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MODULATING NEURO-ENDOCRINE EFFECTS OF BIOACTIVE WATER NAFTUSSYA FROM LAYERS TRUSKAVETS' AND POMYARKY AT HUMANS WITH DYSFUNCTION OF NEURO-ENDOCRINE-IMMUNE COMPLEX

Igor L Popovych[1], Nadiya O Sydoruk[2,3], Anatoliy I Gozhenko[2], Walery Zukow[4]

[1]Department of Immunophysiology, OO Bogomoletz Institute of Physiology NAS, Kyiv, Ukraine i.popovych@biph.kiev.ua
[2]Ukrainian Scientific Research Institute of Transport Medicine Ministry of Health, Odesa Gozhenko@mail.ru
[3]JSC "Dnipro-Beskyd", Truskavets', Ukraine dnipro-b@bk.ru
[4]Faculty of Physical Education, Health and Tourism, Kazimierz Wielki University, Bydgoszcz, Poland w.zukow@ukw.edu.pl

Abstracts

Background. Previously we have been carry out comparative investigation long-term effects of Bioactive Water Naftussya from layers Truskavets', Pomyarky and Skhidnyts'a on some metabolic and biophysical parameters at men with dysfunction of neuro-endocrine-immune complex. The aim of this study is the investigation long-term effects on neuro-endocrine regulation at similar patients. **Materials and methods.** The object of observation were 20 volunteers: ten women and ten men aged 33-76 years without clinical diagnose but with dysfunction of neuro-endocrine-immune complex and metabolism. We evaluated the trait and reactive anxiety, recorded EEG, HRV and blood pressure, determined levels of Cortisol, Aldosterone, Testosterone, Triiodothyronine and Calcitonin. After examination volunteers within 7 days used bioactive water Naftussya (250 mL three times a day) from Truskavets' or Pomyarky layer, then repeated the tests listed. **Results.** Weekly drinking of Bioactive Water Naftussya normalizes initially elevated levels of testosterone in women and reduces initially normal its level in men, in both sexes normalizes initially elevated levels of triiodothyronine and activity of the autonomic regulatory systems as the parasympathetic, so sympathetic, combined with a slight increase in the normal levels of aldosterone and trend to increase (under low) reactive anxiety as well as post occlusive reactivity of vascular tone. Among the 164 registered parameters quantitative EEG revealed noticeable changes only 8. This is, above all, normalizing increase initially reduced spectral power density (SPD) α-rhythm in loci T6 by 93%, P4 by 33%, F7 by 29%, increase by 10% in the normal range modal frequency of β-rhythm and further enhance SPD θ-rhythm in locus T5 by 42%. On the other hand, showed a reduction by 28% initially normal PSD of β-rhythm in locus in O2 and further reduction its by 20% in locus P4. Moreover, there was left-sided lateralization initially symmetric α-rhythm. No significant differences between the effects of Naftussya both deposits were found. **Conclusion.** Bioactive water Naftussya both Truskavets' and Pomyarky

layers causes favorable normalizing effects on abnormalities neuro-endocrine parameters, which is a manifestation of its adaptogenic properties.
Keywords: bioactive water Naftussya, adaptation hormones, HRV, EEG.

INTRODUCTION

Previously we have been carry out comparative investigation long-term effects of Bioactive Water Naftussya from layers Truskavets' and Pomyarky on some metabolic and biophysical parameters at humans with dysfunction of neuro-endocrine-immune complex. We found an increase in the normal range plasma levels chloride and sodium, normalization low level of bicarbonate and decrease within the normal range levels of potassium and phosphate. Urinary excretion of sodium and chloride increases while excretion and concentration of uric acid decreases, as the urine concentration of phosphates. The index lithogenicity urine decreased from 112% to 103% norm standard. Initially reduced level of plasma triacylglycerides increases, while decreases in the normal level of cholesterol in low-density lipoprotein composition. Among the biophysical parameters detected increase in the normal conductivity acupuncture points Pg (ND) at right side, which represent the nervous system, and left shift the ratio between the conductivity of acupuncture points MC (AVL), which represents the immune system. Increases electrokinetic index of epithelial cells of cheek to 1,7±0,3%, that indicating the "rejuvenation" of the organism to 1,4±0,3 years. We first discovered changes in parameters of gas discharge visualization, namely elimination of asymmetries of virtual chakras (first, second and third) as well as reducing the excess energy of the first chakra. No significant differences between the effects of Bioactive Water Naftussya both fields generally not found [4]. The aim of this study is the investigation at similar patients long-term effects on neuro-endocrine regulation as mechanism of action of Bioactive Water Naftussya on the status of functional systems [11,13,14,18-20].

MATERIAL AND RESEARCH METHODS

The object of observation were 20 volunteers: ten women and ten men aged 33-76 years without clinical diagnose but with dysfunction of neuro-endocrine-immune complex and metabolism, characteristic for premorbid (intermediate between health and illness) state.

In the morning on an empty stomach volunteers first completed a questionnaire to assess trait and reactive anxiety by Spielberger [16], they recorded three consecutive blood pressure ("Omron M4-I", Netherlands).

