cycle depend, are defined.

In the first stage – the stage of creation and introduction of the network educational community –

the community's aims are established, the “increase” point choice is performed, the interaction scheme implementation mechanism, which includes the choice of the institution for the “increase” point, the development of the community management model, the definition of methods and ways of interaction, forms of scientific-educational participation, is developed.

The stage of increase and expansion of the network community activity is characterized by its development on the ground of the chosen “increase” points; the community participants' collectives are formed; the network interaction forms are developed. Together with high integration rates the given stage can be attended by the downward tendency as well.

At the stage of maturity and discontinuation of activities the achievement of objectives is performed (in whole or in part), the activity dying out occurs due to some negative consequences, causes of economical, social-psychological, legal sense. The sources of retarding forces are the limits of educability and growth. The clamping factors are conditioned either by the principles of the traditional activity organization or by the exhaustion of rise promoting factors [1]. The investigations show that the cyclical slowdowns most often happen due to the fact that the very high rates of information accumulation, probably, result in crises. In conditions of the information redundancy the system extension including the “development point” expansion is not the protection against the crisis. The unstable state of development in the specified conditions emerges not as the result of managerial mistakes, lack of information or absence of business and consumer confidence, but on the basis of the information accumulation dynamics. The contribution of the new technology into the information creation can result both in dying and distribution of “increase” points, that is associated with high technologies, which, as a rule, have “high instability”.

Thus, when managing an educational process on the basis of network interaction, one can use the mechanism founded on the formation and development of “increase” points, in the heart of which the life cycle theory can be put, which, on the ground of knowledge about an existing point of the network community development, allows planning the educational space alteration by means of new points and “increase” centers search.

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**NON-STATE SECTOR AS HIGHER
EDUCATION SYSTEM ELEMENT IN PERIOD
OF RUSSIAN SOCIETY TRANSFORMATION**

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The reforming of the educational system (and especially higher education) in the country goes hand in hand with socioeconomic and socio-political processes in the society. It means that in the reforming course the measures are necessary providing the higher educational institutions (HEI) functioning business mechanism evolutionary change in accord with the society's socioeconomic life reconstruction general design. The reforming content of the Russian higher school, progressively acting as an educational industry at the present time, is its entry into exchange relations.

The higher education reconstruction in conditions of market system needs a theoretically substantiated strategy of development and functioning of all the spheres of higher school activity, those connected with the educational process financing among them. The commercialization in the context of education represents the alteration of functioning of higher educational institutions as exchange relations subjects for the purpose of their adaptation to a new social and economical system, work simplification with due consideration of market principles including the achievement of supply-and-demand equilibrium, enhancement of the services, which could conform to the changing consumer needs.

The new Russian realia require specialists armed with new knowledge (lawyers, managers, sociologists, psychologists), but the post-Soviet state system of education could not satisfy the "order" of the society to the full extent due to its "ingeneerization". The given contradiction turned to be one of its main causes of becoming of the network of private higher education institutions, which became the subject of discussions both from the position of terminology and more extended problems: legality of education serviceability development and commercialization of higher school.

Another precondition for the non-state sector development was the problem of state educational institutions financing. In the middle of 90-s of the XX century the business function of state higher educational institutions was relatively divided into a budgetary, supposing only state financing; non-trading, in which the emphasis was made upon the HEI's own resources and the call for funds of other (extra-budgetary) financing resources; and combined one, which supposed the use of both budgetary (state) funds and attracted ones. The problem of budgetary financing was rather urgent, as the state funds given for financing education practically hadn't been in-

creased for a long enough period, often even the accepted part of expenditures wasn't realized, saying nothing of an additional financing.

But the policy of non-state education in conditions of self-financing was being formed by economic laws, where the main mechanism controlling the HEI's life was market educational relations, wherein the demand determines the supply of educational services, its variability, the sold product quality and socioeconomic guarantees. Both student and his parents and the society as a whole appear as the consumer, the subject of educational relations.

The non-state HEIs' life foundation, according to the member of the Non-state HEIs' Association Council of the Russian Federation Pruss N.M., is quality in its all manifestations: it is, first of all, the quality of knowledge got by students in a HEI and that of the educational process, the HEI's culture within the system of moral-ethic and social values and priorities; second, it is the quality of the faculty, education programs, their mobility and flexibility, the reliability and federal status of educational documents, the socioeconomic guarantees, which the consumer acquires after graduating from a HEI, need to be referred here as well.

At the evident necessity of the private sector development the problem of negative attitude of a part of the population towards to private HEIs stands out. It is explained by the fact that a range of the opened HEIs begin working without a license for educational activities, the educational programs of these HEIs do not conform to the national educational standard, the main target of the activities is the generation of profit and not the quality of the given education.

Among other problems of the non-state higher education becoming and development one can detach:

- the academic activity staffing (there are cases, when persons, the basic education of who doesn't correspond to the taught disciplines, are engaged in teaching);
- the financing (a minimum volume of the establisher's financial or material means is not provided at the creation or reorganization of a non-state educational institution for the purpose of the HEI's financial stability guarantee);
- the problem of place and socio-cultural role of private education in the sphere of higher education is not investigated enough.

Thus, nowadays in the sphere of education there appeared a necessity to develop a new national policy based on the conception of the non-state education not as an incidental or alternative to the state one phenomenon, but as quite a correct reaction to the new interests and needs emerged in the society and conditioned by the life itself. The non-state education, protecting the interests of various social groups, is becoming a special object of the national educational policy.

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**UNDERDETERMINED MODEL
TECHNOLOGY FOR MANUFACTURING AND
ECONOMIC SYSTEMS MODELING**

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One of the main problems in the manufacturing and economic computer models development is incomplete and underdetermined data. The capabilities of the modern modeling tools are limited by the possibilities of traditional mathematical apparatus. The qualitative new level of modeling can be achieved by using intellectual information technologies. The web-based system for manufacturing and economic systems modeling was developed by the authors. It is based on the underdetermined models technology (developed in Russian Research Institute of Artificial Intelligence).

Many limitations of the traditional modeling approach are removed. A problem is represented in the form of a model (not an algorithm), in this case using of underdetermined data is possible, there are no inputs and outputs, it is easy to solve inverse problems.

The base technologies of this computer system are the underdetermined models technology, Web-technologies and the virtual reality technology (for the visualization of computation results). The integration of underdetermined models and Web-technologies ensures multi-user remote access to the computational core of the system, processing and saving information on the server, and also using accessible data from the Web and the integration with other software. After the registration in the system user can start developing, exploring and computing of models via Internet (Intranet), The system gives an opportunity for collaborative working with complex models. Users can develop some parts of a complex model, which then associates these parts together.

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ADVERTISEMENT IN SYSTEM OF INTERCULTURAL COMMUNICATIONS

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Advertisement has a sizeable effect on social behavior, ideology, values of individuals greatly. This process is contradictory and causes a complex reaction. On the one hand, advertising appears as a required element of the market-based economy development; on the other hand, the increased flow of advertisement causes a negative response at their being sensed. Especially acutely these advertisement aspects' consideration is manifested within the system of intercultural communications. At the advertising activity implementation internationally the attention should be paid to the general principles of intercultural communication and the target population segmentedness on cultural-national factors, first of all, should be taken into account. Under the influence of advertisement the psychological characteristics, properties, states of people, their consciousness and behavioral reactions change. The future of the society, national culture, psychology and self-consciousness of the people depend on the character of its action. The most important condition of the advertisement effectiveness is its conformity to the general characteristics of national psychology, self-consciousness, cultural tradition of Russians. In Russia this situation is complicated with its multinationality, multistructuredness, and religious diversity. To make the advertisement effective the account should be taken of both local national heritages and values of the peoples living in the territory of the Russian Federation.

Advertisement is becoming one of the most effective mechanisms of action on the human, since appears not only as a source of information about new goods and services, but also as a factor contributing to the formation of consumer preferences and consumption standards. The advertisement also offers ready behavior samples introducing certain values and norms in a wider diapason.

If referring to History, the very abstract idea "advertisement" ascends to the early Latin word "reclamare" (which originally meant "exclaim", "advertise", then it was associated with such meanings as "require", "declare", "respond"), to the first written announcements in Pompei and Herculanium, to the first European heralds and native market criers (1). In the very primitive appeal to the crowd already the major characteristic of modern advertisement is seen: to advise, to disseminate the information about something (someone) to attract a buyer or boost commodity or producer. As far as the society developed the meaning of the notion "advertisement" changed and expanded.

Currently, one can distinguish a variety of approaches to the give phenomenon definition: marketing, sociological, cultural, psychological ones, etc. The majority of advertisement definitions in contemporary literature disperse due to differences in

the treatment diversity used by authors when investigating this phenomenon.

To consider advertisement within the system of intercultural communications one should address to the culturological approach.

Advertisement within the framework of the culturological concept is studied as the phenomenon of popular culture, as its element possessing such special features of the last as a "considerable rate of expansion through mass media, average consumer taste determination, stereotypicality, entertainability, pursuit of reality trivialization" (2). And, of course, advertisement is investigated as an equally significant component of modern culture medium as design, beautiful music, urban development, social and political journalism, photography, general press, television.

In the culturological concept of advertisement study there is an accent to the fact that advertisement not only sets the behavior standards in one or another situation, but also determines the society morals and its ethic parameters considerably, acts as the most active propagandist of esthetic values.

Thus, the culturological concept also studies advertisement as a structural element of culture, it performs a projective function aimed at the adoption by the individuum and

society of the values and popular culture achievements, such as comfort level, life quality, education, consumption of other essential characteristics. At that, the advertisement itself is a project, while projecting information and indirectly – the human and the society.

Owing to its feature to transmit values, priorities, norms, ideals of social medium, advertisement is an active participant of present-day personality socialization.

How is advertisement realized within the system of intercultural communications?

Since ancient times and up today a great variety of national cultures appears on the planet in the partnership with advertisement and self-advertisement. In the culture of every nation living on the Earth one can find out a fact of individual creativity defined by the desire to tell from the total weight of compatriots. At the same time they strive to observe traditions, norms and carry out special rituals fully formed in their national community. Following traditions is determined by the sense of “we”.

Observing traditions and wishing to tell from the others, to excel, people try to be in the fashion, which has a variety of changeable forms, but manifests itself in practically all kinds of human joint activities. People want to resemble those who are stronger, more powerful and famous than they are; they try to imitate their idols.

The contemporary society is interlaced into a complex network of informative-communicative processes. The tendencies to globalization appear as a catalytic agent of the intercultural communication process giving the communication space new qualitative forms. Within the framework of the world’s civilizing process, scientific and technological progress, development of transport and appearance of new technological capabilities and also greater openness of the boundaries between states the modernizer has got unlimited opportunities to contact with the representatives of other cultures. In present-day conditions the intercultural communication is performed in the most diverse spheres of so-

cial life: economical, political, mental and others, inclusive of advertisement as well.

Considering the fact that one of the key channels of intercultural communication is an individual as a certain culture bearer, the advertising phenomenon in this aspect represents a great scientific and practical interest, as advertisement appears as one of the main forms of intercultural communication.

