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THE MODULATION BY PHYTOADAPTOGEN "BALM TRUSKAVETS" NEURO-ENDOCRINE, IMMUNE AND BIOPHYSIC EFFECTS OF STRESS IN HEALTHY MEN

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In healthy volunteers-men investigated the influence of phytoadaptogen "Balm Truskavets" on caused by the psycho-emotional stress changes for parameters electroencephalogram (EEG), heart rate variability (HRV), gas discharge visualization (GDV), leukocytogram, phagocytosis, blood levels of cortisol, testosterone, sodium and potassium and reactive anxiety. It was revealed that in control group stress is accompanied by increase of the relative power spectral density (PSD) of δ-rhythm in locus O2 and a tendency to increase PSD in loci C3-α and C4-α, combined with a tendency to reduce the PSD in loci C3-δ, C4-δ, P4-δ and T5-α. Phytoadaptogen revert these trends, but also causes a significant reduction in the relative PSD of β-rhythm in locus Fp1, which is in control does not change. In the control group stress causes a significant increase of 7 HRV-correlates of sympathotonia in conjunction with the reduction of 10 correlates of vagotonia. Phytoadaptogen revert these changes, so that an increase of 31% stress index of HRV in the control group is transformed into a reduction in stress-index by 31% in the intervention group. In general, the canonical correlation revealed a strong (R=0,82) between the stressor changes in relative PSD EEG rhythms, on the one hand, and the HRV parameters - on the other. Phytoadaptogen revert stress becaused reduction energy in a virtual seventh chakra and entropy in the frontal projection of GDV to improve these parameters. Between changes in the relative PSD of EEG rhythms and GDV parameters also showed a considerable canonical correlation (R=0,68). Phytoadaptogen prevents the stressor decline of mineralocorticoid activity and levels of lymphocytes and increase of level of neutrophils. In addition, the phytoadaptogen is accompanied by increase of phagocytic activity of neutrophils and level of testosterone and decrease cortisol level and reactive anxiety, whereas in the control group these parameters are not changed. The method of discriminant analysis identified 4 parameters of EEG, 7 parameters of HRV, 2 parameters of GDV, as well as reactive anxiety, after the aggregate of stressory changes of which two groups of persons meaningful differ between itself. Consequently, phytoadaptogen does a substantial stresslimiting effect.

Keywords: *phytoadaptogen "Balm Truskavets", stress, neuro-endocrine, immune and biophysic parameters, healthy men.*

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МОДУЛЯЦІЯ ФІТОАДАПТОГЕНОМ "БАЛЬЗАМ ТРУСКАВЕЦЬ" НЕЙРО-ЕНДОКРИННИХ, ІМУННИХ І БІОФІЗИЧНИХ ЕФЕКТІВ СТРЕСУ У ЗДОРОВИХ ЧОЛОВІКІВ

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У практично здорових волонтерів-мужчин досліджено вплив фітоадаптогену „Бальзам Трускавець" на викликані психо-емоційним стресом зміни параметрів електроенцефалограми (ЕЕГ), варіабельності ритму серця (ВРС), газорозрядної візуалізації (ГРВ), лейкоцитограми, фагоцитозу, рівнів в крові кортизолу, тестостерону, натрію і калію, а також реактивної тривожності. Виявлено, що у осіб контрольної групи стрес супроводжується підвищенням відносної потужності δ-ритму над електродом O2 і тенденцією до підвищення потужності C3-α і C4-α в поєднанні з тенденцією до зниження потужності C3-δ, C4-δ, P4-δ і T5-α. Фітоадаптоген реверсує ці тенденції, а також спричиняє суттєве зниження відносної потужності β-ритму над електродом Fp1, яка в контролі не змінюється. В контрольній групі стрес спричиняє значуще підвищення 7 ВРС-корелятів симпатотонії в поєднанні зі зниженням 10 корелятів ваготонії. Фітоадаптоген реверсує ці зміни, так що підвищення на 31% стрес-індексу ВРС в контрольній групі трансформується у зниження стрес-індексу на 31% в основній групі. В цілому виявлено сильну канонічну кореляцію (R=0,82) між стресорними змінами відносних потужностей ритмів ЕЕГ, з одного боку, та параметрів ВРС – з іншого *боку. Фітоадаптоген реверсує стресорне зниження енергії віртуальної сьомої чакри і ентропії у фронтальній проекції ГРВ у підвищення цих параметрів. Між змінами відносних потужностей ритмів ЕЕГ і параметрів ГРВ теж виявлено значну канонічну кореляцію (R=0,68). Фітоадаптоген запобігає стресорному зниженню мінералокортикоїдної активності і рівня лімфоцитів та підвищенню рівня нейтрофілів. Крім того, вживання фітоадаптогену супроводжується підвищенням фагоцитарної активності нейтрофілів і рівня тестостерону та зниженням рівня кортизолу і реактивної тривожності, тоді як в контрольній групі ці параметри не змінювались. Методом дискримінантного аналізу виявлено 4 параметри ЕЕГ, 7 параметрів ВРС, 2 параметри ГРВ, а також реактивну тривожність, за сукупністю стресорних змін яких дві групи осіб значуще відрізняються між собою. Отже, фітоадаптоген чинить суттєвий стреслімітуючий ефект.*

Ключові слова: *фітоадаптоген "Бальзам Трускавецький", стрес, нейро-ендокрін, фмунно і біофізичні параметри, здорові чоловіки.*