Then in a sitting position we recorded during 7 min electrocardiogram in II lead (by hardware-software complex "CardioLab+HRV" ("KhAI-Medica", Kharkiv, Ukraine) to assess the parameters of HRV as markers of vagal and sympathetic outflows [1,2,5,7-10]. For further analysis the following parameters HRV were selected. Temporal parameters (Time Domain Methods): the standart deviation of all NN intervals (SDNN), coefficient of variation (C_V), 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}), triangulary index (TINN); heart rate (HR), moda (Mo), the amplitude of moda (AMo), variational sweep (MxDMn). Spectral parameters (Frequency Domain Methods): spectral power density (SPD) bands 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). Expectant as classical indexes: LF/HF, LFnu=100%•LF/(LF+HF) and Baevskiy's Stress Index (BSI=AMo/2•Mo•MxDMn) as well as Baevskiy's Activity Regulatory Systems Index [1].

Simultaneosly with HRV recorded EEG for 25 sec using hardware-software complex "NeuroCom Standard" (KhAI Medica, Kharkiv, Ukraine) monopolar in 16 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. Among the options considered the average EEG amplitude (μV), average frequency (Hz), frequency deviation (Hz), index (%), coefficient of asymmetry (%) and absolute (μV^2/Hz) and relative (%) SPD of basic rhythms: β (35÷13 Hz), α (13÷8 Hz), θ (8÷4 Hz) and δ (4÷0,5 Hz) in all loci, according to the instructions of the device.

In addition, calculated Laterality Index (LI) for SPD each Rhythm using formula [12]:

LI, % = Σ [200•(Right – Left)/(Right + Left)]/8

We calculated also for each locus the Entropy (h) of normalized SPD using formula C Shannon [cited by: 13]:

$$h = -[SPD\alpha \bullet \log_2 SPD\alpha + SPD\beta \bullet \log_2 SPD\beta + SPD\theta \bullet \log_2 SPD\theta + SPD\delta \bullet \log_2 SPD\delta]/\log_2 4$$

At last in portion of venous blood serum we determined levels of Cortisol, Aldosterone, Testosterone, Triiodothyronine and Calcitonin (by the ELISA with the use of analyzers "Tecan" and "RT-2100C" and corresponding sets of reagents from "Алкор Био" Ltd, XEMA Co. Ltd and DRG International Inc.) [6].

After testing volunteers within 7 days used bioactive water Naftussya (250 mL one hour before meals three times a day) from Truskavets' or Pomyarky layers, then repeated the tests listed.

Results processed using the software package "Statistica 5.5".

RESULTS AND DISCUSSION

Fragments results published as abstracts [15].

For the purpose of adequate comparative assessment as an initial condition registered data and their changes as a result of the use of Bioactine Water Naftussya they are transformed into normalized parameters Id and Z, calculated by formulas [4]:

Id=V/M;

Z=(Id-1)/Cv; where

V is individual value indicator (variable);

M is its Mean Norm;

Cv is coefficient of variation in normal rate.

Normal values for surveyed contingent (including age and gender) were obtained from the Instructions of the device or sets and database of Truskavets' Scientific School of Balneology.

As in the previous study [4], we will comply with graduation by which the deviation from the average norm in a range of ±0,5 σ are **ignored**, ±0,5÷1,0 σ is **slight** and more than ±1,0 σ is **moderate**.

The initial endocrine state surveyed continent as a whole is characterized by a moderate increase in serum level of Cortisol in both sexes and slight increase Testosterone in females but not in males while decrease in serum level of Calcitonin in males but not in females (Table 1 and Fig. 1).

According HRV, examined contingent generally characterized by moderate tension of regulatory systems: Baevskiy's Activity Regulatory Systems Index was on average 3,5±0,6 points against the normal range of 0÷3 points. This occurred activation as sympathetic (HRV markers AMo, LF and LFnu), and the parasympathetic (markers MxDMn and RMSSD) regulatory systems (Tables 2-4 and Fig. 2).

Preliminary analysis showed no significant differences between long-term neuro-endocrine effects of Bioactine Water Naftussya both fields, so in the future the two groups were combined.

By calculating the direct (individual) differences found that weekly drinking of Bioactive Water Naftussya normalizes initially elevated level of testosterone in women and reduces initially normal its level in men, in both sexes normalizes initially elevated levels of

triiodothyronine and activity of the autonomic regulatory systems as the parasympathetic, so sympathetic, combined with a slight increase in the normal level of aldosterone (Tables 1,3,4 and Fig. 3).

Table 1. Effects of weekly taking of bioactive water Naftussya on hormones serum levels