Really, at the end of XX-the beginning of XXI century there arose a demand for considering advertisement as a phenomenon of people’s cultural life, as one of the culture formation mechanisms. Nevertheless, the notion of “culture” itself turns out to be extremely indefinite due to the fact that it was being formed for a very long time and was applied in relation to various objects, which are different in their historical origin. Most often culture is considered as the form of organization and development of the society. It is represented in the products of material and spiritual labour, in social norms and traditions, in moral values, in the attitude of people to each other. In the given idea the difference of the socio-economic factors of human life activity from biologic forms of life, the qualitative distinctness and variety of historically specific forms of life activity at different stages of the social evolution within the limits of certain epochs, socioeconomic formations, ethnic and national communities is fixed.

Besides, one can notice that culture also describes people’s behavior, mentality and activity features in concrete areas of social life. In culture a separate individual’s, social group’s or the whole society’s life activity way can be recorded.

Advertisement, in its turn, is a form of communication, which tries to render the quality of commodity and services and also ideas into the language of consumer needs. A special attention at the advertising phenomenon consideration at the present-day stage should be paid to the following aspects characterizing the culture collision:

1) On the one hand, such a collision is manifested at the attempt of a shift of west-

ern advertising manner in conditions of Russian mentality;

2) On the other hand, in an individual advertising unit and commercial already one can observe a combination or opposition of elements, characters, meanings relating to Eastern or Western culture. Naturally, the given aspects, in their turn, cause problems in advertising perception. It is due to the fact that the ethno-cultural, confessional, lingual and other features of every country, every people are subject to the traditions and norms being formed for centuries, worldview, ideological orientations, customary world perception. The goods and services market internationalization caused by the globalization growing tendencies, causes in the sphere of advertising operation the segmentations of target population not only on habitual gender, age, territory, financial and economic factors, etc., but, first of all, on cultural-national (lingual, ethno-confessional, ceremonial, cultic, etc.) signs. The intercultural communication acquires more and more the character of an attributive property of present-day social reality. The influence of these conditions on advertisement is becoming more and more evident.

The advertisement, entering all the society spheres, has a sizeable effect on social behavior, ideas, values of individuals, affecting the process of borrowing and dissemination of material and intellectual values of the West by the same token. This process is contradictory and causes a not uniquely defined reaction. On the one hand, advertisement acts as a required element of the market economy development; on the other hand, an increased flow of advertising units causes a negative reaction at their perception.

All the world's companies run into a not simple problem consisting in advertising the best qualities of their products both in conditions of local culture and internationally. The advertisement of their products needs to be inscribed in the sphere of the ideas characterizing the peculiarities of culture, political traditions, the level of economic development of the country and the

degree of development of material and ideological needs of the population. The most effective is the advertisement that conforms to the national and cultural ideas of the region where the advertising campaign is supposed to be carried out. The identification of various cultures' special features and adaptation of marketing companies to different systems of values often becomes a crucial variable in the publicity of some or other production.

In different national cultures the information about some or other goods can be perceived differently. So, very often the adaptation methods, so that visual and linguistic elements were transferred into new conditions, are used in advertising. If, when creating commercials, wherein a foreign product is promoted, the ad makers manage to adapt the new product to the final culture system, then this advertisement will be efficient. One or another culture representatives' appearance, their skin color, clothing preferences, language, meal manners, etc. can serve an adaptation object.

Nowadays while "exporting" advertisement from the originator culture into the target culture the following two methods are generally used: on the one hand, a part of producers prefers to adapt the advertisement to another cultural medium replacing some elements composing the original advertising unit in accord with the traditions and values of the addressee culture, often assigning the creation of the information proper to the final cultural-language community's representatives. On the other hand, great multinational enterprises most commonly create one advertising unit, which is merely translated into the language of another auditory.

The cross-cultural approach considering the destination areas' cultural differences is used for promoting such brand names as «General Motors», «Volkswagen», etc. The «Kodak», «Benetton», «Coca-Cola» successfully realizing the principle "one picture, one sound, one system of sales" for the whole world, can be referred to the global strategy supporters.

Speaking on generally accepted values of the Russian culture it is necessary to advert to such its aboriginal traits as:

- collectivity based on the traditions of peasant commune;
- outspokenness, kind-heartedness, expressed in the idea of "Russian soul's vastness";
- tolerance as a consequence of the state's multinationality, its geographic position between Europe and Asia;
- strict morality;
- exceptional preoccupation with the future in combination with almost complete neglect to the present;
- childish spontaneous expectancy of a "miracle" and confidence in "Russian perhaps" (3).

In this connection I.Rzhevskaya fairly notes in the magazine "Advertisement – your capital" that "the majority of Russians prefer kind and conservative to aggressive and innovative" (4), and advises the ad makers to avoid platitude, lies, steamy love scenes, mentioning sexual minorities, curses, obscenity and any discrimination in their products.

Thus, the advertisement in Russia as a whole should be reserved, unobtrusive, respecting the society's foundations and its citizens' private inner life. However, as a rule, the communication material, especially foreign one, is not only regardless of the national mentality and makes no reckoning of the Russian audience's anticipations, but also seeks to dictate the addressees the direction of thinking alien to their own one.

Advertisement, certainly, has a cultural significance. In other words, it is impossible to ignore or diminish the advertisement value for the society's psychological and moral "health", as it able to "engineer" people's consciousness according to intentions and needs advertising spenders-producers and change age-old crusted habits, social norms and cultural traditions in a comparatively short term.

Advertisement may be one of the main comprehensible sources of knowledge of

commodities and services. It is no wonder that, absorbing the information, the consumer assimilates and memorizes it in those very words and characters, in which the advertising spender passed it to him. These words and characters form a peculiar "language".

In this sense the concept of G. Hofstede described in the book «The Software of Mind», where he emphasizes four general manifestations of culture, and among them: symbols, rituals, heroes and values, which, in their turn, can be taken for the basis when constructing advertising companies (5), is very interesting. Under the symbols we understand the words, gestures and also subjects, which bear a special meaning and are recognized by the given culture representatives. The heroes are represented by certain persons, who can be real people or imaginary personages, our contemporaries or legendary personalities of the past, but all of them possess the characteristics, which receive high social rating, and thus become a model to emulate. The rituals represent collective actions, which are considered as the basis of social existence. Among the rituals one can name religious ceremonies, special pattern of behavior, greetings, gestures and tokens of respect to elders. Their samples can serve family values, independence, security, individual freedom, intellectual valuables, etc. Therefore it is important to use and turn to such values in advertising one's own products.

Successful advertising and marketing of the identical product in several countries can be possible in the presence of considerable discrepancies in performance, characters, styles and verbal message. The performance of advertising materials adapted to cultures of various countries is the factor of the product's popularity, first and foremost, under the notion of the consumer commodities. The model of G. Hofstede proved its consistence practically and can serve a good reference point while planning advertising campaigns.

Special attention at the advertising preparation should be paid to the religious factor. Religious traditions considerably limit the advertising character content, and the ad makers have to advert to different variants of products' boosting in the regions, say, with Muslim and Christian population. With turning of the Muslim regions' population of Russia to their religious traditions the requirements to the communication material distributed here become more and more severe. In the Muslim republics of Russia – Dagestan, Karachay-Cherkessia, Kabardino-Balkaria and others – during Ramadan the advertising of ladies fashion underwear or entertainment complexes is considered by local authorities as abomination.

Advertisement originally contains contradictions, that exerts influence on the difference in its perception by some or other social groups. Among positive aspects of advertisement functioning in the system of culture one should mark the one, that advertisement takes an active part in culture renovation and its development. In Russian advertisement a tendency to counterfeit foreign models is very often observed; the National history, culture and traditions, values of the Russian society are insufficiently reflected.

At the implementation of advertising activity internationally one should pay attention to the main principles of intercultural communication and take into account the

target population segmentedness on cultural-national factor, first and foremost.

So, advertisement has become an important component of mass culture, a part of propaganda process, a means of control, manipulation and psychological impact on the human behavior. Under the influence of advertisement the psychological characteristics, properties, states of people, their perception and behavioral reactions change. The future of the society, national culture, psychology and self-consciousness of the people depend on the character of its action. The most important condition of the advertisement effectiveness is its conformity to the general characteristics of national psychology, self-consciousness, cultural tradition of Russians. In Russia this situation is complicated with its multinationality, multistructuredness, and religious diversity. To make the advertisement effective the account should be taken of both local national heritages and values of the peoples living in the territory of the Russian Federation.

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MASS MEDIA ROLE IN INFORMATION SPACE FORMATION IN CONDITIONS OF CULTURE GLOBALIZATION

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Contradictory, differently directed processes: universalism failure, deindividualization of culture, standardization of human subjectiveness as it is, which are testimony to the fact that together with the inversion of the internal and external the inversion of the external and meta-external (global) is gradually happening in the mind of people, which allows manipulating the consciousness of people in the exercise of strategic and tactical tasks in politics, economics, education, ideology, etc., take place in the globalization epoch. These are the conditions, in which the trialectic mechanism of mass media influence on the subjects of culture allows making the mechanism of changing community implications into personal meanings more precise and acutely actualizes the problem of social control over the information policy and the problem of self-consciousness culture in Russia. The information policy in Russia defined by the internal, external and meta-external factors will contribute to the formation of informative self-definition of the human who correlates his own subjective unicity to the universal information space.

One of essential features of processes and tendencies under the globalization epoch is the acceleration in the rates of social dynamics maximally constricting social time causing at that more and more new problems. One of such problems – is the entropy of the established axiological system having provided stable development of the society for a long time. It is necessary to acknowledge the axiological diffusion growth, the loss of their traditional substantiality by many values at their mobility degree increasing. The axiological diffusion growth can be associated with appearance of a new type of people, in who the inversion of the internal and external takes place, that allows controlling the subconscious mind by means of, example, the advertisement mythologization or other persuaders. The combination of illusory fanciful omnipotence and more then modest real existence burdened with total dependence on commodity suppliers and, therefore, with painful feeling of insecurity – is a paradoxical feature of the post-modernizer.

At the present moment a contradictory combination of mutually exclusive personalization and depersonalization tendencies is observed. On the one hand, there is an unprecedented exaltation of humanism principles, the assertion of every person's life worth, the liberal headship of the personality over the society, individual interests over social ones; on the other hand, - a greater unifi-

cation both the personality and the culture under the pressure of all-inclusive life standardization and technocratization. The purposely harsh opposition of the "popular" and "individual" is the backbone principle of modern mass culture, where the ultimate standardization of culture products is camouflaged by the imaginary individual method of their consumption; the cultural industry' impersonality and anonymity neighbors to the cult of "stars" and "great names". In this connection the contemporary native culture researcher F. Girenok notes, that "...the universalism crashed. According to the individualization law everyone wants to get his own portion of subjectiveness (national, linguistic, etc.)" (1).

Such contradictory, differently directed processes as the universalism crash, culture depersonalization, standardization of the human subjectiveness itself testify that together with the inversion of the internal and external the inversion of the external and meta-external (global) is gradually happening in the people's mind, that allows manipulating the consciousness of masses to the full extent at strategic and tactical tasks exercising in politics, economics, education, ideology, etc.

The action of this mechanism is assured by the development of culture as a complex self-organized system, which is defined by a stable tendency, intensifying in the course of information selection, to gain-

ing speed of information processing. At that, the criterion of the selection defining the cultural mutations “survival” is the privilege in the information acceleration – in the incremental rate of information transfer. Such a privilege is possessed by the “sensorium” association of a great number of individuals without regard to age, sex and nationality with the help of MM (mass media).