INTRODUCTION

A long ago it is known that psychoemotional stress is accompanied by the changes of parameters of neuroendocrine-immune complex [8,9,13]. Recently it is shown that stress causes the changes of parameters of gas disharge visualization (kirlianogram) also [1,6]. In the arsenal of stresslimiting remedies an important place is occupied by phytoadaptogens, the standard of which ginseng is considered [8]. However adaptogene properties are owned also by plants which grow on territory of Ukraine. In particular, by experimental and clinical researches it is shown adaptogene properties of phytocomposition "Balm Cryms'kyi" [7]. Recently it is shown [4] that phytocomposition "Balm Truskavets" with similar contents 1,5 hours after drinking significant increases electronegativity nuclei of buccal epithelium, which shows a decline of biological age. "Rejuvenating" effect of phytocomposition is accompanied by increased power of δ-rhythm electroencephalogram (EEG) in the left frontal and right central loci and β-rhythm in the right frontal and central leads, combined with a reduction in power of δ-rhythm in the right frontal, θ-and α-rhythm in the left temporal and α-rhythm in the left frontal and central loci. This significantly reduces the asymmetry of δ-and θ-rhythms. By the parameters of heart rate variability (HRV) showed a reduction in power of ultralow-frequency and low-frequency component, and variation range. "Anti-aging" effect is accompanied by a significant reduction in plasma levels of cortisol and increased testosterone and triiodtironine. Kirlianography method detected a significant increase in the area and a decline in the form of gas discharge image on the right projection, decreased index activation (stress), as well as a significant increase in the energy of the chakras virtual, reflecting, according to, the state of the thyroid and parathyroid glands (Vishuddha) and the pituitary gland and the brain (Ajna). So phytocomposition "Balm Truskavets" becauses favourable neuroendocrine effects.

The aim of our investigation is detection of modulation by phytoadaptogen "Balm Truskavets" neuro-endocrine, immune and biophysic effects of stress in healthy men.

EXPERIMENTAL DESIGNE AND METHODS

The object of observation were 32 healthy men aged 26-57 years, employees of the clinical sanatorium "Moldova" (Truskavets, Ukraine). Every of morning before work, carried out initial tests of four persons, then the two of them (basic group) used 5 ml of phytocomposition "Balm Truskavets" (ТУ У 15.8-24055046-005:2009, produced by ПНВП "Українські бальзами", Mykolayiv, Ukraine), while two members of control group used the same volume of spirit-saccharine mixture without plant's extractes. After of that, all observed to commence their professional duties, which is associated with psycho-emotional stress. After of 5 days of treatment the tests was repeated.

Testing included recording of EEG (hardware-software complex "НейроКом", ХАІ-МЕДИКА, Kharkiv, Ukraine) in a 16 unipolar loci (Fp1, Fp2, F3, F4, F7, F8, C3, C4, T3, T4, P3, P4, T5, T6 , O1, O2) by 10-20 international system, with the reference electrodes A and Ref tassels on the ears; and electrocardiogram in standard lead II (hardware-software complex "КардіоЛаб+ВСР", ХАІ-МЕДИКА, Kharkiv, Ukraine). Considered the average EEG amplitude (μV), average frequency (Hz) and relative (%) power spectral density (PSD) of basic rhythms: β (35÷13 Hz), α (13÷8 Hz), θ (8÷4 Hz) and δ (4÷0,5 Hz) in all loci. For further analysis the following parameters HRV were selected. Temporal parameters (Time Domain Methods): the standart deviation of all NN intervals (SDNN,), the square root of the mean of the sum of the squares of differences between adjacent NN intervals (RMSSD), the percent of interval differences of successive NN intervals greater then 50 ms (pNN_{50}), triangular index (HRV TI) [17]; heart rate (HR), moda (Mo), the amplitude of moda (AMo), variational sweep (MxDMn) and derivated indexes [3]. Spectral parameters (Frequency Domain Methods): relative (% of total) PSD of four components of HRV: high-frequency (HF, range 0,4÷0,15 Hz), low frequency (LF, range 0,15÷0,04 Hz), very low frequency (VLF, range 0,04÷0,015 Hz) and ultra low frequency (ULF, range 0,015÷0,003 Hz) [17].

Gas disharge visualization recorded by the device of "ГРВ Камера"[6] ("Биотехпрогресс", St-Pb., RF).

Whereupon took from an ulnar vein the test of blood for determination of plasma levels of cortisol and testosterone by the ELISA method with the use of analyzer of "Tecan" (Oesterreich) and corresponding sets of reagents of JSC "Алкор Био" (St-Pb., RF [5]) and sodium and potassium (by the method of flaming photometry on the device of ПФМ У 4.2), with the purpose of estimation of mineralocorticoid activity after

Na/K-ratio. In addition, counted up leucocytograma and the parameters of phagocytose by neutrophyles of culture of Staphylococcus aureus.

After it volunteers filled a questionnaire with the purpose of estimation of level of the anxiety [11].

Results are treated by methods variation, cross-correlation, canonical and discriminant analyses with the use of package of softwares "Statistica-5.5".

RESULTS AND DISCUSSION

On the preliminar stage of analysis of influence of phytoadaptogen on EEG 8 parameters of PSD of rhythms the individual changes of which in relation to initial sizes are different for the members of control group and basic (phytoadaptogen) were educed. In a Table 1 and on Fig. 1 averages over of absolute direct differences are brought between initial (to beginning of professional activity) and final (after twenty-four hours on completion of workweek) parameters.

