THE FUNCTION OF HYPOPHYSIS-THYROID SYSTEM IN PATIENTS WITH ALCOHOLISM DEPENDING ON IODINE SUFFICIENCY OF THE HUMAN BODY

FUNCTION SISTEMULUI HIPOFIZĂ-TIROIDĂ LA PACIENȚI CU ALCOOLISM

LARYSA ROSTOKA1, IVAN TURIANICA2, PETER CHLEBO2, MARTINA ČÍZMÁROVÁ2

1Uzhgorod National University, biochemistry and pharmacology department, Uzhgorod, Ukraine
2Slovak Agricultural University, human nutrition department, Nitra, Slovakia, E-mail: rostoka@yandex.ru

The aim of our investigation was to study the hypophysis-thyroid status of a body in patients with alcoholism, the inhabitants of various biogeochemical zones of the Transcarpathia, in the highlands – with expressed iodine deficiency and in the lowlands – with lower degree of iodine insufficiency. The content of thyroxin, triiodothyronine, thyrotropic hormone in blood serum has been defined by radioimmunologic method with the use of standard test-sets. The general iodine in the blood and urine has been studied by cerium-arsenide method. The peculiarities as to the influence of various ecologically iodine supply of the body upon TSH function of the hypophysis, hormone function of the thyroid gland, iodine reserves of the body both in practically healthy people and in alcoholism have been established. Alcoholism has been shown to be accompanied by the increased losses of iodine with urine and the depletion of the iodine reserves of the body, the increase of T3 level in blood serum both in lowlands and highlands of the Transcarpathia, it being characterized by different degrees of iodine deficiency complicating the existing iodine deficiency of the body. These findings may be good reasons for including iodine correction into the treatment of alcoholism.

**Keywords:** hypophysis-thyroid system, alcoholism, iodine-conditioned sufficiency, hormone

**Introduction**

The problem of the study of pathobiochemical mechanisms of metabolism impairment and its neuroendocrine regulation connected with the development and
course of alcoholism, the abstinent syndrome, alcoholic intoxication and in the result – stable somatoneurological decay, psychological degradation remains to be topical. There is no common idea as to this point.

The hypophysis-thyroid system plays an important role in the regulation of the exchange of substances including the metabolism of proteins, fats and carbohydrates. Iodine deficiency in the environment results in the development of iodine insufficiency in bioobjects and in the marked impairment of the thyroid gland function, that plays the leading role in the hormone regulation of metabolism intensity and in bioenergetic reaction of the cells, in adaptation-trophic reactions of the body, in immunity regulation (ex. Rapa et al., 2000; Manz et al., 2002; Weber, 2002; Герасимов, 2003; Rostoka et al, 2003; 2007; Turianica et al., 2007). If one takes into the account that iodine as an ecological factor defines the iodine supply of the body and the function of the thyroid gland, and thus the thyroid regulation of metabolism, one cannot exclude its significant influence on the spreading, course, and efficiency in the treatment of alcoholism as well as on the stability of alcohol dependency in general.

Alcoholism is known to result in the impairment of the exchange of proteins, fats and carbohydrates. The changes of protein biosynthesis and neuromediator metabolism lead to physical and psychological dependence, to emotional and volitional impairments, and further on cause the degradation of a personality (ex. Ahtee et al., 1980; Dubac et al., 1997; 1997 a; Морозов et al., 1983). Taking into consideration that thyroid gland hormones play the main role in the regulation of the exchange of proteins, fats, carbohydrates and energetic metabolism it is not excluded that patients with alcoholism show the impairments connected with the function of thyroid gland and the iodine sufficiency of the body (ex. Turianica et al., 2007).

That’s why we have carried out the investigation of hypophysis-thyroid status of a body in patients with alcoholism, the inhabitants of various biogeochemical zones of the Transcarpathia, in the Carpathian highlands – with expressed iodine deficiency and in the Tissa-Denube lowlands – with lower degree of iodine insufficiency.