Variables	Statistic parame-ters	Baseline (20)	After drink course (20)	Change as direct diffe-rences (20)
Cortisol Mean Norm=405 nM/L Cv=0,524	V Id Z	671±71 1,66±0,17*** +2,08±0,55***	702±58 1,73±0,14*** +2,32±0,46***	+31±51 +0,08±0,12 +0,24±0,40
Aldosterone Mean Norm=238 pM/L Cv=0,100	V Id Z	239±3 1,00±0,01 +0,03±0,15	248±4 1,04±0,01** +0,41±0,15**	+9±2 +0,04±0,01*** +0,38±0,04***
Triiodothyronine Mean Norm=2,20 nM/L Cv=0,227	V Id Z	2,46±0,19 1,12±0,09 +0,52±0,39	2,00±0,20 0,91±0,09 -0,40±0,41	-0,46±0,15** -0,21±0,07** -0,93±0,31**
Calcitonine females Mean Norm=5,5 ng/L Cv=0,493	V Id Z	5,0±0,9 0,92±0,17 -0,17±0,34	5,9±0,9 1,07±0,17 +0,13±0,35	+0,8±1,1 +0,15±0,19 +0,30±0,39
Calcitonine males Mean Norm=13,95 ng/L Cv=0,493	V Id Z	8,7±1,0 0,62±0,07*** -0,77±0,15***	5,9±1,2 0,42±0,09*** -1,17±0,18***	-2,8±1,7 -0,20±0,12 -0,41±0,25
Calcitonine all Portion Norm=1,00 Cv=0,492	Id Z	0,77±0,10* -0,47±0,20*	0,74±0,12 -0,52±0,24*	-0,03±0,12 -0,05±0,24
Testosterone females Mean Norm=2,30 nM/L Cv=0,600	V Id Z	3,40±0,31 1,48±0,13*** +0,80±0,22***	2,16±0,09 0,94±0,04 -0,10±0,07	-1,25±0,35*** -0,54±0,15*** -0,90±0,25***
Testosterone males Mean Norm=12,9 nM/L Cv=0,253	V Id Z	12,9±1,5 1,04±0,14 +0,17±0,54	8,2±0,5 0,66±0,05*** -1,36±0,18***	-4,7±1,3** -0,39±0,11** -1,53±0,42**
Testosterone all Portion Norm=1,00 Cv=0,426	Id Z	1,26±0,11* +0,48±0,29	0,80±0,04*** -0,73±0,17	-0,46±0,09*** -1,21±0,25***

Notes. p<0,05*; <0,01**; <0,001***

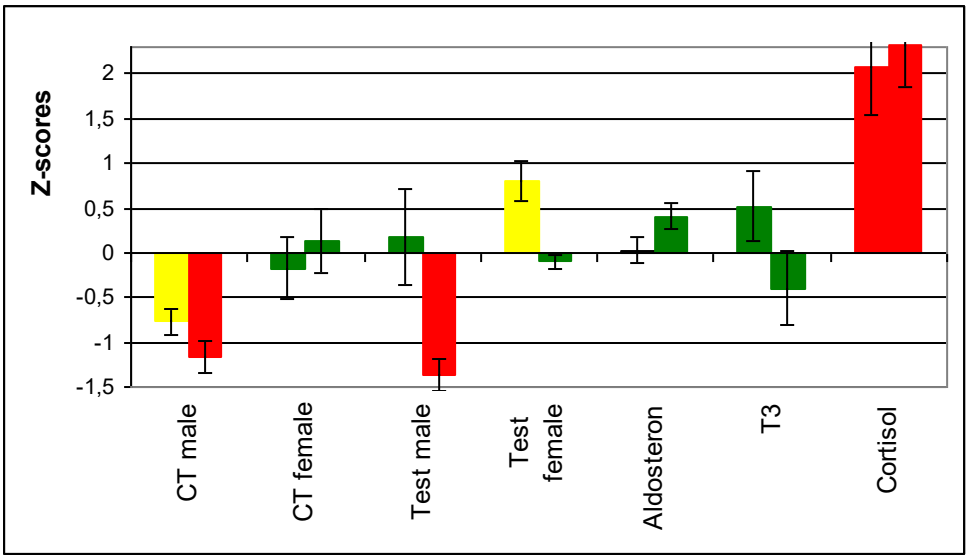

Fig. 1. Z-scores (Mean±SE) for endocrine parameters before (first columnes) and after (second columnes) taking of bioactive water Naftussya

Table 2. Effects of weekly taking of bioactive water Naftussya on Baevskiy's parameters HRV

Variables	Statistic parame-ters	Baseline (20)	After drink course (20)	Change as direct diffe-rences (20)
Moda Mean Norm=871 msec Cv=0,116	V Id Z	871±36 1,00±0,04 0,00±0,36	842±27 0,97±0,03 -0,29±0,27	-29±19 -0,03±0,02 -0,29±0,19
Amplitude of Moda Mean Norm=36,2 % Cv=0,250	V Id Z	44±4 1,29±0,16 +1,15±0,62	46±3 1,34±0,12* +1,34±0,49*	+2±2 +0,05±0,06 +0,19±0,23
MxDMn Mean Norm=154 msec Cv=0,293	V Id Z	224±19 1,48±0,13*** +1,65±0,43***	220±15 1,46±0,09 +1,58±0,32***	-4±13 -0,02±0,05 -0,07±0,29
Stress Index Mean Norm=139 units Cv=0,417	V Id Z	183±54 1,25±0,33 +0,60±0,80	158±30 1,11±0,18 +0,26±0,44	-25±27 -0,14±0,18 -0,34±0,44

Table 3. Effects of weekly taking of bioactive water Naftussya on temporal parameters HRV

Variables	Statistic parame-ters	Baseline (20)	After drink course (20)	Change as direct diffe-rences (20)
Heart Rate Mean Norm=68,8 b/min Cv=0,120	V Id Z	68,7±2,8 1,00±0,04 0,00±0,35	70,8±2,0 1,03±0,03 +0,23±0,24	+2,1±1,5 +0,03±0,02 +0,24±0,19
SDNN Mean Norm=54 msec Cv=0,516	V Id Z	50±5 0,92±0,09 -0,17±0,19	43±4 0,79±0,06** -0,41±0,11***	-6,8±3,3* -0,13±0,06* -0,24±0,11*
RMSSD Mean Norm=26,3 msec Cv=0,486	V Id Z	27,6±4,3 1,32±0,27 +0,66±0,56	23,2±3,2 1,08±0,18 +0,17±0,37	-4,4±1,8* -0,24±0,11* -0,49±0,22*
pNN_{50} Mean Norm=9,0 % Cv=0,820	V Id Z	8,8±3,0 0,86±0,27 -0,17±0,33	5,5±2,5 0,54±0,22* -0,56±0,27*	-3,3±1,3* -0,32±0,13* -0,39±0,15*
Coefficient of variation Mean Norm=7,0 % Cv=0,571	V Id Z	5,7±0,5 0,81±0,06 -0,33±0,14*	5,1±0,4 0,73±0,05 -0,48±0,10***	-0,6±0,4 -0,08±0,05 -0,14±0,10
TINN Mean Norm=11,2 units Cv=0,405	V Id Z	11,5±1,0 1,04±0,09 +0,08±0,22	10,7±0,8 0,96±0,08 -0,11±0,19	-0,8±0,6 -0,08±0,06 -0,19±0,14