Further absolute direct differences were transferred in relative (in %) for every group. It did possible both leveling of some insignificant differences between the initial sizes of groups and achievement of uniscaled effects (Fig. 2).

Table 1. Influence of phytoadaptogen on stressory changes of spectral parameters of electroencephalogram. Stressory effects calculated as means of direct differences between final and initial values (delta %±SE). Significantly stressory effects in control and in intervention (basic) groups marked *.

Group	Control (n=17)			Basic (n=15)			p for effects
EEG rhythms relative PSD, %	Initial	Final	Effect	Initial	Final	Effect	
O2-δ	10,8±1,7	16,4±2,5	+5,5±2,7*	16,7±5,5	14,5±2,5	-2,2±4,4	ns
Fp1-β	40,6±4,2	40,8±5,1	+0,2±2,5	37,2±4,4	27,7±3,9	-9,5±3,9*	<0,05
C4-α	29,6±3,0	30,9±3,0	+1,3±2,0	34,6±4,1	30,6±4,9	-4,0±2,4	ns
C3-α	28,1±3,1	30,1±3,3	+2,0±1,3	33,2±5,2	30,6±5,2	-2,6±1,4	<0,05
T5-α	25,3±3,8	23,3±2,7	-2,0±2,7	31,3±4,7	34,3±4,3	+3,0±2,7	ns
C4-δ	21,2±3,5	19,9±3,0	-1,2±3,3	23,8±2,9	29,0±4,7	+5,2±3,9	ns
C3-δ	26,0±3,3	21,2±2,8	-4,8±3,1	25,9±4,7	29,6±4,3	+3,7±3,9	ns
P4-δ	17,9±2,6	13,6±2,4	-4,2±3,1	17,3±3,0	20,0±4,1	+2,7±3,5	ns

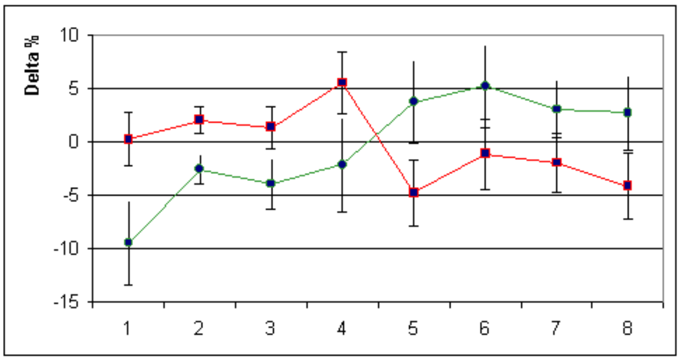


Figure 1. Changes for EEG rhythms relative power spectral density. Data are presented as means of direct differences between final and initial values (delta %±SE). Filled squar, control group; filled circle, basic group. Parameters: 1 - Fp1-β; 2 - C3-α; 3 - C4-α ; 4 - O2-δ; 5 - C3-δ; 6 - C4-δ; 7 - T5-α; 8 - P4-δ.

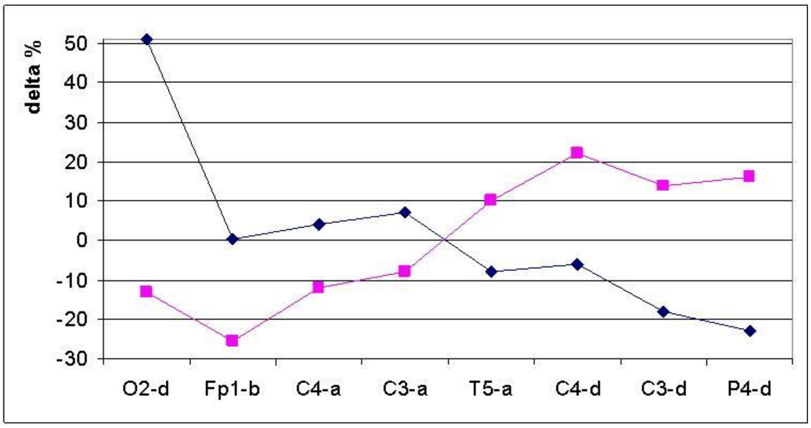


Figure 2. Changes for EEG rhythms relative power spectral density. Data are presented as percent differences between final and initial values in every group

Evidently, that professional psycho-emotional stress is accompanied by an increase on 51% of relative PSD of δ-rhythm in locus O2, and the prehumulone to him use of phytoadaptogen prevents such increase not only, and even causes a tendency to the decline of PSD on 13%. Thus, the independent (per se) effect of phytoadaptogen on PSD of O2-δ presents -68%. Farther, in a control group PSDs of Fp1-β, C4-α and C3-α does not change practically (deviations present +0,5%, +4% and +7% respectively), while in a basic group they go down (on 25,5%, 12% and 8% respectively). Thus, phytoadaptogen per se causes the decline of these parameters on 26%, 16% and 15% respectively.

On the other hand, psycho-emotional stress is accompanied by tendencies to the decline of PSD of P4-δ, C3-δ, C4-δ and T5-α respectively on 23%, 18%, 6% and 8%, while the previous use of phytoadaptogen reverses these tendencies to +16%, +14%, +22% and +10% respectively. Thus, the independent stimulant effects of phytoadaptogen on the transferred parameters present respectively 39%, 32%, 28% and 18%.