The action of the trialectic mechanism of mass media influence on the subjects of culture under the globalization epoch is based on two theories: first, the theory of A.S. Driker on the information selection in the process of cultural evolution, according to which “the evolution of global system of culture represented by the aggregate of private evolutionary processes is an integral result of the selection and is characterized, first and foremost, by the seeking for the information gain rate increase” (2); second, the psychological theory of activity by A.N. Leontyev, according to which the implications for the external circumstance subject and his actions under the circumstances are frankly out of the phase with the subject’s understanding of their meaning. “Under certain conditions, - A.N. Leontyev writes, - the inconsistency of meanings and implications in an individual consciousness can take the form of real extraneity between them and even their opposition” (3).

Resting on the basic statements of these theories and considering the processes taking place in culture in the globalization epoch, one can come to the following conclusions:

a) the rearrangement of internal, external and meta-external (global) factors in order of importance is widely used by MM to influence social and individual consciousness by means of specified implications creation – knowledge, ideas, regards, wherein some or other positions, often engaged ones, are expressed;

b) Under certain conditions, when none of the positions impresses the individual, the inconsistency of meanings and values in the individual consciousness comes,

which acquires the character of extraneity between them, even their opposition (for example, the constituent body “votes” with its feet, i.e. stays away from the voting stations, otherwise votes “against all”, etc.);

c) the information selection of implications, which in the consciousness of the individual subjectivize into this or that meaning, is equally important for the personality as the information selection is for mass communication media; however, if the information selection is the prerogative of the information policy, the information choice depends directly on historical subjects’ (personalities’ or different level social communities’) self-consciousness culture.

Thus, the trialectic mechanism of mass media influence on the subjects of culture under the globalization epoch allows making the mechanism of changing community implications into personal meanings more precise and acutely actualizes the problem of social control over the information policy and the problem of self-consciousness culture.

Under globalization conditions the national mass media, actually, are one of means of the original national culture retaining. In connection with that it is really necessary to pay attention to some important features of mass media role from the point of view of civil and open societies functioning. The civil society needs the medium of the governmental, social organizations’, economics’, etc., activity assessment, and mass media are an important element of the civil society in many ways. As for the open society, it resists the totalitarian, strictly regulated order. The mass media in Russia exactly provide the openness and information access inclusive of the access to the official information, and, accordingly, are really an instrument of this open society.

In the era of the Internet and electronic structures and the attendant to this MM role reduction there appears a fear that the society will be open for the restricted medium only. Really, the information society development promotes new social dangers associated with

the information accessibility, and at the same time it is necessary to search for the ways of their settlement, negotiation of one of the main conflicts caused by the intensifying division of the population according to the degree of involvement into the information medium.

Sure, the access to information nowadays can be exercised without mass media benefit, but the access to the social sphere, without mass media, is evidently impossible. Mass media remain an important, if not the main, instrument of public opinion shaping and development, they establish the agenda – social, public and cultural, are a very important factor of publicity.

Besides, such an interesting phenomenon is registered: the more the Internet is used in the country, the more newspapers there are there. The informatization opens new opportunities for traditional mass media: press, radio and TV use the Internet to expedite their subject matter delivery by the medium of the last. Together with that at least part of the readers stops reading newspapers using information from the Internet. Many TV fans turn to the World Wide Web, and sociologists mark some runoff of the viewers. The radio situation seems to be the most stable: the automobile number grows, and the number of listeners – together with that.

New information and communication technologies have a serious effect on the information dissemination, delivery and access. What is meant here is the globalization of mass media and demassification. These circumstances open up new vistas for the information receiving and dissemination, change the communication view essentially. There appears not only the plurality of channels, but also that of the work methods with news; several opportunities for information extracting are documented. One of them is traditional – through newspapers, radio, TV (organs of public opinion), the other one – through the Internet and databanks. In the last occurrence there appears to get not mass, but individualized information. This demas-

sification can, from the point of view of many, destroy mass media, at any rate, fragment and atomize the use of information. And in these very conditions the future mass media problem emerges – if they will retain in the information society and how they can be transformed.

The culture globalization affects the structural elements of self-consciousness of every person individually (first of all, the mentality is meant here) and the society as a whole (public psychology, ideology). The self-consciousness culture is closely connected with the problem of mental personal and social identity, with the mechanism of best activity samples selection in various areas. The problem of culture globalization is performed in this relation as the problem of concretion of the human and humanity universal personal identities expressed in such phenomena as the information choice culture of the person and the culture of information selection in information policy.

The culture of personal information choice – is the life behavior adaptability, which supposes self-consciousness and social reality harmony, reasonable observation of general moral and legal norms as an essential condition of personal identity, the elaboration of one's own Life picture based on the scientific worldview and humanitarian Picture of life. By means of information choice culture the personality finds real foundations for adequate moral and social self-determination, that adds a substantial quality to it, the gift to be *causa sui*, i.e., the cause of itself. As a consequence, a human being realizes himself as an essential cause of the given society state.

The present-day policy in the area of information and information technologies performed through the agency of the information choice culture is inseparably connected with the trialectic rearrangement of internal, external and meta-external factor of culture development in order of importance. One can emphasize the three main factors, which should determine the Russian information policy development tactics:

1. The internal factor should become an adequate determination of the development subject as, first and foremost, the subject of universal information space. The matter is that in modern Russian political mentality an old scheme of the development subject determination on social and national tokens is still keeping on acting: they are class, nation, ethnos, race or political party. Such an approach does not already agree with the realia of the present-day world, wherein the becoming of the information society intended to form the human type unbounded with any social or national determinations, goes at full drive.

2. The external factor of policy in the area of information should be, in our opinion, an adequate determination of national priorities of Russia. In conditions of culture globalization national priorities are to be arranged in the context of the world-wide situation taking into account, first of all, such moments as the national security of Russia and its competitive power in the world arena.

3. The meta-external factor of the information policy, in our opinion, should be the idea of power redistribution at all the

levels in accordance with the level of professional competency in some or other area. Now the social background role decrease is already evident in the personnel dynamics and professional mobility. Beneath our eyes, step by step, the society of meritocracy (power of the most gifted) is being formed. Step by step, in the course of social evolution the principle of advancement of the most talented people selected from all social layers to leading positions.

Thus, the information policy determined by the abovementioned factors will promote the development of information self-definition of the human, who correlates his subjective unicity to the universal information space. The last is unlimited, includes a vast number of entirely different quality cultural units and a high self-consciousness culture is required to choose from this variety what really matters for the human.

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THE NECESSITY OF DEVELOPMENT OF HUMANISTIC POTENTIAL IN MODERN SPORT OF HIGH RESULTS

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Practical realization of the system of ideas, decisions and measures connected with the sport humanization is the most difficult and up-to-date problem of sport science and social discourse on the problems of sport. The necessity arises not only to understand the whole range of questions connected with the development of non-humanistic tendencies in sport but also to develop practical recommendations. The problem, connected with the tendencies of coming out of the saturation point is up-to-date in the modern sport. That is why it is necessary to create new competition and games towards humanization, improve judicial regulations, realized in Olympic ideal and at the end of the competition award with the medal with the inscription: "Humanism thanks to sport". The aim result of sport activity should not come to gaining the record but assist in physical and personal development, increase person's vital capacity and health.

Theoretical development and practical realization of ideas decisions and arrangements, connected with the sport humanization, are the most difficult and up-to-date task of sport science and social discourse on problems of sports.

The necessity arises not only to understand the whole range of questions, connected with development of non-humanistic tendencies in sport but also to work out practical tendencies. The greatest difficulty is that the best intensions and theory bring together with that sport humanization is opposed to intention of sport activity, connected with the aspiration of its object for distinguishing the limits of human abilities in sport.

The problem, connected with the tendencies of going out of the saturation point, arise on certain value and normative ground. The roots are in the development of technical tendencies, in the cult of power and activism, in assimilation of social and natural processes, in pre-eminence of thingish connections and in person transformation into a weak link because of the complexes, created by the society. That's why the solution of the problem of sport humanization is connected with understanding of dangerous perspectives of realization of adhocacy thinking and form of practice. The sport humanization is connected with treatment of a person as integrity whose corporal and spiritual manifestations represent indissoluble unity.

Now measurements are being taken against activity directed towards the artificial improvement of results (use of dope). New methods of training and competition process are being developed. There is an interesting conception, which is based on the creation of such conditions of training and competitions when the sportsman's organism reaction to the training load will not go out of the saturation point. [1. P.52]

The problem is that the majority of illnesses connected with the sport activity are caused by the disparity of used training loads. Because of that overstrain and overexertion occurs, they are followed by worsening of immunity and body resistance. Russian science promotes interesting ideas about the necessity of such training organization when the result will be registered only when the sportsman perform his action within the limits of optimum work of organism. [1. P.52]

Such way of training and competition process organization demands great efforts and technical supply. However, the main obstacle is in the stereotypes of sport thinking according to which the sportsman is supposed to win in spite of the signals about inadequate effort load sent by the organism. [6. P.44]

However, even now there is a project directed to the correction and overcoming the stereotypes of this kind. The question is that there is an opposition between the principal of adhocacy according to witch the

sportsman is supposed to win even if he has to overcome the saturation point of his efforts and the principal of fair play when the sportsman can not use intolerable methods to gain the victory. This principal is the basis of the sport practice developing on the ground of the Olympic ideas. It implies respect for the adversary and for yourself. Without fair play, the competition becomes rude and humiliating and it is manifested in the behavior of the sportsman. [3. p.10] The fair play characterizes the manner of action following from self-respect and including honesty, conscientiousness worthy behavior in the situations when others do not play fair; positive and cooperative respect for the partner, adversary and referee; ability to be modest after the victory and suffer a defeat in a calm way. [3. p.18] That is why the strengthening of the principal of fair play demands constant opposition to the principal of victory which is based in the idea of new sport result, record, victory over the adversary and success.

This evidence concerns that there are certain difficulties in achieving the principal of fair play. First, sport can not be absolutely bound to this principal because of its nature and the peculiarities of the competition process, which demand comparison of results and making new records. Moreover, there will always be people who will decide to make these records at any price.

The realization of the principal of fair play is the main task for the Olympic sport and sport of high results.

Today the programs directed toward the realization of this principal include:

- changing the slogan of the Olympic movement which should be connected with the humanistic values (from the point of view of sculptor Taite McKenzie the slogan should be as follows: "Speed, lightness, courage and fair play"; the president of international schools of physical education consider that it should be as follows: "better, more beautiful and more humane"; there are also other propositions.

- Broadening the practice of choosing sportsmen at the Olympic Games, who have realized the Olympic ideals and at the end of the competition award with the medal with the following inscription: "Humanism thanks to sport".

- Stirring and propagandizing the activity of international committees Play Fair and other similar organization

- Improving the judicial or referee's regulations changing points concerning more precise classification of the breaching the code of the competitions

- Developing new competition and games directed towards humanism. A lot of propositions are promoted to solve the problem of competition process in which the change in rules would be possible (by appointment of all the participants), they would become more democratic, humanistic, available for all the people irrespective of the age, level of preparation, state of health (disability and so on). And this approach is supposed to preserve such orientations as competition, superiority, maximum results, measuring and comparing the results. [4. p.9]

It is possible to make the point clear as a lot of specialists and sport representatives claim that professional preparing of athlete in a big-time sport achieves such a high level that there is no point to speak about amateur sport. That is why creation of legal rules of a big-time sport is the essential part of the process of humanization.

The aim result of sport activity should not come to gaining the record but assist in physical and personal development, improve person's vital capacity and health.