**Material and Methods**

In the clinical and biochemical investigations the blood serum and the urine of patients’ with alcoholism have been studied: first group included 14 persons living permanently in Tissa-Denube lawland with less expressed iodine deficiency and who received 120 μg of iodine daily with food and water, and the second group of 10 persons, living in the mountainous zone of the Carpathians (its south-western part) with more expressed natural iodine deficiency than in the lowland environment, who received 80 μg of iodine daily (ex. Turianica et al., 2007; Rostoka et al., 2007). The group of healthy people served as the control: 29 were from the lowlands and 25- from the highlands districts. The content of thyroxin (T₄, nmol/l), triiodothyromine (T₃, nmol/l), thyrotropic hormone (TSH, nmol/l) in
blood serum has been defined by radioimmunologic method with the use of standard test-sets. The general iodine (GI) in the blood serum (nmol/l) and urine (μg/daily) has been studied by cerium-arsenide method (ex. Barker et al., 1951; Степанов, 1965).

Statistical processing was carried out after a computer database was formed in Microsoft Excel by means of personal computer with calculation of Student’s t-test and means comparison.

**Result and Discussion**

It has been established that in people living permanently in mountainous zone with ecologically conditioned more expressed iodine insufficiency the hormone function of the thyroid gland is lower than in Tissa-Danube lowland, where the intensity of iodine deficiency is lessened. It is accompanied by the formation of lower T4 and T3 levels in blood in spite of the decreased level of iodine excretion with urine and increasing of TTG level in blood serum (table 2).

People who live permanently in the Carpathians which is characterized with considerable iodine deficiency in the environment show lowering of the thyroid gland function (T3 and T4 levels that evidently stimulates TTG hypophysis function), the excretion of iodine with urine, probably it being the protective mechanism of economical use of iodine comparing with the indices in the inhabitants that permanently live under conditions of Tissa-Danube lowland with less expressed iodine deficiency. According to ICCID critiria the estimation of iodine deficiency severity as to mediane ioduria in the mountainous zone approaches the low bound of indices of moderate degree of severity of goitre endemia (22,6±1,53 μg/l) while in the lowland it reaches the upper bound (35,3±1,87 μg/l) (table 1, 2).

The patients with alcoholism that live permanently in the lowland biogeochemical zone of the Transcarpathia with less expressed ecologic iodine deficiency than in the mountains showed the increased level of TSH and T3 in blood serum on the background of its exhausted iodine with the urine as to the control data (table 1).

The defined increase of T3 production in patients with alcoholism, the inhabitants of lowland zone, occurs mainly due to the stimulation of metabolic transformation in T4 tissues to provide thyroid regulation as the response to excessive losses of iodine with the urine, the decrease of iodine reserves in blood and in the body of the patients as a whole caused by excessive taking of alcohol.
Table 1

Findings of hypophysis-thyroid system functional state in patients with alcoholism in the Lowland zone

<table>
<thead>
<tr>
<th>Finding</th>
<th>Control n = 29</th>
<th>Alcoholism n = 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₃ (nmol/l)</td>
<td>1.02±0.07</td>
<td>1.35±0.09*</td>
</tr>
<tr>
<td>T₄ (nmol/l)</td>
<td>124±7.63</td>
<td>125±5.85</td>
</tr>
<tr>
<td>TSH (nmol/l)</td>
<td>3.25±0.2</td>
<td>3.96±0.46*</td>
</tr>
<tr>
<td>GI blood (nmol/l)</td>
<td>465±11.8</td>
<td>326±13.3*</td>
</tr>
<tr>
<td>GI urine (μg/daily)</td>
<td>53.0±4.80</td>
<td>87.4±5.32*</td>
</tr>
</tbody>
</table>

*– The difference as to the control findings is reliable

In patients with alcoholism inhabiting in more unfavorable as to the iodine zones the function of thyroid grand is being activated, the increased levels of T₄ and T₃ in serum being the indicator of it. The increase of T₃ level is likely to be associated with the accelerated metabolic conversion of T₃ in tissues which may result in the depletion of the thyroid gland. Alongside with this suppress of TSH function of the hypophysis and the enlarged losses of iodine microelement with the urine have been observed, this complicates its deficiency in the body as to the condition of practically healthy persons in the same zone (table 2).