It is known that parameters of HRV are the sensible indicators of stress [3,17,20]. In complete accordance with this position it is established (table 2) by us, that psycho-emotional stress causes the increase of a stress index of Bayevskyi on 31% due to a decline on 19% of variation swing (correlate of vagal tone) in combination with an increase on 9% amplitude of moda (correlate of sympathic tone) and sympathotonic change for moda on 8%. Phytoadaptogen prevents the increase of stress index not only, and results in the decline of his level in relation to initial on 31%, due to a decline on 10% of sympathic tone and increase on 13% of vagal tone, and also vagotonic change for moda on 5%. Thus, the independent stresslimiting effect of phytoadaptogen presents 62%, due to strengthening on 32% of vagal activity and decline on 19% of sympathic activity.

This conclusion is confirmed and complemented by data about the changes for temporal and spectral parameters of HRV. In particular, phytoadaptogen reverses the stressory decline of vagal correlates such as HRV TI (- 19%), SDNN (-24%) and RMSSD (-23%) in their increase (table 3), which testifies to his vagotonic effect in 34÷36%.

Table 2. Influence of phytoadaptogen on stressory changes of Bayevski parameters of heart rate variability

Group	Control (n=17)			Basic (n=15)			p for effects
Showing	Initial	Final	Effect	Initial	Final	Effect	
Moda (Mo), ms	803±37	741±33	-62±20*	840±43	887±44	+47±13*	<0,001
Amplitude of moda (AMo), %	52,6±4,5	57,2±3,5	+4,7±2,6	51,8±4,7	46,5±3,6	-5,3±2,3*	<0,01
Variative swing (ΔX), ms	187±18	151±15	-36±11*	182±21	206±18	+24±11*	<0,001
Index of vegetative balance (AMo/ΔX)	400±85	503±94	+103±68	379±66	282±48	-97±30*	<0,02
Vegetative index of rhythm (1/Mo•ΔX)	8,8±1,4	12,0±2,2	+3,2±1,7	8,3±1,0	6,6±0,8	-1,7±0,5*	<0,01
Index adequaticy of regulation (AMo/Mo)	70±9	81±7	+11±5*	66±8	55±5	-11±4*	<0,01
Stress-index (AMo/2•Mo•ΔX)	275±64	361±69	+86±42*	245±45	168±30	-77±22*	=0,01
Index activity of regulatory systems	3,8±0,7	5,0±0,8	+1,3±0,6*	4,0±0,5	3,1±0,5	-0,9±0,4*	<0,01

Table 3. Influence of phytoadaptogen on stressory changes for temporal parameters of heart rate variability

Group	Control (n=17)			Basic (n=15)			p for effects
Showing	Initial	Final	Effect	Initial	Final	Effect	
HRV TI	9,7±1,1	7,8±0,8	-1,8±0,6*	9,0±1,1	10,4±1,0	+1,4±0,6*	<0,001
HR, min⁻	75,9±3,8	80,9±3,6	+5,0±2,1*	70,7±3,7	68,1±3,4	-2,6±0,9*	<0,01
SDNN, ms	40,6±4,9	31,0±3,0	-9,6±2,6*	40,6±5,2	45,1±5,2	+4,5±1,8*	<0,001
RMSSD, ms	23,4±4,1	18,2±2,3	-5,3±2,7	30,8±6,0	35,0±7,5	+4,2±2,0	<0,01
pNN_{50}, %	6±3	3±1	-3±2	13±5	14±6	1±1	ns

It is educed (table 4) in relation to spectral parameters of HRV, that a stressory decline of total power of spectrum (TP) is on 46%, in a most degree due to VLF component (-54%), by a less measure to HF (-42%) and LF (-36%) components, due to the previous use of phytoadaptogen leveled, even with tendencies to the height on 8%, 30% and 19% respectively, and total power of spectrum grows on 19% meaningful. After these parameters the independent vagotropic effect of phytoadaptogen presents 55÷72%.

Integral parameter of HRV - index of activity of the regulatory systems - under act of stress it is expectant grows on 34%, and phytoadaptogen reverses increase in his decline on 23% (table 4), id est able to reduce tension of the regulatory systems on 57%.

Table 4. Influence of phytoadaptogen on stressory changes for spectral parameters of heart rate variability and index activity of regulatory systems

Group	Control (n=17)			Basic (n=15)			p for effects
Showing	Initial	Final	Effect	Initial	Final	Effect	
TP, ms^2	1978±463	1076±233	-902±279*	1962±471	2346±531	+384±177*	<0,001
ULF, ms^2	116±51	78±30	-38±39	90±26	121±37	+31±31	ns
VLF, ms^2	953±266	438±87	-514±218*	636±134	690±128	+53±111	<0,05
LF, ms^2	537±124	342±68	-195±91*	648±151	772±139	+124±122	<0,05
HF, ms^2	372±151	217±64	-157±97	588±241	763±379	+176±130	=0,05
Index activity of regulatory systems	3,8±0,7	5,0±0,8	+1,3±0,6*	4,0±0,5	3,1±0,5	-0,9±0,4*	<0,01

Expounded is visualized on Fig. 3, which certifies ability of phytoadaptogen not only to prevent, and even to turn inside out the changes for parameters of HRV, caused by professional psycho-emotional stress.

The screening of connections in pairs between the changes for parameters of EEG and HRV detectes maximal correlation between dynamics for PSD of T5-α rhythm and stress index Bayevskyi (Fig. 4). A **canonical** cross-correlation analysis educed close connection between the changes for relative PSD of rhythms of EEG and parameters of HRV, which represent the state of the vegetative regulation (Fig. 5).