Further studying of sport inevitably should be connected with more profound studying the problem of humanization and with determining the methods of its salvation. It is necessary to single out the problem of discovering and actualization of such strategies as development of sport practice in which the humanistic nature of sport would be manifested in a better way.

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*Materials of Conferences***LANDSCAPE APPROACH TO
GEOECOLOGICAL RESEARCH OF THE
SMALL RIVER BASINS**

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Due to high rate of economical activity anthropogenic pressure grows on the geosystems of different hierarchical level (from landscape region to phase [biogeosystem formed on homogeneous element of relief]), including water objects. At the same time the condition of water objects changes quality of geosystems connected with them. It creates the potential danger not only to living organisms but also to people.

The state of the natural complexes of the small rivers basin is an indicator of the river network condition. Any change in the natural-territorial complexes (NTC) has an effect on their hydrological regime and also it brings the series of changes into the large rivers. Besides river system represents independent azonal territorial unit but its basin is characterized by certain set of geocomplexes – NTC. The very aggregate of characteristics of geocomplexes determines hydrological indices of river in different parts of it, forming the general picture of hydrological and hydrochemical indices of the river system.

The small and medium river basin landscapes constantly escape from steadfast attention of researchers in spite of the fact that they define an ecological situation of region on the whole. As a result, it is necessary to study and preservation of an initial spatial link (natural-territorial complexes) which define the characteristic and condition of the small rivers.

Nowadays the problems of a geoeological condition of large river systems and the small rivers and also natural outflow of the underground waters connected with karst are poorly studied. For example, the majority of research in this region is made in practical aspect without detailed consideration of geographical and geoeological conditions of the small rivers. The importance of research is also proved by the fact that small rivers of Krasnoyarsk region are less studied than large ones. On the territory of the Krasnoyarsk region (excluding the Angara river basin) more than 180 thousand rivers in length less than 100 km, that makes more than 96 % of total of all types of the rivers in this vast region. Only 135 small rivers had or have stationary points of hydrometric observation [1]. It is important to notice the economical aspect of this problem, the installation of stationary points of observation on all small rivers is impossible because of large financial expenses. Therefore

the small rivers are studied not enough. The problem-solving helps to understand dynamics of landscape shape changes of the river basin. Besides, it is necessary to understand the problem of natural genesis of landscapes, and to determine the anthropogenic factors influence on natural landscape formative and hydrological processes [2].

Objects of our geoeological research are the natural-territorial complexes including basins of the medium and small rivers of the Krasnoyarsk region - Mana, Kacha, Bolshaya and Malaya Sliznevo, Bazaikha, Beryozovka, Esaulovka. Subject of research is NTC geoeological condition and its interrelation with hydrological and hydrochemical indicators of the rivers for the further monitoring.

The research is based on the following sources: historical archives, funds, scientific publications, and thematic maps. The major method of our research is a landscape method. The further work was connected with deciphering space images and field work which was based on the landscape basis of NTC level of groups of natural boundaries made by us (Scale 1:100 000, 1:200 000). Sources of the primary information about ecological condition of studied areas are laboratory examination of water (hydrochemical indicators of water samples), and also the state reports about environmental conditions the Krasnoyarsk region (1999-2005), data from meteorological stations and materials of Central Siberian Hydrometeorological Station.

Since 2004 we collected the information about the basic characteristics of investigated objects gathered. Complex field research was carried out on 7 rivers with different anthropogenic loading and physical-geographical characteristics. On the example of the Kacha River we will consider interrelations between NTC conditions, formation of a river basin, its hydrological and hydrochemical parameters.

The territory investigated by us is situated down on a joint of two landscapes: the Krasnoyarsk Plain and the Kemchugsky Hills. In this connection on the given territory three more transitive areas are allocated: foothill ridge weakly inclined plain, bog-valley terraced complex, and valley complex of the Yenisei River. Foothill ridge weakly inclined plain is a result of transition from the Kemchugsky Hills to the Krasnoyarsk Plain, bog-valley terraced complex was formed due to the work of the Kacha River. Valley complex of the Yenisei River is the 5th Yenisei above-floodplain terrace which is situated in the mouth of the Kacha River.

On all area of studied basin there are 5 landscape areas with different physical-geographical characteristics. From this follows that kinds of human economic activities on all of these areas are various.

Landscape area I - the foothill height concerning the Kemchugsky Hills; in each square kilome-

ter a discharge is formed about 6 times more than in the Krasnoyarsk Plain. Occupying approximately 30 % from all area of the Kacha River basin the mountain part of this territory gives 80 - 85 % of the general discharge [3]. The district defines features of all river basin nutrition (the mixed type with prevalence of snow). The forest district, with prevailing forms of a relief - gentle and middle-slopes, wide NTC watersheds, is presented by subtaiga pine and larch-pine forests, with dark coniferous representatives on valleys of the rivers. From the middle of the XX-th century 10 - 15 % of the given district of a river basin were used by people for timber cutting. In total during 1935 - 1980 more than 16 thousand hectares were cut down. Forests in the Kacha riverheads (the areas of continuous cuttings down have reached 50-85 %) was most intensively cut down, and by 1990 actual decrease of forest coverage taking into account forest regeneration has made 10-35 % and more [3]. Now the most part remains «forestless» since it is used for gardening.

Landscape area II - foothill ridge weakly inclined plain consists of 22 % of the area of the river basin. More smoothed relief contributes to the fact that 35 - 40 % of territory is occupied by dwelling building, agricultural fields, cottages, summer pastures. As a result practically all inflows the Kacha River are regulated by artificial dams and about 11 ponds were constructed. In the given territory the drawoff for irrigation of agricultural fields is carried out. Uncontrollable discharge from cattle-breeding complex on the territory of a river reservoir are fixed. For drinking water supply, the Kacha River discharge is not used because its water does not meet the sanitary requirements.

Landscape area III - the raised forest-steppe plain, occupies 33 % of the area of the river basin. 70 - 80 % of this district are smoothed raised elevations and very gentle slopes which are occupied by arable lands, mowings and pastures livestock, settlements. There is an increased use of water for irrigation compared to the previous district as there are more agricultural enterprises. Pollution sources pollution of this part of basin are unauthorized dumps of solid domestic and industrial wastes, boiler-houses in immediate proximity from river-bed, industrial areas, summer camp for rest of children, asphalt factory, petroleum products warehouses, garages with mechanical workshops, dumps in a coastal zone, cattle-breeding complexes and the agricultural enterprises.

Landscape area IV - bog-valley terraced complex of the Kacha River, occupies 11 % of the area of the river basin. Only 50% of its economic potential is used. It is basically valley meadows on which pasture of livestock and fellings are made and cottages are built. Mechanical pollution of the river bed by the adjacent industrial enterprises takes place. Also the large airport discharges polluted water to sewage system.

Landscape area V – valley complex of terraces of the Yenisei River. The district occupies only 4 % of the area of pool of the Kacha River, 95 % of district are city buildings of the Krasnoyarsk. The bottom part and a river mouth are in city boundaries. On the given territory there are dumps of the large enterprises, not authorised dumps of a household waste, city rubbish.

In parallel with studying of ecological condition NTC, hydrological measurements and hydrochemical analyses according to a number of indicators (pH, indicators of biological and chemical consumption of oxygen, the maintenance of the dissolved oxygen, rigidity of water, mineral structure, biogene elements) are conducted.

Such landscape-geoecological approach allows to receive full complex representation about a modern condition of territory of basin as a whole, to allocate zones of the high anthropogenic loading and to define dynamics of the following processes influencing on hydrological and hydrochemical indicators of river system. The revealed regularities allow not only to predict, but also directly plan the protective actions increasing NTC stability, and preventing the rivers from negative change.

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**ON MONITORING OF ASTANA SOLID
WASTE LANDFILL**

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The new capital of the Republic of Kazakhstan is in the stage of active construction and growth of population. These factors are attended with natural growth of solid domestic waste amount. From July, 2006, in Astana a new landfill located as far as 6 km along the Astana-Pavlodar highway, 50 m eastwards from the one, near the old polygon, operates.

The landfill area is bermed with a 1,5 m tall embankment to prevent atmospheric fallouts from draining from the landfill territory. Gathering and stocking of recyclable materials is carried out separately: metal scrap, reinforced concrete, automobile tires, wood waste.

In geomorphological relation the areas of the polygons are located on the water-parting of Sarybulak and Solyonaya Balka streams flowing into the Ishim River. In 2001 the groundwater monitoring project, wherein it was considered sufficient to manage a network of three well bores №1,2,3 to organize a secure network and find out the mere fact of contamination, was developed. The presence of these well bores together with the existing bore №201 allowed evaluating the intensity of groundwater contamination processes.

The bore № 1 was drilled 50 m northwards from the open cast.

The bore № 2 was drilled down the groundwater stream 50 m southwards from the open cast; nowadays the bore is out of order.

The bore № 3 was drilled down the groundwater stream 200 m southwards from the open cast. The bores' depth made 40 meters each one. All the bores revealed Paleozoic formations. The water bearing zone of the upper Devonian rocks jointing is defined by the well bore №201, which is 40 m deep, drilled in 1991 for the landfill water supply.

In the course of the works carried out from 2003 to 2007 it was found out that there is a hydrochemical influence of the polygon on the groundwater. In all the bores it was determined an increased concentration of cadmium, lead, solid residue. In 2008 the drilling of two more well bores in the SDW disposal location area is prescribed by the Environmental Management Plan: downstream the groundwater flow, high and low the landfill location. These measures will allow improving the existing system of overseeing the influence of the landfill on the environment.

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*Short reports***ECOLOGICAL CRIMES AND NATURE
MANAGEMENT**

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Unfortunately, the questions of the rational use of the natural resources and closely connected with them ecological problems have always been paid attention to not by the actual users of these natural resources, but by scientific workers. Modern nature users do not care about ecological problems. Most of them are unaware of them at all. As it is the general interrelationship between all natural components and processes that controls nature, it is high time for the users to realize the necessity of solving their narrow departmental purposes on account of their ecological consequences.

The rational use of the natural resources is unprofitable for the companies that use all kinds of them without any control in Russia. Each of them cares for today's profit and tries to squeeze everything out of the Earth, leaving nothing for their descendants, taking advantage of the speechlessness of nature and the actual loss of the state control.

The main reason for the destruction of the natural stability of landscapes, their complete degradation lies in the criminal, narrow departmental and in the recent years actually uncontrolled use of the resources. Since the so-called "perestroika" private businessmen of all levels have been trying to pump mineral resources out of the Earth, to fell the forests, to do everything for the exhaustion of the resources of dry land and World Ocean. But why are the government and the leaders of all levels inactive? Why do not the laws on these important problems operate? Why does the legal system develop so slowly?

The ecological problems connected with the unreasonable nature management have become especially keen recently, when the negative influence of man upon the natural environment on our planet increased.

Global ecological problems are the result of the criminal nature management on the local and regional levels.

In the course of recent years, when even the mineral resources have been under the control of joint-stock companies, the situation has become worse. This small group of businessmen has suddenly got rich. Their main aim is to plunder all kinds of natural resources as soon as possible.

The existing extremely unsatisfactorily state of all natural resources and landscapes is on the whole accounted for the ecological ignorance of the users, their narrow approach to the exploitation of natural resources. There are a number of publications, reasonable researches and suggestions dedicated to these

problems. But the situation is getting worse and worse, as the propositions are not compulsory for the users to fulfil.