Table 4. Effects of weekly taking of bioactive water Naftussya on spectral parameters HRV

Variables	Statistic parame-ters	Baseline (20)	After drink course (20)	Change as direct diffe-rences (20)
HF SPD Mean Norm=339 $msec^2$ Cv=0,713	V Id Z	407±132 1,30±0,46 +0,40±0,64	330±132 1,00±0,36 0,00±0,51	-77±61 -0,30±0,19 -0,40±0,26
LF SPD Mean Norm=596 $msec^2$ Cv=0,482	V Id Z	1043±284 1,68±0,36 +1,34±0,75	707±157 1,10±0,19 +0,20±0,39	-336±182 -0,55±0,25* -1,14±0,53*
VLF SPD Mean Norm=1353 $msec^2$ Cv=0,524	V Id Z	1507±267 1,10±0,18 +0,18±0,35	957±113 0,71±0,08*** -0,56±0,15***	-549±209* -0,39±0,14** -0,74±0,27**
ULF SPD Mean Norm=100 $msec^2$ Cv=0,800	V Id Z	84±20 0,84±0,20 -0,19±0,25	78±26 0,78±0,26 -0,28±0,32	-6±31 -0,06±0,31 -0,07±0,39
LF/HF Mean Norm=2,9 Cv=0,709	V Id Z	5,4±1,4 1,87±0,46 +1,23±0,64	4,9±1,2 1,70±0,42 +0,99±0,59	-0,5±1,6 -0,17±0,54 -0,24±0,76
100•LF/(LF+HF) Mean Norm=64% Cv=0,200	V Id Z	76,0±2,7 1,19±0,04*** +0,94±0,21***	72,5±3,6 1,13±0,06* +0,66±0,28*	-3,5±2,9 -0,06±0,05 -0,28±0,23
Baevskiy Activity Regulatory Systems Index (0÷3 points)	V	3,5±0,6**	2,4±0,5	-1,1±0,5*

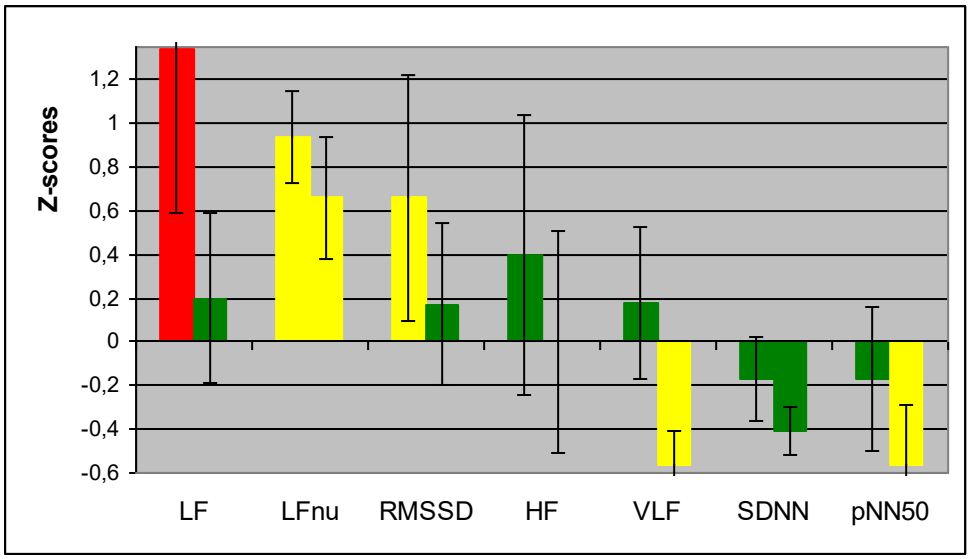

Fig. 2. Z-scores (Mean±SE) for HRV parameters before and after taking of bioactive water Naftussya