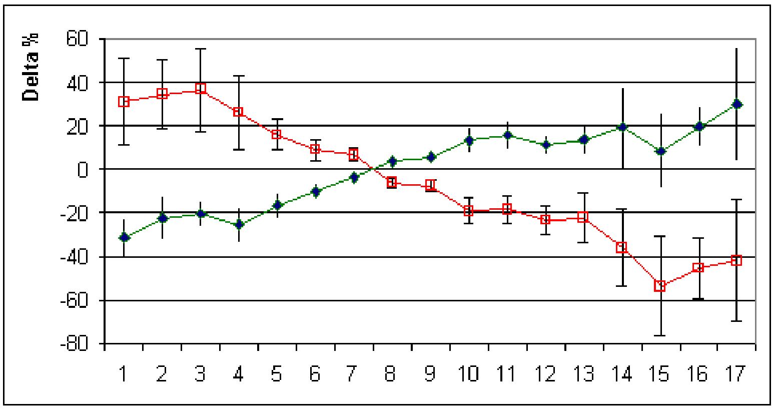


Figure 3. Changes for parameters of HRV. Data are presented as mean of direct differences between final and initial values (delta %±SE). Filled squar, control group; filled circle, basic group. Parameters: 1 – stress-index Bayevskyi (AMo/2Mo•ΔX); 2 – index activity of regulatory systems Bayevskyi; 3 – 1/Mo•ΔX; 4 – AMo/ΔX; 5 – AMo/Mo; 6 – AMo; 7 – HR; 8 – mRR; 9 – Mo; 10 - ΔX; 11 – HRV TI; 12 – SDNN; 13 – RMSSD; 14 – LF; 15 – VLF; 16 –TP; 17 – HF.

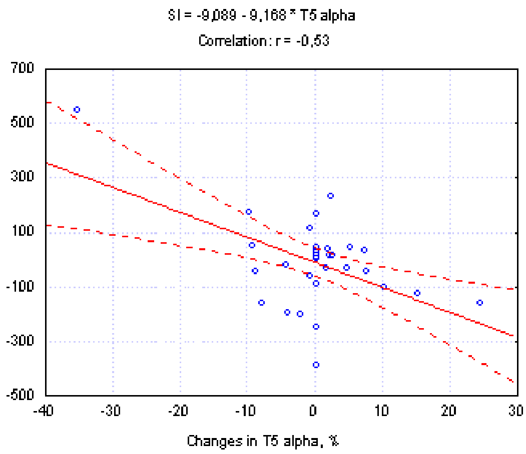
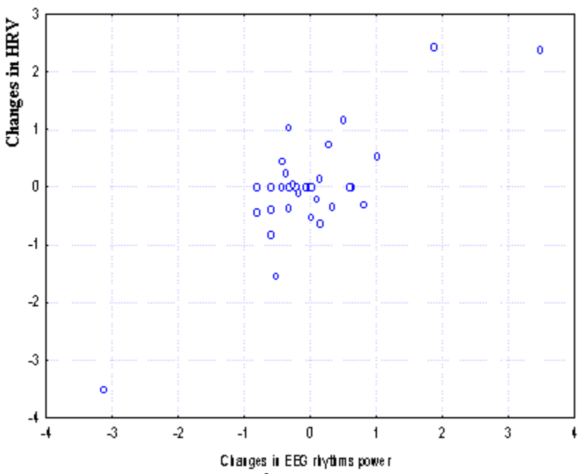


Figure 4. Correlation between changes for relative power spectral density of T5-α rhythm (axis of X) and stress index Bayevskyi (axis of Y)