The governmental control over the use of natural resources is completely lost. That is why the prices of all kinds of raw and energy resources, products of national consumption are growing rapidly. All the joint-stock companies and firms, that exploit the natural resources, must be national.

Unprecedented burden on the landscapes has bound the users to search for some new ways of maintenance of their natural production not to permit the depletion of natural resources and contamination of the natural values. Nature gets from man only industrial and domestic waste, which is often toxic.

For the solution of the ecological problems it is necessary to unite the efforts of many professionals and, first of all, nature users, guard services, authorities, all the naturalists, as these problems are complex and multivariate.

As before in the articles, dedicated to the working out of some more rational ways of the use of natural resources and the solution of the ecological problems, the main attention is paid to the state of separate natural components: the earth's crust, atmosphere, water, vegetation and animal world.

On the basis of the general interrelation between the natural components, factors and processes as well as objects of man's life we believe that the landscapes and other geosystems of the local level must be objects of the estimation of their qualitative state, their ecological potential.

At present the publications are mostly dedicated to the analyses of the state of separate natural components, the irrational use of one of which causes worsening of the ecological condition of all the rest. They must be looked upon as interconnected constituent parts of nature complexes.

A myth of the inexhaustibility of the natural resources has been dominant in our country for a long time that caused their wasteful use and the appearance of all ecological disasters.

Modern economy exploits the ever growing number of the natural resources, especially mineral and raw resources. The landscapes are being destroyed already at the stage of mining. Their inevitable changes have long ago become objects of scientific landscape studies.

As mineral resources are practically non-renewable, their classification from the point of view of ecological security of their influence upon the stability of landscapes is of vital importance.

Thus, the natural resources, that seem unlimited at first sight, undergo the irreversible process of depletion; the qualitative state of land, water, forest resources becomes worse. The number of ecological problems is growing, as well as the contradictions be-

tween the productive activity of man and the stability of natural environment. The growing consumption of the natural resources is evident. The qualities of the natural environment, especially of the biosphere, have deteriorated. The decrease in the natural fertility of lands is connected with the reinforcement of the processes of rapid erosion, secondary swamping, salting and so on.

Due to the irrational use of the agricultural lands, from 5 to 12 mln. hectare of lands have been lost. According to the estimation of the United Nations Organization the quality of the exploited lands since 1950 has dropped by 40%. Since 1950 there has been a triple growth in the timber production, more that 50% of which is just burnt even in highly developed industrial countries, and in the so-called "developing" ones - up to 90%. Only about 45% is worked up [1].

Humanity has never faced such barbarous attitude towards the use of forests. The process of disappearing of many species of animals and plants is going permanently and rapidly, that causes the menace of future deterioration of biological diversity. This has led to the degradation of landscapes in many regions of the Earth, especially in the regions of ecological troubles and ecocatastrophes. All the ecological disasters are consequences of the criminal nature use, which has determined pollution and exhaustion of the natural resources, to the processes of rapid erosion, deforestation, desertification and so on. The whole World Ocean has been poisoned. It has taken nearly 40 years to pollute near space.

All these troubles have become global and have been created by man. Now it is on the intergovernmental level that they can only be solved [2].

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PRINCIPLES AND METHODS OF SOLVING ECOLOGO-HYGIENIC PROBLEMS OF THE REGIONS OF RUSSIA ON THE LANDSCAPE BASE

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The most critical ecological situations are connected with degradation of natural landscapes, their pollution as a result of progressive deterioration of the air, surface and subterranean waters, reinforcement of the processes of rapid erosion, chemical and radioactive pollution, decrease in species diversity

etc. That is why many landscapes of Russia are degrading; active is the process of desertification including the arctic desertification. We have a number of regions with the most critical ecological problems. Nature in these regions of Russia and in the regions with the greatest density of population has been changed so that it has become dangerous for man's health [2].

The problem of man's morbidity is complex and multifactor. The influence of a separate natural component, for example water or air quality on man's health is hard to estimate. The first reason is the constant spatial and temporal changes of the state of the components. The second one is the diversity and the absence of any borders of the habitat of man in comparison to the ecology of animals. The problem of the influence of the habitat on the morbidity is in the process of solving mainly on the level of general meditations without any fixation of the principal indices of morbidity on the cartographic base. To solve it in the 21st century it is necessary, first of all, to eliminate the reasons of the present state of the natural environment, caused by its pollution and the depletion of natural resources. Man is at fault in all the ecological disasters. The specific ways of solving many ecological problems including the problems of morbidity of the population must base on the use of large-scale scientific landscape and geochemical maps, which we do not actually possess in our country. They are to be made. We suggest solving this problem in the 21st century taking into account the following basic principles and methods

1. To chart large-scale landscape maps for the whole territory of the country of scientific content. Like universal topographic maps they must be the basic ground and landscapes - the object of estimation depending on concrete practical purposes including the exposure of potential areas of expansion of diseases. It is well-known that man's morbidity depends on the composition of chemical elements, their lack or excess in drinking water, air, soils and living organisms. The concentration or dispersion of chemical elements causes dangerous situations for man's health. Many diseases are connected with the variations of concentration of chemical elements with toxic qualities.

2. The most perspective is the use of principles and methods of geochemistry of landscapes based on the theses of classical geochemistry. They have long ago been worked out in the works by V.I.Vemadskiy, M.A.Glasgovskaya, V.V.Dobrovolskiy, B.B.Polynov, A.I.Fersman etc. The important issue of their works is the ascertainment of geochemical anomalies in landscapes. Many quantitative geochemical indices are used for it. The most important of them are: destructive activity of elements of technogenesis, which characterises the degree of danger of a chemical element for living substance; the module of man-caused pressure, which represents a total flow of man-caused substances to the square unit in a time unit; coefficient

of man-caused transformation, which assess the increase intake water-soluble components and dust, coefficient of the self-cleaning capability of soils, module of the aerial-technogenic intake of the substance, the index of dust burden to the background quality of dust, the total index of the general man-caused of elements with regard to the background.

3. The combined use of the above stated and other qualitative geochemical factors will allow the exact fixation of the qualitative state of landscapes. The qualitative criteria are rather various, but they must be unique by the estimation of morbidity. The most valuable are the data about the maximum permissible concentrations of chemical elements and polluting substances, defined in comparison to the basic norms, as extreme, long-term burdens on the landscapes predetermine the increase of morbidity of the population. Geochemical and man-caused anomalies may be easily fixed if the natural geochemical background, the model of which are landscapes, situated beyond the bounds of the direct influence of man-caused pollution sources, is well-known.

4. Thus by means of imposing a landscape and a geochemical maps we can define the regularities of the distribution of the chemical elements. In the places of landscapes where the migration of chemical elements subsides, concentration is evident, and vice versa by the intensification of migration the places of dispersion are amassed. The landscapes, characterised by anomalous concentrations of chemical elements, always become a nidus. The rapt attention should be drawn to the overburden, involved into the migration of chemical elements, i.e. lithogen base of the landscaped, as only this base is relatively stable and represents a long-term storage of all natural processes and man-caused changes in the landscapes.

5. Basing on the materials of landscape-geochemical studies, hygiene, medical geography and medical ecology will go on solving the aims according to its own methods, but on a reliable landscape base. For research workers in the field of medicine, studying these problems, the main estimation criterion of the critical state of environment will always remain the increase in the morbidity of the population and search for the ways of its rehabilitation. In the course of the last decades the hygienic studies in this field were directed on the normalization of the unhealthy environmental factors, creation of the socio-hygienic monitoring and definition of the ecological harm to the population health. Medical ecology also studies the state of health among the population, living under the conditions of the ecological crisis and on this basis tries to find the main reasons of the diseases, predetermined by the environmental factors, to work out strategic direction of their preventive measures and treatment. Medical ecology may be considered as a new approach, a perspective scientific tendency with a specific technology of selection, analyses and gener-

alization of the information for the treatment choice for every patient.

Thus, the synthesis of hygiene, medical geography and medical ecology on the basis of landscape-geochemical studies will allow these sciences in the 21st century to become one of the most useful for mankind for solving ecologo-hygienic problems and prophylaxis of the morbidity of the population.

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THE ROLE OF FOREST ECOSYSTEMS IN THE DEGRADATION STABILITY OF LANDSCAPES

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Forest degradation has long ago been considered one of the main global ecological problems. Forests determine natural and ecological potential of landscapes, which the degradation stability depends on. The reduction of forests causes the breach of the stability and to the processes of rapid erosion. The stability criteria to the man-caused effect are difficult to find. But the equilibrium of the functions of landscapes always depends on the biological productivity and the ability for renewing of forests. The main criterion of the stable functioning of forest landscapes is their high productivity which is determined by a normal natural renewability of the forests.

The problem of landscape stability depends on their natural and ecological potentials what is determined by the optimal correlation of warmth and moisture. This is typical of forest-steppe, deciduous and taiga landscapes of Russia. These landscapes are characterized by the highest natural and ecological potential, restrain the processes of rapid erosion, that means the degradation of geosystems. The biggest mass of flora and fauna communities to the square unit or habitat volume. To the north of the above mentioned types of landscapes i.e. in sylvatundra and tundra regions a disproportion in the product amount of gas and moistening. That is why the species composition of flora and fauna is poor here, their biomass is extremely insignificant. To the south of the region of the optimal correlation of warmth and moisture, i.e. in steppe, half-desert and desert types of landscapes, under the conditions of the excess of warmth and lack of moisture the existence and correlation of the living

organisms caused depletion of the species composition of flora and fauna, to the insignificant biological productivity.

Besides, it is hard for biota and ecosystems to survive here because of such man-caused factors as rapid water erosion, secondary salting and progressive desertification. It carries along degradation of the biota of landscapes, first of all, fauna what causes reduction or the complete loss of their biological productivity. Speed of the destruction of landscapes depends on it. In tundra, forest-tundra, half-deserted and deserted landscapes the danger of total degradation of landscapes is rapidly growing, because of the absence of forests. In forest ecosystems the destruction of landscapes is going on, connected with irrational land tenure, which causes the processes of rapid erosion, developing arable lands from barren slopes and slopes subject to erosion, non-fulfillment of assistance measures for the natural renewal of the forests, which is also caused by fires, unsystematic and uncontrolled felling on the slopes and in the mountains.

All that caused deforestation in many regions and rapid degradation of landscapes i.e. to the abrupt reduction of the species diversity in forest ecosystems.

Landscape researches of the territory and analyses of the used fund and cartographic materials let us come to the following conclusion: in each natural territorial complex (NTC) the potential possibilities and abilities for use are based. To take into account means not only to learn how to run the economy but also to control landscapes, i.e. to stimulate their fulfilment of the functions that most fully satisfy the requirements of nature users without destroying the dynamic stability of landscapes. To foresee the reaction of the landscapes and their constituent parts to the changes, it is necessary to estimate each concrete NTC from the point of view of the degree of appropriateness to this or that kind of economy use.

1. Up to the present times the distribution of the forest, meadow and plough lands is solved without the necessary scientific grounds. As a result of the rapid processes of plane washing away and linear erosion, non-fulfillment of anti-erosion measures many places in most of landscapes have turned into erosion and are spotted by the dense ravine -joist network. The scientist seems to be not in the non-chernozem region but somewhere on the territory of an upland forest and steppe zones of Russia.