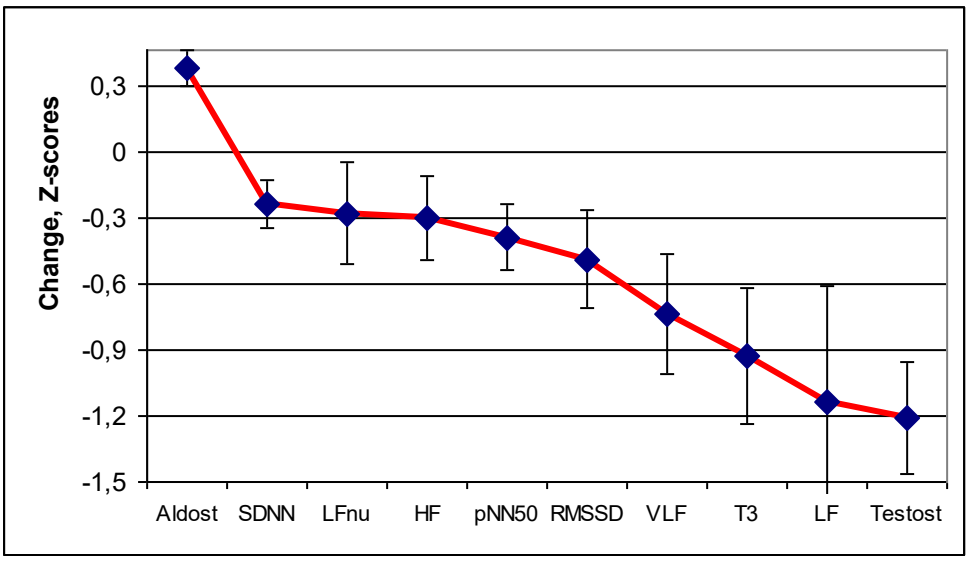

Fig. 3. Changes as direct differences (Mean±SE) in endocrine and HRV parameters sensitive to the influence of bioactive water Naftussya

Among the 164 registered parameters quantitative EEG revealed noticeable changes only 8. This is, above all, normalizing increase initially reduced spectral power density (SPD) α-rhythm in loci T6 by 93%, P4 by 33%, F7 by 29%, increase by 10% in the normal range modal frequency of β-rhythm and further enhance SPD θ-rhythm in locus T5 by 42%. On the other hand, showed a reduction by 28% initially normal PSD of β-rhythm in locus in O2 and further reduction its by 20% in locus P4. Moreover, there was left-sided lateralization initially symmetric α-rhythm (Table 5 and Fig. 4-5).

Table 5. Effects of weekly taking of bioactive water Naftussya on sensitive parameters EEG

Variables	Statistic parame-ters	Baseline (20)	After drink course (20)	Change as direct diffe-rences (20)
SPD F7-α; Cv=0,602 Mean Norm=31,7 %	V Z	21,2±3,0 -0,55±0,16**	27,4±3,0 -0,23±0,16	+6,2±2,3 +0,32±0,12*
SPD T6-α; Cv=1,136 Mean Norm=134 μV^2/Hz	V Z	72±12 -0,39±0,10***	139±45 +0,14±0,36	+67±36 +0,53±0,28
SPD P4-α; Cv=1,013 Mean Norm=341 μV^2/Hz	V Z	238±66 -0,30±0,19	316±94 -0,07±0,27	+79±40 +0,23±0,12
Frequency of β-rhythm; Cv=0,179 Mean Norm=19,2 Hz	V Z	17,9±1,0 -0,39±0,28	19,6±1,2 +0,22±0,34	+1,8±1,0 +0,51±0,29
SPD O2-β; Cv=0,760 Mean Norm=25,8 %	V Z	23,1±3,1 -0,14±0,16	16,7±1,6 -0,47±0,08***	-6,4±3,0 -0,33±0,15*
SPD P4-β; Cv=0,649 Mean Norm=25,5 %	V Z	20,4±2,6 -0,36±0,15*	16,3±1,6 -0,59±0,09***	-4,1±2,3 -0,24±0,13
SPD T5-θ; Cv=0,949 Mean Norm=23,5 μV^2/Hz	V Z	43±8 +0,86±0,37*	60±17 +1,65±0,78*	+18±13 +0,79±0,60
Laterality Index of α-rhythm, % Mean Norm=-2±2 %	V	-8±8	-22±5***	-14±10

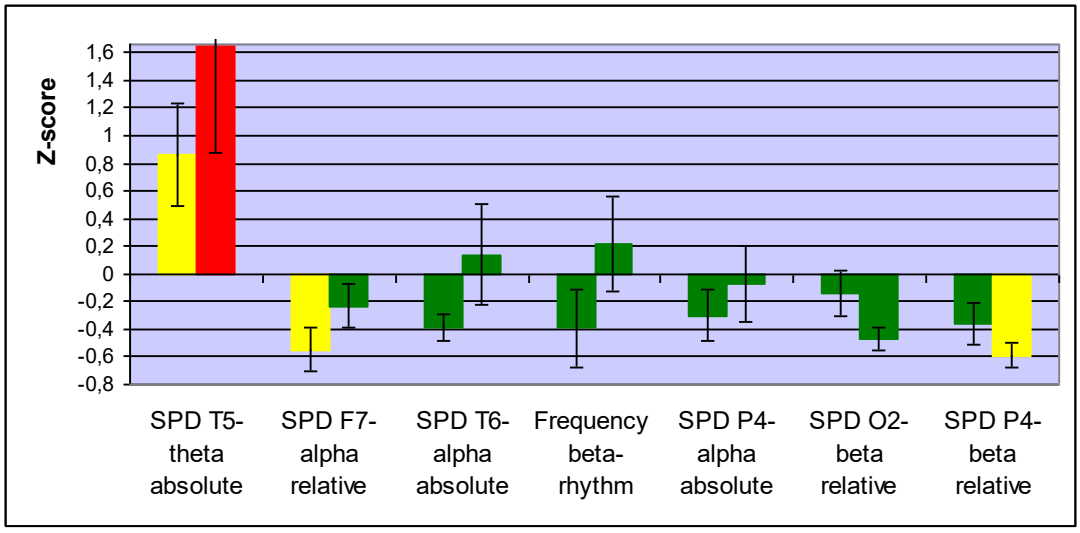

Fig. 4. Z-scores (Mean±SE) for EEG parameters before and after taking of bioactive water Naftussya