Befor Oppenheimer S.M.et al. [21] reported the left insula is predominantly responsible for parasympathetic effects while the right insular cortex is more likely to produce sympathetic responces. Functional magnetic resonance imaging studies have identified dorsal and ventral anterior cingulate cortex involvement in autonomic control [16,18]. Ventral anterior cingulate cortex activation correlated significantly with HF HRV, suggesting its control of parasympathetic autonomic activity [18]. Functionally and anatomically, the subgenual anterior cingulate cortex is more strongly linked to autonomic control centers than the dorsal anterior cingulate cortex. Its activity relates to parasympathetic, rather than the sympathetic autonomic system [16]. Tolkunov D. et al. [25] showed strong anticorrelation (r=-0,61) between the amygdala's power spectrum density scaling parameter β and wake HRV, suggesting that sluggish limbic regulation translated down-stream into sluggish autonomic regulation, at both shorter-acting (parasympathetic) and slower-acting (sympathetic) time-domains, as well as suggesting a robust relationship between dysregulated limbic outputs and their autonomic consequences. Yi-Yuan Tang et al. [27] in the study of 42 healthy young males to explore the relationship between brain activity and parasympathetic tone analysed the correlation between the changes in frontal midline θ power (related to generators in the anterior cingulate cortex [14]) and HFnu HRV. After 5 days of integrative body-mind training correlations between HFnu and Fz-θ (r=0,566), FCz-θ (r=0,551) and Cz-θ (r=0,575) were significantly positive. Popovych I.L. et al. [22] also found correlations between HFnu and F4-θ (r=0,38) and P4-θ (r=0,45), between HF% and Fp1-θ (r=0,32) and P4-θ (r=0,43), and between indicator of parasympathetic tone RMSSD and P4-θ (r=0,46). However, correlations between HF% and O1-θ were significantly negative (r=-0,42). Prinsloo G.E. et al. [23] in the study for eighteen healthy males found that less pronounced changes in HRV, due to work-related stress, accompanied by higher relative PSD Fz-θ, Pz-θ and Cz-θ, lower fronto-central relative β power and higher θ/β ratio. It is also perfectly consistent with data Popovych I.L. et al. [22] on a negative correlation LFnu, LF% and LF/HF with F4-θ, P4-θ, F7-θ, F8-θ, F4-θ and positive - with F7-β and F8-β - on the one hand, and a positive correlation with HF% Fp1-θ and P4-θ and negative - from P4-β - on the other side. Subhani A.R. et al. [24] in the study of ten healthy participants showed a significant upsurge in the value Fz-θ/Pz-α while mental stress (playing video games). PSD LFnu and LF/HF ratio were significantly increased and HFnu sank during video games. On the other hand, the decrease in 7 healthy elderly individuals LFnu accompanied by a fall in α-wave proportion of EEG [19], whereas in 38 healthy young volunteers during mental arithmetic task were found positive correlation between the percent change from the baseline in slow α-power and that in LF/HF ratio [20]. Instead, Popovych I.L. et al. [22] found a negative correlation between PSD LFnu and F4-θ (r=-0,38), and P4-θ (r=-0,45) and positive correlation between PSD LFnu and P4-α (r=0,41), and O2-α (r=0,32), the amplitude of α-rhythm (r=0,35) and the index α-rhythm (r=0,46). The above applies to the LF/HF ratio and inverse way - PSD HF. Data Popovych I.L. et al. [22] on a negative correlation between PSD HF HRV and α-rhythm consistent with findings Wahbeh H.and Oken B.S. [26] that in patients with posttraumatic stress disorder peak α frequency was higher while peak HF HRV was lower than in patients without posttraumatic stress disorder. Ohtake Y. et al. [20] found that mental arithmetic task induced an increase in slow β-power in the stress responders, wherea it induced a decrease in slow β-power in the stress non responders. According to data Popovych I.L. et al. [22] with PSD β-rhythm LF/HF ratio correlated negatively. In the course of this discussion should lead data Young-Chang et al. [28], that acupressure significantly reduced the EEG spectral entropy values and at the same time tended to decrease the LF/HF ratio at healthy young males and females.



R=0,82; $\chi^2_{(40)}$=57; p=0,04

Figure 5. Canonical correlation between changes for EEG rhythm relative power spectral density (axis of X) and for heart rate variability (axis of Y)

According to existent ideas, chakras show by itself power centers, related to the endocrine glands and nerve-centres [12].

Table 5. Influence of phytoadaptogen on stressory changes for parameters of gas discharge visualization

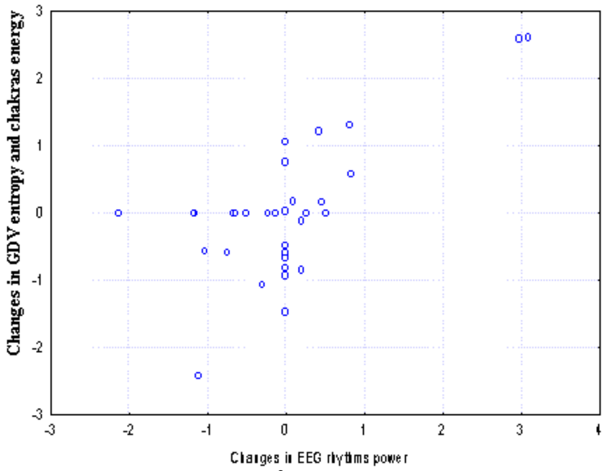
Group	Control (n=17)			Basic (n=15)			p for effects
Chakras energy	**Initial**	**Final**	**Effect**	**Initial**	**Final**	**Effect**	
Chakra 1	0,15±0,06	0,24±0,05	+0,09±0,04*	0,18±0,10	0,21±0,06	+0,03±0,08	ns
Chakra 2	-0,05±0,07	-0,04±0,08	+0,01±0,08	-0,01±0,10	0,02±0,07	+0,04±0,08	ns
Chakra 3	-0,07±0,08	-0,03±0,10	+0,04±0,07	-0,03±0,07	-0,03±0,06	0,00±0,04	ns
Chakra 4	0,39±0,06	0,36±0,06	-0,03±0,04	0,40±0,07	0,38±0,06	-0,01±0,06	ns
Chakra 5	0,09±0,06	0,20±0,05	+0,11±0,05*	0,12±0,07	0,25±0,08	+0,13±0,06*	ns
Chakra 6	-0,08±0,05	0,01±0,03	+0,09±0,04*	-0,03±0,07	0,06±0,07	+0,09±0,06	ns
Chakra 7	0,04±0,05	-0,01±0,05	-0,05±0,04	0,02±0,05	0,08±0,05	+0,06±0,02*	<0,05
Entropy GDV	**Initial**	**Final**	**Effect**	**Initial**	**Final**	**Effect**	
Right projection	3,79±0,03	3,81±0,04	+0,02±0,04	3,80±0,06	3,79±0,04	-0,02±0,05	ns
Frontal projection	3,88±0,04	3,84±0,04	-0,04±0,02	3,78±0,06	3,87±0,04	+0,09±0,04*	<0,05
Left projection	3,92±0,04	3,94±0,04	+0,02±0,03	3,86±0,06	3,89±0,06	+0,02±0,06	ns

Method of gas disharge visualization, essence of which consists in registration of photoelectronic emission of skin, induced by high-frequency electromagnetic impulses, allows to estimate energy of virtual chakras [6]. It is educed (table 5) that psycho-emotional stress is accompanied by the increase of energy of first, fifth and sixth chakras, constrained, according to ideas of Indian-Tibetan medicine [12], respectively from testes, thyroid and parathyroid glands and hypophysis and brain, and phytoadaptogen quite not prevents these changes. At the same time, phytoadaptogen reverses tendency to diminishing to energy of seventh chakra in the meaningful increase of energy of this chakra. It is considered that seventh chakra is related to the psyche.