2. The stated actual state of use of the main renewable natural resources caused other pernicious consequences among them the deterioration of the outflow regime (its greater nonuniformity in different seasons, the increase in the surficial component of the outflow) and in general to the deterioration of the condition of small rivers and rivulets. In boundary periods small rivers and rivulets in our zones characterized by superfluous humidity have not only grown shallow, but on the enduring areas they have turned

into temporal streams, parch. Shallowing of the permanent outflows, drop in their level caused the reinforcement of the erosion processes, what carried along drying up of the agricultural lands especially in the valleys and in the valley-side.

3. The amount of the outflow during the spring flood and abundant rains has also changed. In these periods the recurrence of the biggest expenses and summary layer of the outflow. That is why the solid outflow has increased. As a result the strong siltation of the springs, watercourse-beds, closed water bodies including ponds their overgrowing.

4. The anti-erosion stability of the slopes and rates of plane, linear and rapid erosion depend on the man-caused factors (especially on the degree of ploughing up) as well as on the lithology of the rocks, resistance to the washing away, on the slope steepness and length.

5. Uneven distribution of forests within individual landscapes and in the river basin is on the whole unacceptable. Slope surfaces need to be transferred from arable lands into other kinds of lands (meadow, forest) as the humic horizon as well as podzolic and alluvial horizons have been washed off.

6. In the places with temporal or permanent abundant humidity the most optimal conditions of habitat of the arboreal vegetation have been formed. It would be at least unsensible to cultivate these places as agricultural lands.

7. For the significant improvement of the actual complex use of land, water and plant resources in all the landscapes it is necessary to solve questions of the prohibition of felling in the forests of water-protective zones, to increase the age of felling of the main forest-forming species, to widen the water-protective stripes along water valleys including small rivers and rivulets, carry out the measures on more even afforestation of the river basins. It is necessary to prohibit the felling of bushes of anti-erosion and nature-protective meaning, especially in bottomlands, on the slopes, in places of the forming of the outflow of small rivers, annually carry out measures of forestation of ravines, sands and shrub areas, creation of protective forests on the coasts of lakes, ponds and storage reservoirs.

8. These principal measures of the improvement of use of the renewable natural resources would allow to slow down the degradation processes of landscapes significantly.

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TO THE QUESTION OF GLOBAL PROBLEMS OF MODERN CIVILIZATION

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Many scientific works claim, that humanity is approaching the global ecocatastrophe. The main reason for it is determined by the impetuous growth of the Earth population. It causes the necessity of the continuous growth of the industrial production, power engineering and also the use of ecologically dangerous kinds of fuel. The elaboration of the energy- and resource-saving, as well as zero-discharge technologies will no doubt slow down the process of the destruction of the biosphere.

The problem of the global warming of the climate especially acute in the least decades and its consequences also belongs to the analyses of the influence of man upon the Earth landscapes. However, we should keep in mind, that the main reason for this process is not the growth of the carbonic acid concentration in the near-ground strata of the atmosphere and other anthropogenic factors, but natural regularities. In the Earth evolution ice ages were-followed by inter-ice periods. It is especially typical for the anthropogen. In the course of the following several thousands of years we faced the gradual warming of the climate, as the inter-ice age has come. With this natural process of warming collide the well-known anthropogenic factors. That is why in the course of the last 25-30 years the climate has really become the warmest in comparison to the more that a century-long period from the beginning of the instrumental observations.

The progressive degradation of the landscapes, the abrupt reduction of the species diversity of the living organisms are connected with the pollution of all the habitats of the organisms, the recourse depletion. These processes are accumulating and in many regions they have already reached and exceeded the permissible limits. The stability of the geosystems especially of the local level has been broken давно.

Man never took into consideration natural laws and regularities, never thought about the consequences of his vital forces. The reason for that lies not only in the fact that he was unaware of them in most cases. He has just been and remains потребитель in his relations with nature.

The evolution of civilization must be under rigid control. It is necessary to increase the effectiveness of the use of all natural recourses, especially those of the biosphere.

Despite the existence of various kinds of monitorings only some restricted facts about temporal changes of the geosystems are available for us.

The surface field studies, especially expeditionary, are actually stopped. We just can suppose that we can study the accelerating global changes better on

the grounds of the space surveys, and according to the results of mathematical and computer-based modeling.

The acceleration increase of the processes of economic development of the society, unreasoned use of natural recourses have caused, as it has been stated, the instability of natural landscapes. These problems of the society have a global character at present.

The individual activity of man and society in general seems unpredictable. That is why natural laws have lost the guarantees of the stable development.

Man's unlimited greediness, his criminal use of the natural resources, the myth of their inexhaustibility have caused the beak of the dynamic balance of the evolution of the system nature-society.

Man should have long ago realized that he is only part of nature that is independent from anything but its own laws and regularities. The earth nature, which he has turned into a poisoned planet, possesses such important qualities as self-preservation and self-development.

At present the natural environment has lost its ability of self-regulation and self-cleansing, as the stability limit has been increased. It can be accounted by the fact, that the annual products of the productive activity of man increase the biomass of the dry land landscapes, produced by the biosphere. These man-caused substances are alien to the natural-qualities of the environment and stimulate the rapid degradation of landscapes. It is already impossible to revive the natural landscapes.

The life of man as well as other living beings has temporal restrictions, but nature is in space and eternal in time, though there is nothing permanent in it except the changes. Man has always realized nature as object of the intensive uncontrolled and unpunished use of its riches, which he can appropriate.

Sensible co-existence with natural environment has been realized by man only in theory. In fact he does nothing and he may even be unable to solve many global problems, which he has himself created on the local and regional levels. It is already impossible to slow down the development of technical progress. But the pollution of the habitats of the living organisms, ruthless эксплуатация of mineral resources, actual elimination of the rest of the resources, decrease of the natural fertility of the soils, deterioration of the water, air quality, excessive forest felling, the elimination of many species of animals is not the inevitable consequence of the development of the production progress and human civilization. One of the reasons for the global ecological problem is man's striving for the unrestrained growth of the consumption and enrichment. This all proves the criminal attitude of man to his living environment.

Man acts in such a way as he is aware of the temporal limits of his existence on the Earth and in the Universe. But to leave good reminiscences of his existence for the future generations he has to solve at

least some of the problems created by him and first of all ecological problems.

The development of the natural environment and human society are interrelated and irreversible. That is why the destruction of the Earth landscapes and their natural environment in general is sure to cause the degradation of humanity as part of the biosphere. It is impossible to change the routes of development of human civilization.

Thus the appearance and the intensification of the global problems is caused by the ignorance, low level of culture. These problems are various. To the most important aims, the solving of which determine the conservation of civilization belongs the turn from the criminal to the reasonable use of nature. It is necessary to stop pollution of the environment, to decrease the intensity of the use of the traditional energy and all kinds of resources, stop the impetuous growth of the earth population. The natural environment quickly loses its natural qualities under the pressure of man-caused changes. That is why modern civilisation is bound to die if man won't solve the ecological problems in the nearest future. [1]

Thus man without taking into consideration the natural laws of the development of biosphere has turned it into such a state, which according to the words great Russian scientist V.I. Vernadskiy is in no way close to the notion of "noosphere". i.e. the sphere of the living and the sensible. .

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LANDSCAPE MONITORING OF THE NATURAL ENVIRONMENT OF BIOTA

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Nature has developed complex bounds uniting living organisms with their natural environment into one entity. The landscape biota includes the whole of all the living organisms that most keenly react upon the changes in their habitat, especially its pollution. It is necessary to carry out monitorings of the state, evolution, dynamics and degradation of the separate natural components or processes as well as ecological monitorings of all the habitats. But they are always local, fleeting, and that is why ineffective, and the most essential is, that they don't permit to make long-term regional and moreover global prognoses. Monitorings usually make use of a great amount of data. However, the united data fund of the pollution of the habitats of biota as well as of territorial and water landscapes on the whole is essential. All the monitorings, which determine the maximum permissible concentrations of the substances dangerous for biota

and man won't save the existing ecological situation. - It is no doubt necessary to take into account the established norms of the maximum permissible concentrations or maximum permissible levels. However, all lands of pollution do not produce separate, but united influence upon the landscapes, thus creating critical conditions for the life of biota, causing rapid reduction of species diversity of living organisms and landscape degradation.

AH monitoring programmes with the aim to control the state of the separate natural components must have a landscape base. This will allow the most secure and objective estimation of the ecological and biological qualities of the habitat of all living organisms including man.

Landscape monitoring is based upon the system analysis of the structure of the habitat of living organisms. Such habitat is constructed by the geosystems of all levels of organisation, which are remarkable for their integrity and dynamics, possess migratory and accumulative characteristics of natural and man-caused substances. The interrelation of the five main natural components (Hthosphere, water, air, flora and fauna) is the basis of the balanced state of natural complexes.

They hardly submit to the anthropogenic influence including the man-caused one. Especially resistant is geoma of the landscapes, i.e. geological and geomorphologic conditions of the life of biota, which is temporally and spatially dynamic. The stabilizing role of landscape geoma has a determinant impact upon the bioproductive, water and migratory conditions of chemical elements in geosystems. It determines the stability potential. The first and foremost aim is the choice of standard individual monitoring geosystems in every type of landscape. These standard monitoring regions must be first of all geosystems of the protected natural territories. The main aim of the creation of the reserved, territories must become their preservation for the purpose of comparison with familiar degrading geosystems. They must be created in all natural zones of the world and on all genetic species of the geologic measures with all the year round complex observations and must not be restricted to the studies of ecosystems, flora and fauna only. Then we could foresee many undesired consequences of the man-caused influences.

These unique natural objects as well as natural resources created by Nature for us must be under rigid control of the State and must not be transferred to private any propriety or rented. They must be a base for models of restoration of the spoiled and degraded individual landscapes of the same type. Landscape mapping of these geosystems with the use of aerial and space survey will let us determine the degree of danger of the man-caused pollution for biota and the migration conditions of the man-caused substances.

Landscape monitoring provides a possibility to follow the temporal changes of loadings upon biota,

to set regions of carrying out observations of the pollution sources, to determine the sanitary quality norms of all the habitats and to define the maximum permissible norms of anthropogenic pressure on landscapes.

It is only on the basis of landscape monitoring, that it is possible to create the regions of the background monitoring, which must be situated in all types of landscapes of the Earth and occupy individual landscapes on different genetic types of surface measures on account of rock substances which are involved in the processes of vertical and space migra-

tion of chemical elements and man-caused substances. Landscape monitoring must base on the comparison of data of the space information of different flight time about the dynamics of natural processes of pollution of natural components and anthropogenic changes of the landscape biota.

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CHILDHOOD PHYSICAL ABUSE IN OUTPATIENTS WITH PSYCHOSOMATIC SYMPTOMS

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Background: In Japan and Asia, few studies have been done of physical and sexual abuse. This study was aimed to determine whether a history of childhood physical abuse is associated with anxiety, depression and self-injurious behavior in outpatients with psychosomatic symptoms.

Methods: We divided 564 consecutive new outpatients at the Department of Psychosomatic Medicine of Kyushu University Hospital into two groups: a physically abused group and a non-abused group. Psychological test scores and the prevalence of self-injurious behavior were compared between the two groups.

Results: A history of childhood physical abuse was reported by patients with depressive disorders (12.7%), anxiety disorders (16.7%), eating disorders (16.3%), pain disorders (10.8%), irritable bowel syndrome (12.5%), and functional dyspepsia (7.5%). In both the patients with depressive disorders and those with anxiety disorders, STAI-I (state anxiety) and STAI-II (trait anxiety) were higher in the abused group than in the non-abused group ($p < 0.05$).