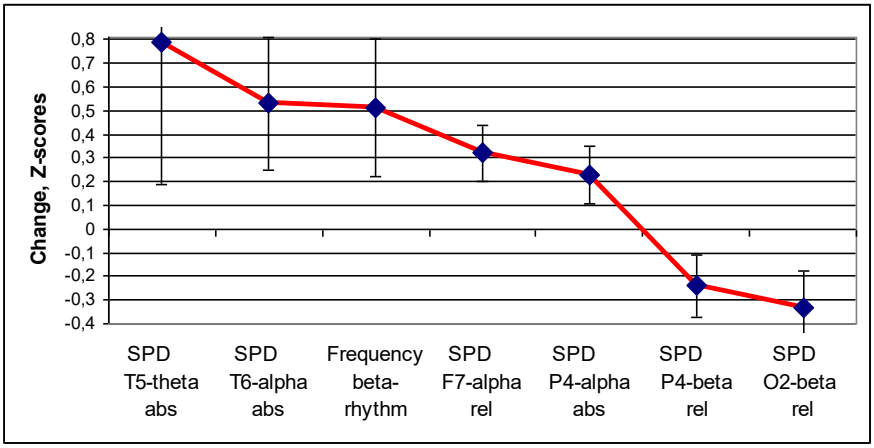

Fig. 5. Changes as direct differences (Mean±SE) in EEG parameters sensitive to the influence of bioactive water Naftussya

A consistent blood pressure measurements conducted by us to assess post occlusive reactivity of vascular tone [17]. Found the trend to increase ratio: systolic blood pressure 2/ systolic blood pressure 1 (Table 6).

Table 6. Effects of weekly taking of bioactive water Naftussya on post occlusive reactivity of blood pressure

Variables	N regist-ration	Baseline (20)	After drink course (20)	Change as direct diffe-rences (20)
Systolic Blood Pressure, mm Hg	1 2 3	141,1±4,7 134,7±4,5 134,4±4,6	137,9±5,1 134,8±4,6 132,7±4,4	-3,2±2,8 +0,2±2,4 -1,8±3,3
Diastolic Blood Pressure, mm Hg	1 2 3	81,4±2,4 81,5±2,7 81,5±2,6	80,3±2,2 80,4±2,2 79,1±2,2	-1,2±1,7 -1,1±2,0 -2,4±1,7
SBP2/SBP1		0,956±0,009	0,981±0,012	+0,025±0,014
SBP3/SBP1		0,955±0,015	0,966±0,012	+0,011±0,020
DBP2/DBP1		1,000±0,014	1,004±0,016	+0,004±0,021
DBP3/DBP1		1,000±0,011	0,986±0,011	-0,014±0,014

This change is due, apparently, as the weakening cholinergic effects on vascular tone, and with activation of the renin-angiotensin-aldosterone system.

Also found trend to increase (under low) reactive anxiety from 22,7±1,4 to 24,8±1,4 points.

In order to identify precisely those indicators (variables) on which set of neuro-endocrine status of surveyed persons before and after the course taking water Naftussya significantly different, discriminant analysis of information field was conducted. The program forward stepwise is included in a model (Table 7) almost all mentioned variables except six who are redundant (duplicated) discriminant information.

Table 7. Discriminant Function Analysis Summary
Step 14, N of vars in model: 14; Grouping: 2 grps
Wilks' Lambda: 0,166; approx. $F_{(14,3)}$=9,0; $p<10^{-6}$

Variables currently in the model	Wilks Λ	Part-l Λ	F-re-move	p	Tole-rancy	Before n=20	After n=20	Change
Testosterone, portion norm	,435	,382	40,5	10^{-5}	,359	1,26±0,11	0,80±0,04	-0,46±0,09
SPD O2-β, %	,177	,939	1,6	,213	,635	23,1±3,1	16,7±1,6	-6,4±3,0
Bayevskiy ARS Index, un.	,303	,547	20,7	10^{-3}	,213	3,8±0,7	2,4±0,5	-1,4±0,6
α-rhythm Laterality Ind, %	,188	,886	3,2	,085	,537	-8±8	-22±5	-14±10
SDNN HRV, msec	,181	,919	2,2	,151	,081	55±7	43±6	-13±7
LF HRV, $msec^2$	,176	,943	1,5	,232	,090	1043±284	707±157	-336±182
Cv HRV, %	,193	,861	4,0	,056	,070	5,7±0,5	5,1±0,4	-0,6±0,4
Aldosterone, pM/l	,173	,960	1,0	,318	,786	239±3	248±4	+9±2
BPS2/BPS1 Ratio	,277	,600	16,7	10^{-3}	,472	0,96±0,01	0,98±0,01	+0,02±0,01
SPD T6-α, μV^2/Hz	,271	,614	15,7	10^{-3}	,078	72±12	139±45	+67±36
β-rhythm Frequency, Hz	,189	,880	3,4	,076	,640	17,9±1,0	19,6±1,2	+1,8±1,0
Reactive Anxiety, points	,204	,814	5,7	,024	,609	22,7±1,4	24,8±1,4	+2,2±1,8
SPD T5-θ, μV^2/Hz	,181	,919	2,2	,150	,167	43±8	60±17	+18±13
SPD P4-α, μV^2/Hz	,185	,898	2,8	,105	,209	238±66	316±94	+79±40