Table 2

Findings of hypophysis-thyroid system functional state in patients with alcoholism in Mountainous zone

<table>
<thead>
<tr>
<th>Finding</th>
<th>Control n = 25</th>
<th>Alcoholism n = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₃ (nmol/l)</td>
<td>0.85±0.03 **</td>
<td>1.58±0.12* **</td>
</tr>
<tr>
<td>T₄ (nmol/l)</td>
<td>83±3.30 **</td>
<td>118±9.53*</td>
</tr>
<tr>
<td>TSH (nmol/l)</td>
<td>6.02±0.24 **</td>
<td>1.8±0.70* **</td>
</tr>
<tr>
<td>GI blood (nmol/l)</td>
<td>392±15.7 **</td>
<td>273±20.6* **</td>
</tr>
<tr>
<td>GI urine (μg/daily)</td>
<td>34.0±2.30 **</td>
<td>74.2±4.94* **</td>
</tr>
</tbody>
</table>

* and ** – Findings as to the control and intergroup are reliable respectively

The established stimulation of the thyroid gland function in patients with alcoholism inhabiting the highlands is not caused by central TSH stimulation. This enables us to think about the probable dominating role of alcohol taking in the stimulation of thyroid gland function and consequently the stimulation of thyroid regulation that occurs not only on the account of the increased T₄ production, but due to the accelerated T₃ production in the tissues during the process of conversion, which is likely to result in the suppression of TSH function of the hypophysis, in the increase of the share of catabolic processes and the cachexia states in patients with alcoholism in highland zone of the Transcarpathia with more expressed iodine deficiency.
It is necessary to point to the opposite direction of the hormone response of the hypophysis as to TSH production in patients with alcoholism in various biogeochemical zones of the Transcarpathia. If these patients in the lowland zones show the stimulation of TSH production of the hypophysis, then in case of ecologically conditioned more expressed iodine deficiency deep suppression of TSH function of the hypophysis with more than 3 times fall of TSH level in the blood serum as to the appropriate control and more than twice as to its level in the blood serum in patients with alcoholism inhabiting the lowland zone has been observed.

However, under condition of the different direction of TSH hormone production of the hypophysis in patients with alcoholism in the highlands the function of the thyroid gland as to the T\textsubscript{4} production is activated which is likely to be associated with its stimulation by alcohol.

The established similar hormone tension of the thyroid gland in alcoholism especially under more expressed ecological iodine deficiency results in its rapid functional exhaustion with further probable complication of negative consequences which result in the transition from stimulation to impairments of the thyroid regulation of metabolism, to physical and intellectual degradation.

Patients with alcoholism in both biogeochemical zones with various degrees of iodine deficiency due to the excessive losses of iodine with the urine showed the formation of depleted iodine reserves of the blood. Thus, alcoholism stimulating excessive losses of iodine with the urine causes the depletion of iodine reserves in blood and consequently the iodine reserves of the body on the whole both in the lowlands and in the highlands. This is especially unfavourable for the patients inhabiting the mountainous zone where the highest deficiency incoming of iodine microelement with food and water in observed.

**Conclusions**

The peculiarities as to the influence of various ecologically conditioned iodine supply of the body upon TSH function of the hypophysis, hormone function of the thyroid gland, iodine reserves of the body both in practically healthy people and in alcoholism have been established. Alcoholism has been shown to be accompanied by the increased losses of iodine with urine and the depletion of the iodine reserves of the body in patients with alcoholism both in lowland and highland zone of the Transcarpathia, it being characterized by different degrees of iodine deficiency complicating the existing iodine deficiency of the body. Hyper production of T\textsubscript{3} in alcoholism both in lowland and highland biogeochemical zones of the Transcarpathia has been established. More expressed T\textsubscript{3} production in patients from the highlands is likely to occur due to the increased under these conditions stimulation of conversion of T\textsubscript{4} into T\textsubscript{3} in the tissues under the influence of alcohol. Alongside with this the patients from mountainous zones showed thyroid function activation and subsequently the increase of T\textsubscript{4} level on the background of TTH
deficiency in the blood serum. These findings may be good reasons for the expediency as to including iodine correction into the treatment of alcoholism.

References