In the patients with depressive disorders, the abused group was younger than the non-abused group ($p < 0.05$). The prevalence of self-injurious behavior of the patients with depressive disorders, anxiety disorders and pain disorders was higher in the abused groups than in the non-abused groups ($p < 0.005$).

Conclusion: A history of childhood physical abuse is associated with psychological distress such as anxiety, depression and self-injurious behavior in outpatients with psychosomatic symptoms. It is important for physicians to consider the history of abuse in the primary care of these patients.

Background

Reports of abuse and domestic violence have been increasing in Japan. However, few studies have been done of the prevalence of physical or sexual abuse history in Japan and Asia. In a large, national telephone survey of 1,145 men and 1,481 women in the United States, Finkelhor et al. reported the prevalence of child sexual abuse history to be 27% for women and 16% for men [1]. The American rate of physical abuse history has been estimated at 5.7 cases per 1000 children [2]. Drossman and Leserman reported a high prevalence of sexual and physical abuse history among female outpatients referred to a gastroenterology clinic [3]. They found that 44% of the studied women reported some type of sexual and/or physical abuse history. Since this report, there has been increasing interest in the relationship between a history of abuse and gastrointestinal (GI) symptoms. Women with sexual abuse history were reported to have more pain, non-GI somatic symptoms, psy-

chological distress and functional disability compared to those without sexual abuse history, and women with physical abuse history also had a worse health outcome on most health status indicators [4]. Many persistently ill patients, not only those with GI disorders but also patients with psychiatric disorders seeking psychosomatic primary care, have been abused. In Japan and Asia, few studies have examined the health impact of physical and sexual abuse. We have been studying the psychological pain mechanism of patients with functional gastrointestinal disorders (FGID) [5,6]. In our research and treatment of FGID patients, we have found a number of victims of childhood physical abuse.

We focused on a history of childhood physical abuse in outpatients not only with FGID but also with other somatic or psychiatric disorders. We hypothesized a history of abuse would be associated with anxiety, depression and self-injurious behavior, and therefore studied the history of childhood

physical abuse in outpatients with psychosomatic symptoms to determine the relationship.

Methods

Participants

Enrolled participants were 564 consecutive outpatients examined on their first visit to the Department of Psychosomatic Medicine of Kyushu University Hospital from May 2001 to May 2002. All patients completed a self-reported questionnaire about a history of childhood physical abuse

and self-injurious behavior. The self-reported questionnaires were given to all new patients on their first visit to our clinic and needed to be answered quickly and without hesitation before a clinical interview. We divided the patients into two groups: a childhood physically abused group and a non-abused group. Psychological test scores and the prevalence of self-injurious behavior history were compared between the two groups. All participants gave informed written consent before entering the study.

Table 1. Questionnaire concerning childhood physical abuse and self-injurious behavior

1. When you were child, did an older person hit, kick, or beat you?	(yes, no)
2. Have you ever injured and/or intended to injure yourself?	(yes, no)

Definition

A structured clinical interview of the patients and a psychiatric diagnosis was done according to DSM IV [7]. For the FGID diagnosis, irritable bowel syndrome (IBS) and functional dyspepsia (FD) were defined by the Rome II criteria [8].

Questionnaire

A history of childhood physical abuse was surveyed using a modified, self-reported questionnaire by Leserman and Drossman [9,10]. A history of self-injurious behavior was queried in a similar manner (Table 1).

Psychological Assessment

All patients completed a validated, self-reported questionnaire for anxiety [State Trait Anxiety Inventory (STAI-I is the state anxiety scale and STAI-II is the trait anxiety scale [11])] and one for depression [Zung self-rating depression scale (ZSDS)[12]].

Statistical Methods

Mann-Whitney U test, Fisher's exact test, and unpaired t-test (two tailed) were used to compare age, gender, the duration of disease, and the psychological test score (STAI-I, STAI-II, ZSDS) with the prevalence of self-injurious behavior as a psychiatric symptom.

Results

Of the 564 outpatients, 518 had psychiatric disorders such as depressive disorders (n = 323), anxiety disorders (n = 60), eating disorders (n = 98) [anorexia nervosa (n = 37), bulimia nervosa (n = 42), others (n = 19)], pain disorder (n = 37). 46 outpatients had mainly somatic symptoms not categorized in psychiatric disorders. 88 were FGID patients including 48 IBS patients and 40 FD patients, 34(70.8%) IBS patients and 22(55%) FD patients had psychiatric disorders such as a depressive disorder or an anxiety disorder. 14 patients with somatic disorders other than FGID and without psychiatric disorders had no experience of childhood physical abuse. A history of childhood physical abuse was reported by 71 of 518 patients with such psychiatric disorders (13.7%); 41 of 323 patients with a depressive disorder (12.7%), 10 of 60 patients with an anxiety disorder (16.7%), 16 of 98 patients with an eating disorder (16.3%), 4 of 37 patients with a pain disorder (10.8%)(Table 2). In FGID patients a history of childhood physical abuse was reported by 6 of 48 IBS patients (12.5%), and 3 of 40 FD patients (7.5%) (Table 3).

Table 2. Characteristics and psychological test (STAI-I, II, ZSDS) scores of patients with psychiatric disorders

Psychiatric disorder (DSM-IV)	Abused	Non-abused	p-Value
depressive disorders (n = 323)	n = 41	n = 282	
Age (years) †	36 (29,42.5)	41.5 (30,56)	0.0428 (a)
female [N (%)]	29 (70.7)	176 (62.4)	0.3858 (b)
Duration of disease (months) †	12 (3,27.5)	8 (3,24)	0.5501 (a)
STAI-I*	61.5 ± 8.6	57.2 ± 10.2	0.0107 (c)
STAI-II*	62.3 ± 9.3	57.5 ± 11.8	0.0042 (c)
ZSDS*	55.7 ± 7.8	53.3 ± 8.8	0.0991 (c)
self-injury [N (%)]	25 (61)	71 (25.2)	p < 0.0001 (b)
anxiety disorders (n = 60)	n = 10	n = 50	
N(%)			0.0020 (d)
panic disorder	2 (20)	31 (62)	
posttraumatic stress disorder (PTSD)	6 (60)	6 (12)	
social phobia	2 (20)	13 (26)	
Age (years) †	26 (18.5,29.5)	32 (24,37)	0.1078 (a)
female [N (%)]	9 (90)	29 (58)	0.0762 (b)
Duration of disease (months) †	15 (1,102)	7 (1,36)	0.4793 (a)
STAI-I*	65.7 ± 6.4	51.6 ± 11.0	p < 0.0001 (c)
STAI-II*	64.8 ± 9.4	52.1 ± 13.3	0.0057 (c)
ZSDS*	54.2 ± 12.7	47.3 ± 10.5	0.0720 (c)
self-injury [N (%)]	8 (80)	7 (14)	0.0001 (b)
eating disorders (n = 98)	n = 16	n = 82	
N (%)			0.2299 (d)
anorexia nervosa	3 (18.8)	34 (41.5)	
bulimia nervosa	9 (56.3)	33 (40.2)	
other eating disorders	4 (25)	15 (18.3)	
Age (years) †	23 (18.25,29.75)	22 (17,27.5)	0.6032 (a)
female [N (%)]	16 (100)	79 (96.3)	1.0000 (b)
Duration of disease (months) †	30 (10.5,71.5)	25 (7,72)	0.6969 (a)
STAI-I*	56.3 ± 11.3	54.9 ± 9.7	0.6085 (c)
STAI-II*	58.8 ± 13.9	58.6 ± 11.4	0.9508 (c)
ZSDS*	54.6 ± 10.1	54.3 ± 8.9	0.9042 (c)
self-injury [N (%)]	11 (68.8)	42 (51.2)	0.2746 (b)
pain disorder (n = 37)	n = 4	n = 33	
Age (years) †	39.5 (35.25,49.75)	47 (30,57.5)	0.5405 (a)
female [N (%)]	1 (25)	22 (66.7)	0.1419 (b)
Duration of disease (months) †	28.5 (7.5,54.75)	14 (7.5,57.5)	0.8256 (a)
STAI-I*	56.0 ± 9.9	52.4 ± 9.1	0.4634 (c)
STAI-II*	57.0 ± 13.3	51.2 ± 12.9	0.4028 (c)
ZSDS*	48.5 ± 10.3	46.6 ± 10.3	0.7297 (c)
self-injury [N (%)]	4 (100)	4 (12.2)	0.0011 (b)

* The results are expressed as mean ± SD.

† The results are expressed as medians (25%,75%).

p-Values estimated by Mann-Whitney U test (a), Fisher's exact test (b), unpaired t-test (two tailed) (c) or chi-square test with Yates's correction (d)

In both the patients with depressive disorders and those with anxiety disorders, STAI-I (state anxiety) and STAI-II (trait anxiety) were higher in the abused groups than in the non-abused groups ($p < 0.05$). In the patients with depressive disorders, the abused group was significantly younger than the non-abused group ($p < 0.05$) (Table 2). 6 of 10 abused patients with anxiety disorders (60%) had posttraumatic stress disorder (PTSD). 31 of 50 non-abused patients with anxiety disorders (62%) had a panic disorder. No significant differences were found be-

tween the abused groups and the non-abused groups in terms of both the duration of the disease and the percentage of females (Table 2, 3). The prevalence of self-injurious behavior history of the patients with depressive disorders, anxiety disorders and pain disorders was higher in the abused groups than in the non-abused groups ($p < 0.005$) (Table 2). Of the FGID patients, only the IBS patients had higher STAI-II (trait anxiety) scores in the abused group than in the non-abused group ($p < 0.005$) (Table 3).

Table 3. Characteristics and psychological test (STAI-I, II, ZSDS) scores of patients with functional gastrointestinal disorder

	Abused	Non-abused	p-Value
irritable bowel syndrome (n = 48)	n = 6	n = 42	
Age (years) †	28 (25,34.75)	31.5 (19.75,39.5)	0.6966 (a)
female [N (%)]	4 (66.7)	17 (40.5)	0.3827 (b)
Duration of disease (months)†	10.5 (6.5,75)	16 (6.75,40.5)	0.9130 (a)
STAI-I*	59.5 ± 6.6	56.7 ± 8.7	0.4541 (c)
STAI-II*	67 ± 5.8	56.6 ± 12.0	0.0047 (c)
ZSDS*	53 ± 10.5	53.5 ± 9.1	0.9021 (c)
self-injury [N (%)]	2 (33.3)	13 (31)	1.0000 (b)
functional dyspepsia (n = 40)	n = 3	n = 37	
Age (years) †	31 (27,39)	37 (24,51.5)	0.7775 (a)
female [N (%)]	2 (66.7)	20 (54.1)	1.0000 (b)
Duration of disease (months)†	42 (3,96)	20 (8.5,73.5)	0.8572 (a)
STAI-I*	60 ± 8.2	54.2 ± 12.7	0.4445 (c)
STAI-II*	59 ± 5.3	54.7 ± 13.3	0.3167 (c)
ZSDS*	54.7 ± 7.5	50.1 ± 8.9	0.3910 (c)
self-injury [N (%)]	0 (0)	4 (10.8)	1.0000 (b)

* The results are expressed as mean ± SD.