Variables currently not in the model; Df for all F-tests: 1,24

	Wilks Λ	Part Λ	F to enter	p	Tole-rancy	Before n=20	After n=20	Change
Triiodothyronine, nM/l	,160	,96	,88	,36	,48	2,46±0,19	2,00±0,20	-0,46±0,15
RMSSD HRV, msec	,162	,98	,57	,46	,15	27,6±4,3	23,2±3,2	-4,4±1,8
pNN_{50} HRV, %	,161	,97	,70	,41	,16	10,0±3,0	5,5±2,5	-4,5±1,7
VLF HRV, $msec^2$	,161	,97	,74	,40	,14	1507±267	957±113	-549±209
SPD P4-β, %	,166	1,00	,04	,84	,61	20,4±2,6	16,3±1,6	-4,1±2,3
SPD F7-α, %	,165	,99	,21	,65	,45	21,2±3,0	27,4±3,0	+6,2±2,3

Next 14-dimensional space discriminant variables transformed into a one-dimensional space canonical discriminant function (canonical root), which is a linear combination of discriminant variables. Discriminating (distinction) ability of root characterizes canonical correlation coefficient (r*) as a measure of connection, degree of dependence between groups (before and after balneotherapy) and discriminant function. He is 0,913 (Wilks' Λ=0,166; $\chi^2_{(14)}$=56; $p<10^{-6}$).

Table 8 shows the raw (current) and standardized (normalized) coefficients of canonical variables. Coefficients in raw form gives information about the overall contribution of the variables to the value of the discriminant function, while standardized coefficients reflecting the relative contribution of variable independent on units. They make it possible to identify those variables that make the largest contribution to the value of the discrimination function. There also are given full structural coefficients as the correlation coefficients between the root and discriminant variables. The structural coefficients indicates how closely linked variable and discriminant function, that is what portion of information about discriminant function (root) lies in this variable. As you can see, the root reflects the inverse manner information about 7 parameters and on a direct manner also 7.

Table 8. Summary of Stepwise Analysis and Coefficients for Canonical Variables

Variables currently in the model	Parameters of Wilks' Statistics					Coefficients		
	F to enter	p-level	Λ	F-value	p-level	Struc-tural	Standar-dized	Raw
Testosterone, portion norm	12,8	,001	,749	12,8	10^{-3}	**-,26**	-1,438	-1,337
SPD O2-β, %	1,6	,213	,166	9,0	10^{-6}	**-,13**	-,340	-,030
Bayevskiy's ARS Index, un.	7,0	,012	,629	10,9	10^{-3}	**-,12**	-1,597	-,593
α-rhythm Laterality Index, %	1,6	,215	,203	10,0	10^{-6}	**-,11**	-,505	-,016
SDNN HRV, msec	2,2	,151	,214	10,6	10^{-6}	**-,09**	1,091	,054
LF HRV, $msec^2$	3,6	,066	,282	11,6	10^{-6}	**-,08**	,870	,001
Cv HRV, %	3,0	,096	,258	11,2	10^{-6}	**-,07**	-1,538	-,739
Aldosterone, pM/l	2,6	,117	,343	13,0	10^{-6}	**,13**	,247	,016
SBP2/SBP1 Ratio	12,3	,001	,369	15,0	10^{-6}	**,12**	1,008	21,5
SPD T6-α, $\mu V^2/Hz$	9,5	,004	,498	12,1	10^{-4}	**,10**	2,429	,016
β-rhythm Frequency, Hz	3,0	,094	,314	12,0	10^{-6}	**,09**	,475	,099
Reactive Anxiety, points	3,6	,069	,230	11,1	10^{-6}	**,08**	,606	,098
SPD T5-θ, $\mu V^2/Hz$	2,1	,162	,188	9,7	10^{-6}	**,07**	-,763	-,013
SPD P4-α, $\mu V^2/Hz$	1,7	,209	,177	9,3	10^{-6}	**,05**	-,765	-,002
Canonical r*=0,913; Wilks' Λ=0,166; $\chi^2_{(14)}$=56; p<10^{-6}						**Constant**		-26,5

Calculating individual values of canonical discriminant root makes it possible to visualize the quantitative status of each participant observation (Fig. 6). It is seen that in all volunteers drinking course causes still directed changes in neuro-endocrine status, the severity of which depends on the individual reactivity, but not on origin of water Naftussya. Quantitative measure integrated neuro-endocrine effect is squared Mahalanobis distance (D^2_M) between the states before and after the course (D^2_M=20,1; F=9,0; p<10^{-6}).