At the same time, stress is accompanied by a tendency to diminishing to **entropy** of gas disharge image in a frontal projection, and phytoadaptogen again reverses this tendency in the meaningful increase of entropy.

Before in an experiment on rats it was shown, that the preventive use of phytoadaptogens also predetermines the substantial increase of **entropy** of cellular composition of thymus and spleen on a background acute stress which is associated with weakening of pathogenic and strengthening of sanogenic effects of stress on a neuroendocrine-immune complex and metabolism [8].

Between the changes for parameters of GDV and EEG strong enough canonical correlation is educed (Fig. 6) which is the certificate of informing and objectivity of GDV-method.



R=0,68; $\chi^2_{(42)}$=35; p=0,07

Figure 6. Canonical correlation between changes for EEG rhythm relative power spectral density (axis of X) and gas discharge visualization (GDV) entropy and virtual chakras energy (axis of Y)

On a reactive anxiety stress the meaningful does not influence, while phytoadaptogen assists the decline of her level on 17% (table 6). It is not educed also meaningful changes under the conditions of levels in plasma of testosterone and cortisol, but in the basic group level of testosterone grows on 34%, but level of cortisol shows a tendency to the decline on 14%. Mineralocorticoid activity, appraised after Na/K-ratio of plasma, at the terms of stress goes down on 6%, it combines with the meaningful decline of relative content of lymphocytes and reciprocal increase of segmentonuclear neutrophyles. Phytoadaptogen prevents these characteristic for stress changes. In addition, the meaningful increase of phagocytose activity of neutrophyles, absent in a control group, is established in a basic group.

On the final stage the discriminant analysis of stressory changes of all registered parameters was conducted. It is educed (table 7) that the identification (characteristic) effects of phytoadaptogen is reversion of stressory decline of vagal regulatory influences, relative PSD of δ-rhythm in locus C3, energy of seventh virtual chakra and entropt of gas dicharge image in a frontal projection and reversion of increase of relative

PSD of α-rhythm in locus C3 and δ-rhythm in locus O2, and also initiation of decline of reactive anxiety and relative PSD of β- rhythm in locus Fp1.

Table 6. Influence of phytoadaptogen on stressory changes for anxiety reactive and parameters of blood

Group	Control (n=17)			Basic (n=15)			p for effects
Showing	Initial	Final	Effect	Initial	Final	Effect	
Anxiety reactive	30,2±1,8	28,2±1,7	-2,0±1,5	33,4±1,2	27,8±1,2	-5,6±1,5*	>0,05
Testosterone, nM/l	22,8±2,1	24,1±1,9	+1,3±1,5	22,3±2,4	29,8±2,3	+7,6±2,5*	<0,05
Cortisol, nM/l	620±61	615±73	-5±58	646±95	555±93	-91±58	ns
Plasma sodium, mM/l	134,2±0,6	135,2±0,8	+1,0±0,7	134,2±0,7	134,6±2,3	+0,4±2,2	ns
Plas. potassium, mM/l	3,08±0,09	3,33±0,09	+0,25±0,11*	3,43±0,08	3,37±0,06	-0,06±0,10	<0,05
Na^+/K^+-ratio	43,7±1,0	41,0±0,9	-2,7±1,1*	39,4±1,0	40,2±1,1	+0,8±1,1	<0,05
Lymphocytes, %	26,6±0,6	25,4±0,4	-1,2±0,3*	28,4±1,8	28,8±1,4	+0,4±0,5	<0,01
Eosinophyles, %	3,6±0,1	3,2±0,1	-0,4±0,2	3,6±0,4	3,6±0,2	0,0±0,2	ns
Monocytes, %	6,0±0,6	6,0±0,4	0,0±0,2	7,4±0,7	7,0±0,4	-0,4±0,3	ns
Neutrophyles SN, %	60,2±0,4	61,8±0,2	+1,6±0,3*	57,4±2,5	57,0±1,8	-0,4±0,8	<0,05
Neutrophyles BN, %	3,6±0,1	3,6±0,1	0,0±0,2	3,2±0,2	3,6±0,3	+0,4±0,2	ns
Phagocytose, %	82,6±1,2	83,3±0,9	+0,6±0,8	82,8±1,1	84,3±1,1	+1,5±0,5*	ns

Table 7. Summary of discriminant analysis (forward stepwise)