†The results are expressed as medians (25%, 75%).

p-Values estimated by Mann-Whitney U test (a), Fisher's exact test (b), unpaired t-test (two tailed) (c) or chi-square test with Yates's correction(d)

Discussion

Childhood abuse represents a serious international problem, with abuse victims at high risk of depression, suicide and behaviors such as substance abuse and running away from home [13,14]. Childhood sexual or physical abuse is a great risk factor for self-cutting and suicide attempts [15,16]. It was reported in Japan that subjects with habitual self-mutilation more frequently had a

history of suicide attempts, sexual abuse, and childhood physical abuse than general psychiatric controls[17]. We found childhood physical abuse influenced younger patients with depression (Table 2).

High rates of both childhood sexual (27%) and physical abuse and of eating disturbance (20% to 25%) have been reported in the general adult female population of the United States [18]. Physical abuse history

was associated with high dissociation in female patients with eating disorders in Japan [19]. Our study showed no significant difference in the development of eating disorders between the physically abused group and the non-abused group (Table 2). Although we did not examine sexual abuse in these patients, we have often during treatment found patients with eating disorders who had been sexually abused.

Rapkin et al. showed that physical abuse history was more prominent than sexual abuse history in female patients with chronic pelvic pain [20]. Previous sexual abuse history is a significant predisposing risk for somatization and non-somatic chronic pelvic pain [21]. Patients with chronic pelvic pain showed a high prevalence of depression, substance abuse, adult sexual dysfunction, somatization, and history of childhood and adult sexual abuse [22]. Leserman et al. showed that women with a history of abuse were much more likely to report somatic symptoms associated with panic, depression, musculoskeletal disorders, and genito-urinary disorders [23]. In our study there were no significant differences between the physically abused group and the non-abused group in the percentage of females, however we have also experienced many out-patients with psychiatric disorders who reported somatic complaints at their first visit.

A history of abuse is found to be common in FGID patients seen at referral centers in comparison to primary care clinics [24]. In research on the relation between GI symptoms and a history of abuse in a US study, of 130 subjects with IBS, 56 (43.1%) had experienced sexual abuse and 8 (6.2%) had suffered physical abuse, and of 200 subjects with dyspepsia, 70 (35%) had experienced sexual abuse and 9(4.5%) had suffered physical abuse [25]. Our study showed higher rates of childhood physical abuse history in patients with FGID (12.5% of IBS, 7.5% of FD) than a US population-based study (Table 3). The prevalence of physical or sexual abuse history in patients with

FGID was reported differently with wide range in different communities [24]. It may be different among psychosocial situations, cultures and races.

The above indicate that childhood physical abuse history strongly influences emotional instability, pain, and behavior. We found a significantly high rate of self-injurious behaviors in the physically abused patients with depressive, anxiety and pain disorders. In both the patients with depressive and anxiety disorders, STAI-I and II (state and trait anxiety) were higher in the abused groups than in the non-abused groups ($p < 0.05$) (Table 2). 60% of abused patients with anxiety disorders had PTSD, while 62% of non-abused patients with anxiety disorders had a panic disorder. This difference seems to show that strong psychological effects from abuse may result from stress-effects on controlling areas of the brain [26]. Childhood abuse in the setting of PTSD has been reported to be associated with long-term changes in brain structure (e.g. smaller hippocampal volume) and function by neuroimaging studies [27].

The relationship between childhood abuse, self-injury and borderline personality disorder has been reported [28], however the outpatients in our study had no borderline personality disorder. The resultant psychological trauma associated with childhood physical abuse might induce self-injurious behaviors such as cutting and suicide attempts. Childhood physical abuse seems to be associated with interpersonal violence or personality dysfunction [29]. The number of abused patients with FGID in our study may be too small to evaluate more exactly the difference between the abused group and the non-abused group. However, the high score on STAI-II of the abused group of IBS patients seems to suggest a link between childhood trauma and trait anxiety, which influences bowel dysfunction (Table 3) [30,31]. A history taking of childhood physical abuse indicating childhood trauma induced by poor family or social functioning is useful for the

primary treatment with patients with psychosocial symptoms.

This study has some methodological limitations. We studied referrals to a university-based tertiary care clinic of psychosomatic medicine in an urban area of Japan. The prevalence of childhood physical abuse history in our study also might be higher than that of population-based studies in Japan. A simple yes-no, self-report screening questionnaire about only childhood physical abuse history was used. When we conducted a clinical interview of patients after their questionnaires were finished, we did not always focus on a history of abuse in the psychiatric diagnosis. This question was not done by an interview, so there is concern about the reliability for stating an adverse health outcome from only physical abuse. In Drossman's first study, 11 of the 12 physically abused patients were also sexually abused. Almost one third of the abused patients had never discussed their experiences with any-one and only 17% had informed their doctor [3]. Leserman et al. stressed the relationship between abuse severity (e.g. life threatening physical abuse) and somatic symptoms [23]. However, we dared not ask about the frequency or degree of physical abuse which would be life-threatening. It might be difficult to recognize quickly the difference between physical abuse and physical punishment as discipline from an older person. It is also possible that the result of the prevalence of a history of physical abuse in our study might be more excessively estimated than that of the true physical abuse. However, the prevalence of not only physical abuse but sexual abuse in the community is uncertain in different studies in North America [3,32]. Even in the population based US study, a similar self-report screening questionnaire was mailed to a random sample of persons, and physical abuse was reported substantially less often [25]. This study was not only for research but for primary patient care. Sexual abuse, which has been reported to be the strongest measure of abuse, was not determined in this study.

Some victims of sexual abuse were probably among our patients. The prevalence of self-injurious behavior of the patients with eating disorders and FGID was not higher in the childhood physical abused groups than the non-abused groups. It is also possible that more victims of sexual abuse might be among the patients with eating disorders and FGID. We respect and keep the right to privacy of our patients. Questions about sexual abuse should only be asked in a structured interview using valid and reliable measures [4,10] and after the patient-therapist relationship has been well established.

Conclusion

Our study showed a history of childhood physical abuse was associated with anxiety, depression and self-injurious behavior in outpatients with psychosomatic symptoms. Determining the possibility of a history of abuse is necessary to formulate a treatment plan for new outpatients with psychosomatic complaints. Future population-based research including both physical and sexual abuse will be necessary to further this line of study. Further cross-cultural psychosocial studies on abuse need to be globally promoted.

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*Materials of Conferences***PROFESSIONAL COMPETENCES AND
IMAGE OF “PSYCHOLOGIST” PROFESSION**

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The growing demand for professional competence has already been observed on the part of psychological theory and practice for long. It occurs in connection with psychology achievements application sphere expansion, and also with gradually formed image of the profession of a psychologist.

The literature analysis discovers the diversity and ambiguity of the specified notions' interpretation. In the content of the works, wherein the competence problem is being considered (Zeyer E.F., Zimin V.N., Markova A.K., Mudrik A.V., Kuzmina N.V., Tatur Yu.G., Khutorskoy A.V., Shishov S.Ye. and others), there is a terminological confusion of the terms “professional competence” and “professional competency”, though these notions contain substantial differences.

According to Pluzhnik I.L., competency supposes the awareness of the worker concerning his professional activity and the ability to implement it on the basis of knowledge, abilities and skills of technologies grasping [4]. The notion of “competence”, as a rule, is considered in the line of such notions as skills, competency, ability, mastery. Practically all researchers agree that the notion of “competence” is closer to the conceptual field “know how”, than to that of “know what” [1]. The *professional competence* can be considered as the *capability and readiness to perform an activity independently and successfully on the basis of integration of motives, abilities, skills and experience with concrete social-professional situation*. The idea of professional competence is wider, than those of “knowledge”, “abilities” and “skills”, as it comprises all of them and combines with professional motives, abilities of the specialist, his social behavior, and opportunities for self-realization in professional activity.

The professional competence – is one of those key competences, which a psychologist should be equipped with, as the possession of it the process of educational activity creates the foundation for the development of professionalism and mastery.

Nowadays, psychology represents an integrated system of sciences and kinds of professional psychological activity (education, economics, politics, sport, etc.). Each of activity kinds presents its own specific requirements for professional training, capabilities of the specialist, and also his professional competences. One can with good reason associate an image competence with the number of the last.

The social-psychological analysis of the notion “image” allows defining the last as a symbolic

form of a subject created in the process of subject-subject interaction. Speaking on the “image of a profession”, it is usually meant a generalized image of a professional group of representatives of a given professional community, endowed with certain stable characteristics. In terms of such an approach, the expectations concerning the behavior of the corresponding professional group representatives are formed, that can significantly predetermine the estimation of their behavior [3]. Agreeing in general with the comprehension of a profession image, according Perelygina Ye.B. and others [2], *we shall mean a symbolic form of a professional psychologist, as a subject, created in the process of professional training and professional psychological activity, by the image of the profession of a psychologist*.

Although the popularity of such a knowledge branch as psychology grows in our society, the word “psychology” itself is still under a cloud of mystery for many. It is explained, first of all, by an extremely simplified comprehension of the profession of a “psychologist”. The circumstance, that very often people bearing no relation to this profession in its strictly scientific apprehension in fact call themselves psychologists, also impedes. Often a false image of a professional psychologist is created by pseudoscientific editions and sometimes – mass media. Not in the less degree, and it should be confessed, the erroneous notion of the profession is also created by psychologists themselves. As a rule, it is connected with insufficiently formed professional competences. It is not a secret that a certain part of “piping hot” specialists, having a university diploma with a psychologist qualification, in fact are not always ready and able to implement the obtained knowledge in practice in the social-professional situation.

Thus, the professional competence in no small degree (if not to a greater extent) influences the image of a psychologist and, therefore, the formation of an adequate image of a professional answering the expectations of a person, group of people being in need of a professional psychological aid and comfort. The formation of necessary professional competences requires taking into account the image characteristics, which include both professional and personality traits of a specialist.

Considering the multifunctionality of the profession of a psychologist, let us refer to the first ones the ability to self-presentation, creation of social-professional desirability sample; the ability and readiness for learning and understanding the human, rendering of assistance in his personal formation and development; the ability to “read” fluently and interpret the inner state of the other on behavior nuances, to manage non-verbal intercourse means; the ability and readiness for social-psychological interpretation of a personality on its appearance; the ability and readi-

ness for empathy; social-psychological observancy and others.

To personally meaningful image characteristics of the professional competence of a psychologist let us refer the ability to self-development, self-perfection; moral responsibility for the performance of his professional activity; humanity, tolerance, respect to people; creativity; communicative abilities; goodwill, modesty, kindheartedness; intellectual abilities; interpersonal and emotional attractiveness; self-confidence and others. Personal traits are becoming professionally significant factors for the creation of favourable conditions in the activity of a psychologist and, accordingly, for the formation of competences influencing the image of the profession.

The abovementioned image characteristics, on the one hand, influence physical (anatomical, physiological, functional features, paralinguistic characteristics) and social (social appearance, proxemic features of communication, verbal, extralinguistic and activity features) image of the perceived subject; on the other hand, they mirror in this very physical and social image.

The formation of professional competence influencing the “psychologist” profession image is realized both in the course of professional activity and in the process of professional development. Even a professional choice – is to a large extent an attempt to

create one’s own image already. Therefore, though the psychologist profession image acquires the entire picture and becomes available in the mature enough age, nevertheless, it is necessary to realize the opportunities of higher educational institution training, in the course of which professional competences of the future specialist are formed.

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