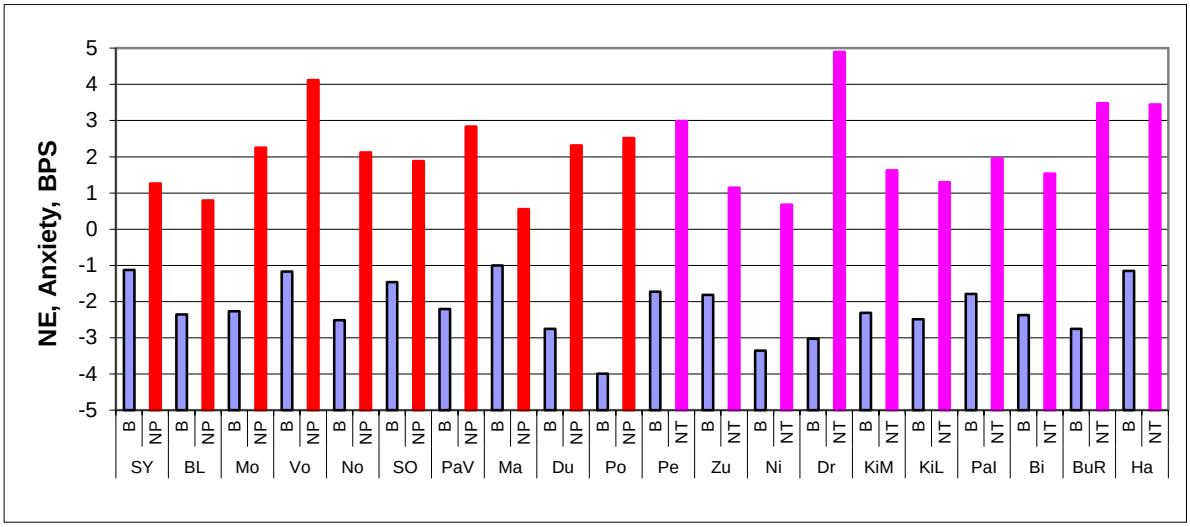

Fig. 6. Individual levels of Neuroendocrine. Anxiety and Blood Pressure Canonical Root before (B) and after course drinking of bioactive water Naftussya from Pomyarky (NP) and Truskavets' (NT) layers. Below is listed the initials of volunteers

Figure 7 confirms the visual impression of lack of differences between the neuroendocrine effects of water Naftussya both sources.

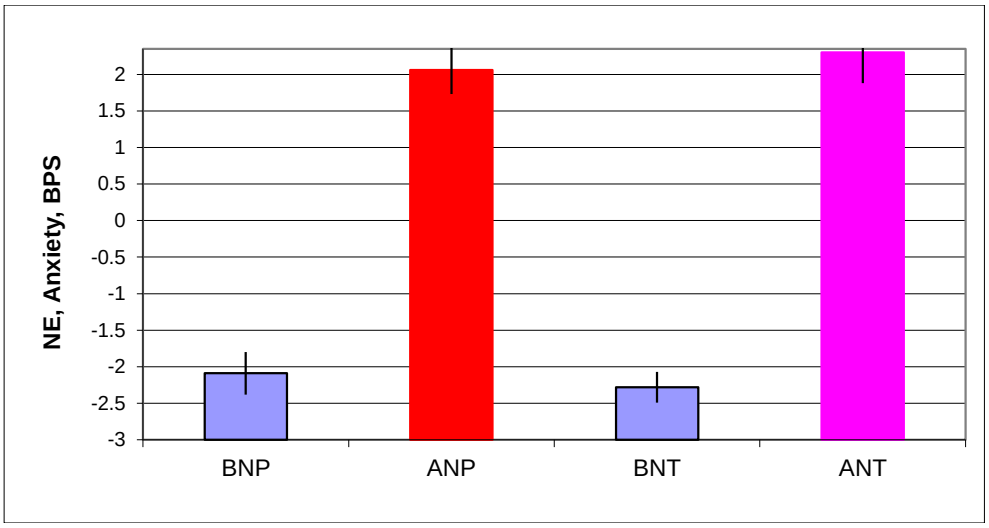

Fig. 7. Averages (M±SE) of Neuroendocrine. Anxiety and Blood Pressure Canonical Root before (B) and after (A) course drinking of bioactive water Naftussya from Pomyarky (NP) and Truskavets' (NT) layers.

Fourteen selected parameters can be used for identification (classification) initial or final neuroendocrine status of each person. This goal of discriminant analysis is realized using classification (discriminant) functions as special linear combinations for each group that maximize the differences between groups and minimize the variance within groups. Coefficients are not standardized, so not interpreted. The person belongs to a group with a maximum value function calculated by summing the quantities of products variables at coefficients classifications functions plus constant (Table 9).

Table 9. Classification Functions and Constants for Discriminant Variables

Variables currently in the model	Before	After
Testosterone, portion norm	-22,48	-28,32
Bayevskiy's ARS Index, un.	-10,81	-13,40
SPD T6-α, μV^2/Hz	,254	,325
BPS2/BPS1 Ratio	983	1077
Aldosterone, pM/l	1,547	1,616
β-rhythm Frequency, Hz	2,857	3,291
LF HRV, $msec^2$	-,0004	,0034
Cv HRV, %	-16,24	-19,47
Reactive Anxiety, points	2,995	3,422
SDNN HRV, msec	2,220	2,454
α-rhythm Laterality Index, %	-,472	-,543
SPD T5-θ, μV^2/Hz	-,067	-,122
SPD P4-α, μV^2/Hz	-,0084	-,0176
SPD O2-β, %	,036	-,096
Constants	-707,4	-823,3
Squared Mahalanobis Distance: 20,1 (F=9,0; $p<10^{-6}$)		

In this case, we can retrospectively accurately detect the initial state entities and state after drinking course of bioactive water Naftussya.

Thus, Bioactive Water Naftussya both Truskavets' and Pomyarky layers causes favorable normalizing effects on abnormalities neuro-endocrine parameters, which is a manifestation of its adaptogenic properties. Based on previously obtained data on close links between neuro-endocrine and immune parameters [3,11,13,14], the following article will be given the results

of research immunotropic effects of Bioactive Water Naftussya both Truskavets' and Pomyarky layers.

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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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