INTRODUCTION

The results both clinical-physiological, and experimental researches of immediate and course effects of bioactive water Naftussya (BAWN) of spa Truskavets’ on vegetative nervous system are ambiguous: there are found out both vagotonic, and sympathotonic effects, and also uncertain [3,7,8-12,15,16,21]. Therefore the problem remains actual, which that has defined a theme of our research.

TECHNIQUE

The chronic experiment on 58 male and female rats of a line Wistar with weight of a body 200-250 is carried out. At a preparatory stage all animals were tested on resistance to hypoxia (estimated on time of second agonal breath after creation in barochamber of pressure air 145 mm Hg) [1,5] and aerobic muscular serviceability (estimated on duration of swimming in warm water with aggravation up to a complete exhaustion) [1,6]. One week after there were defined parameters of vegetative regulation by a method of variational cardiointervalometry of electrocardiogramma (ECG) [2], registered under easy aether narcose after introduction under skin the needle electrodes. At the following stage of experiment 10 rats remained intact, and the others loaded through metallic tube by BAWN (chink 21N of Truskavetsian deposit) in a doze of 20 ml/kg unitary within 7 days. The next day after ending a drinking course they first repeatedly registered ECG, and then subjected rats to acute stress by a premise them in close crates and immersings last up to a level of processus xyphoideus in cold (t=20-21°C) water for 4 hours [17,23]. Some days after water immersion restraint stress they took away test of blood from cuted tip of a tail (for biochemical and immunologic tests) and once again they registered ECG.

The results are processed on PC under the program Statistica with the use of methods of the variational, discriminant and canonical analyses [20].

RESULTS AND THEIR DISCUSSION

Retrospectively the two types of effects of BAWN on basal vegetative regulation (Table 1) are revealed. At 73 % rats the amplitude of moda (AMo) as a correlate of sympathotone was considerably reduced, whereas a variational swing (ΔX) as a correlate of vagotone in the greater degree raised at absence of significantly changes of size of moda (Mo), which reflects humoral channal of regulation. In aggregate it testifies about vagotonic character of vegetotropic effect. At 27 % rats, on the contrary, are ascertained sympathotonic changes of parameters vegetative regulation: significant increase of sympathotone in combination with less expressed decrease of vagotone and sympathotonic shift of humoral channal of regulation.

Thus, week drinking of BAWN causes both vagotonic effectes (more often) as well as sympathotonic effectes (less often) on basal vegetative regulation in rats.

It is necessary to believe, that sympathotonic effect of BAWN is caused by contained in its structure organic substances [1], among which, probably, are available inhibitors of catechol-o-methyltransferase, as it is established for phytoadaptogens [4,13]. Vagotonic effect of BAWN has, probably, reflectory mechanism.
With the purpose of finding-out a probable conditionizing role of initial parameters in various directed vegetotropic effects of BAWN the procedure of discriminant analysis (method forward stepwise) is carried out. It turned out (Table 2), that all four registered parameters are predictive factors conditionizing the character of vegetotropic effect of BAWN.

Table 1. The ambivalent effects of week using of BAWN on basal vegetative regulation in rats

<table>
<thead>
<tr>
<th>Parameters of vegetative regulation</th>
<th>Vegetative regulation in control (intact) (n=10)</th>
<th>Type of vegetotropic effect by using of BAWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sympathotone (AMo), %</td>
<td>X±m 1,00±0,12 I±m 0,00±0,31 d±m -0,16±0,07</td>
<td>Vagotonic (n=35)</td>
</tr>
<tr>
<td>Vagotone (ΔX), ms</td>
<td>X±m 1,00±0,27 I±m 0,00±0,31 d±m +0,98±0,23</td>
<td>Sympathotonic (n=13)</td>
</tr>
<tr>
<td>Humoral channal of regulation (Mo), ms</td>
<td>X±m 1,00±0,11 I±m 0,00±0,31 d±m -0,09±0,08</td>
<td>Basal</td>
</tr>
<tr>
<td></td>
<td>X±m 1,00±0,11 I±m 0,00±0,31 d±m +0,98±0,23</td>
<td>After stress Basal After stress</td>
</tr>
</tbody>
</table>

Comments: 1. X±m - mean and its standart error.  
2. I±m - index of deviation from control and its standart error.  
3. d±m - Euklidian distance from control and its standart error.  
4. Significantly differences between control (C) and both types; benween vagotonic (V) and sympathtonic effects.