Discriminant variables	Wilks' parameters			Coefficients for canonical variables			Classification functions		Changes for discriminant variables	
	Λ	F	p	Raw	Stand	Struct	Basic	Control	Basic	Control
SDNN, ms	0,58	21,6	$<10^{-4}$	0,005	0,05	0,26	-0,124	-0,157	+4,5±1,8	-9,6±2,6
C3-α power, %	0,48	15,5	$<10^{-4}$	-0,248	-1,13	-0,11	-1,284	0,273	-2,6±1,4	+2,0±1,3
Chakra 7 energy	0,40	13,9	$=10^{-5}$	11,52	1,50	0,10	67,74	-4,49	+0,06±0,02	-0,05±0,04
O2-δ power, %	0,33	13,5	$<10^{-5}$	-0,058	-0,90	-0,05	-0,267	0,098	-2,2±4,4	+5,5±2,9
Anxiety reactive	0,27	14,2	$<10^{-5}$	-0,405	-1,32	-0,06	-2,767	-0,224	-5,6±1,5	-2,0±1,5
Entropy frontal	0,22	14,9	$<10^{-5}$	4,59	0,67	0,12	30,08	1,27	+0,09±0,04	-0,04±0,02
Fp1-β power, %	0,19	15,0	$<10^{-5}$	-0,109	-1,16	-0,10	-0,717	-0,034	-9,5±3,9	+0,2±2,5
ΔX, ms	0,18	13,5	$<10^{-5}$	0,037	1,68	0,20	0,189	-0,044	+24±11	-36±11
AMo/ΔX	0,16	12,6	$<10^{-5}$	0,004	0,71	-0,12	0,013	-0,011	-97±30	+103±68
HF, ms^2	0,15	11,9	$<10^{-5}$	0,003	1,74	0,10	0,022	0,001	+176±130	-157±97
pNN_{50},%	0,12	13,0	$<10^{-5}$	-0,200	-1,61	0,09	-1,386	-0,130	+1±1	-3±2
Mo, ms	0,10	13,7	$<10^{-5}$	0,008	0,57	0,24	0,043	-0,008	+47±13	-62±20
ULF, ms^2	0,10	13,0	$<10^{-5}$	0,002	0,45	0,06	0,015	0,001	+31±61	-38±39
C3-δ power, %	0,09	12,7	$<10^{-5}$	-0,057	-0,67	0,08	-0,446	-0,086	+3,7±3,9	-4,8±3,1
			Constant	-2,003			-17,15	-3,237	Means of root	
Squared Mahalanobis distance between groups: 41,9; F=12,7; $p<10^{-5}$									3,33±0,28	-2,94±0,22
Eigenvalue=10,44; Canonical R=0,955; Wilks' Λ=0,087; $\chi^2_{(14)}$=56; $p<10^{-5}$										

After the aggregate of the transferred effects two group meaningful inter se differ, about what testify both distance of Mahalanobis and individual unstandardized sizes of canonical discriminant radical (Fig. 7).

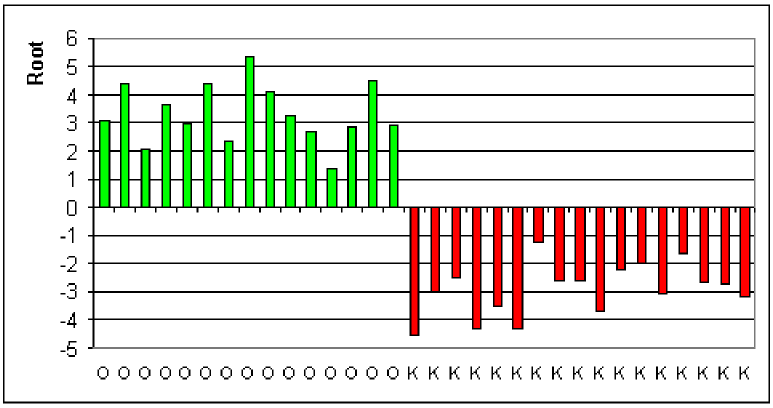


Figure 7. Discriminant analysis. Unstandardized canonical scores for members of basic (O) and control (K) groups.

CONCLUSION

1. Stress is accompanied by increase of the relative PSD of δ-rhythm in locus O2 and a tendency to increase PSD in loci C3-α and C4-α, combined with a tendency to reduce the PSD in loci C3-δ, C4-δ, P4-δ and T5-α. Phytoadaptogen "Balm Truskavets" revert these trends, but also causes a significant reduction in the PSD of β-rhythm in locus Fp1, which is in control does not change.

2. Stress causes a significant increase of 7 HRV-correlates of sympathotonia in conjunction with the reduction of 10 correlates of vagotonia. Phytoadaptogen revert these changes, so that an increase of 31% stress index of HRV in the control group is transformed into a reduction in stress-index by 31% in the intervention group.

3. Phytoadaptogen revert stress becaused reduction energy in a virtual seventh chakra and entropy in the frontal projection of GDV to improve these parameters.

4. Phytoadaptogen prevents the stressor decline of mineralocorticoid activity and levels of lymphocytes and increase of level of neutrophils. In addition, the phytoadaptogen is accompanied by increase of phagocytic activity of neutrophils and level of testosterone and decrease cortisol level and reactive anxiety, whereas in the control group these parameters are not changed.

5. The method of discriminant analysis identified 4 parameters of EEG, 7 parameters of HRV, 2 parameters of GDV, as well as reactive anxiety, after the aggregate of stressory changes of which two groups of persons meaningful differ between itself.

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ACCORDANCE TO ETHICS STANDARDS

Tests in patients are conducted in accordance with positions of Helsinki Declaration 1975, revised and complemented in 2002, and directive of National Committee on ethics of scientific researches. During realization of tests from all participants the informed consent is got and used all measures for providing of anonymity of participants.

For all authors any conflict of interests is absent.

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UDC: 612.017.1.. ***V.Ye. Babelyuk, O.O. Kundych, G.I. Dubkova, A.G. Starodub*** The modulation by phytoadaptogen "Balm Truskavets" neuro-endocrine, immune and biophysic effects of stress in healthy men