Table 2. The predictive factors conditionizing character of vegetotropic effect of BAWN in rats

<table>
<thead>
<tr>
<th>Predictive factors</th>
<th>Group Param-s</th>
<th>Control (n=10)</th>
<th>Vagotonic (n=35)</th>
<th>Sympathotonic (n=13)</th>
<th>Parameters of Wilks' statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swimming test, min</td>
<td>X±m 206±7 I±m 1,00±0,03 d±m 0,00±0,31</td>
<td>123±10</td>
<td>147±20</td>
<td>α F 0,730</td>
<td>CVCR SCCV RCCV -0,010 -0,516 -0,007</td>
</tr>
<tr>
<td>Sex-index (male=1, female=2)</td>
<td>X±m 1,50±0,17 I±m 1,00±0,11 d±m 0,00±0,31</td>
<td>1,63±0,08</td>
<td>1,23±0,12</td>
<td>α F 0,801</td>
<td>CVCR SCCV RCCV 0,622 0,673 1,141</td>
</tr>
<tr>
<td>Weight of body, g</td>
<td>X±m 19,2±5,9 I±m 1,00±0,30 d±m 0,00±0,31</td>
<td>16,2±1,4</td>
<td>24,5±4,2</td>
<td>A F 0,863</td>
<td>CVCR SCCV RCCV -0,654 -0,723 -0,006</td>
</tr>
<tr>
<td>Hypoxic test, sec</td>
<td>X±m 134±26 I±m 1,00±0,19 d±m 0,00±0,31</td>
<td>125±10</td>
<td>147±20</td>
<td>A F 0,730</td>
<td>CVCR SCCV RCCV -0,255 -0,447 -0,007</td>
</tr>
<tr>
<td>Const.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments: 1. CCF - coefficients of classification functions and constants.  
2. CVCR - correlations variables-canonical root.  
3. SCCV - standardized coefficients for canonical variables.  
4. RCCV - raw coefficients for canonical variables.

Thus BAWN renders vagotonic effect on rats, as a rule, female with smaller, in comparison with the average control, aerobic muscular capacity and resistance to hypoxia. On the contrary, excess of average levels of swimming and hypoxic testes and belonging to a male conditionizes in aggregate sympathotonic effect of BAWN. The weight of body is also included in model, which is a little bit increased owing to a week course of drinking.
Discriminant information is condensed in unique canonical variable (root). Pooled-within-groups correlations (CVCR) are essential concerning swimming test and sex-index, but not concerning hypoxic test and weight of body (Table 2).

Means of canonical variables (Fig. 1) at rats with vagotonic and sympathotonic reactions make +0.36±0.17 versus -0.98±0.29 respectively, that is unstandardized canonical scores in the first case, as a rule, are positive, and in the second case they are almost exclusively negative. Squared Mahalanobis distance between groups makes 1.88 (F=3.89; p=0.009). Summary tests with successive root removed: canonical $r^2=0.52$; Wilks' $\Lambda=0.73$; $\chi^2=13.9$; $p=0.008$. The calculation of classification functions by addition of products of individual sizes of predictive factors on coefficients of classification functions plus constant enables forecasting of vagotonic effect with accuracy of 89%, sympathotonic effect - 46%; total correctly of prognosis - 77%.

**Fig. 1. Unstandardized canonical scores in rats with vagotonic (V) and sympathotonic (S) balneoreactions on drinking of BAWN**

If discriminant analysis allows forecasting only the character vegetotropic effect of BAWN, then with the help of canonical analysis it is possible with the certain degree of probability to anticipate quantitative changes parameters of vegetative regulation. It is revealed (Table 3), that if separate predictors correlates with separate parameters of vegetative regulation weakly or moderately, the constellations are connected already considerably: canonical $r^2=0.54$; $\chi^2=25.0$; A Prime=0.56; p=0.015.

Thus the first root of predictive factors is correlates with swimming test very close ($r=0.84$), with sex-index correlates weaker ($r=0.71$), both with weight of body ($r=0.37$) and hypoxic test ($r=0.25$) correlates moderately. On the other hand, the information contents in first root of vegetative parameters is determined in the maximal degree by sympathotone ($r=0.985$), to a lesser degree by vagotone ($r=0.75$) and humoral channal ($r=-0.76$).
Table 3. Matrix of between and within correlations

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Code</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex-index</td>
<td>1</td>
<td></td>
<td>-0.32</td>
<td>-0.01</td>
<td>-0.33</td>
<td>0.46</td>
<td>-0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>Swimming test</td>
<td>2</td>
<td></td>
<td></td>
<td>-0.05</td>
<td>0.30</td>
<td>-0.30</td>
<td>0.45</td>
<td>-0.32</td>
</tr>
<tr>
<td>Hypoxic test</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>0.13</td>
<td>0.08</td>
<td>0.18</td>
<td>-0.07</td>
</tr>
<tr>
<td>Weight of body</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.09</td>
<td>0.21</td>
<td>-0.19</td>
</tr>
<tr>
<td>Humoral channal</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.64</td>
<td>0.74</td>
</tr>
<tr>
<td>Sympathotone</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.70</td>
</tr>
<tr>
<td>Vagotone</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Second root of predictive factors is determined considerably by hypoxic test ($r=-0.66$) and sex-index ($r=-0.56$), but it is weak determined by weight of body ($r=-0.28$) and swimming test ($r=-0.14$). Parameters of vegetative regulation correlates with second root in such sequence: Mo ($r=-0.62$), AMo ($r=-0.17$), ΔX ($r=-0.09$). Tests with successive root removed: canonical $r^*=0.45$; $\chi^2=10.4$; $\Lambda$ Prime=0.78; $p=0.108$.

Third pair does not deserve attention because of the statistics: canonical $r^*=0.10$; $\chi^2=0.47$; $\Lambda$ Prime=0.99; $p=0.79$.

Canonical connections between roots of predictive factors (right set) and vegetative parameters (left set) are represented on Fig. 2.

Fig. 2. Canonical correlation between predictive factors (axis X) and parameters of vegetative regulation after drinking BAWN (axis Y)

The equations of first and second of pairs roots:

- $0.851 \cdot \text{Amo} - 0.237 \cdot \text{Mo} + 0.026 \cdot \Delta X = -0.502 \cdot \text{Sex} + 0.702 \cdot \text{Swim} - 0.047 \cdot \text{Weight} + 0.294 \cdot \text{Hypox}$
- $-1.454 \cdot \text{Mo} - 0.806 \cdot \text{Amo} + 0.425 \cdot \Delta X = -0.627 \cdot \text{Hypox} - 0.780 \cdot \text{Sex} - 0.365 \cdot \text{Weight} - 0.311 \cdot \text{Swim}$

Revealed by us close inverse correlation between sympathotone and vagotone is very known [14,18,19,22].

Acute stress at rats with vagotonia induced by BAWN is accompanied by less expressed rise of sympathotone and fall of vagotone, and also the size of Mo in comparison with the postsressory changes at rats with sympathotonia.

As stress renders distinct influence on immune system [24], it is interesting to look after accompanying immunotropich effects, that will be a theme of following our message.
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AMBIVALENT VEGETOTROPIC EFFECTS OF BIOACTIVE WATER NAFTUSSYA AND OPPORTUNITY OF THEIR FORECASTING AT RATS

It is shown, that week drinking of bioactive water Naftussya spa Truskavets’ causes both vagotonic effects (less often) as well as sympathotonic effects (more often) on basal vegetative regulation in rats. It is detected four predictors which enables forecasting of vagotonic effect with accuracy of 89 %, sympathotonic effect - 46 %; total correctly of prognosis - 77 %.

LITERATURE

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