

Hypophysis-thyroid regulation features at different professional law-enforcement officer groups

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ABSTRACT

Introduction: The law and order authority service including military are characterized with higher physical exercises and psychoemotional stress that result in forming specific functioning of regulation system in organism. Endocrine system (hypothalamus – hypophysis – thyroid or hypothalamus – hypophysis – adrenal axis etc.) provides increasing or decreasing of organism stability and depends from environment and life activity. In army the processes of long-term adaptation are activated. Under this circumstances the hormones (including thyroid) changes biosynthetic organization processes.

During long-time effects of severe factors in hypothalamus – hypophysis – thyroid regulation system occurred changes that reflect in other regulatory mechanisms. This changes results in natural adaptation reactions in energy metabolism, total metabolism in tissues and organs.

In consideration of endocrine system importance, social factors in adaptation forming the investigation of hormonal levels in different conditions are actual scientific and practical problem.

Objective: The aim of our investigation is analysis of hormonal supplying by hypophysis – thyroid regulation system at different law-enforcement officer groups in dependence from professional stress.

Method: The two healthy men group (130 persons), aged 23-35 years that living in Archangelsk (Russia) were investigated. The first group is Ministry of Home Affairs law-enforcement officers, but second group is civilians unrelated to law-enforcement service. In according to professional occupation the first group was divided in three categories. In first category were combatants that send on a mission to Caucasus (Chechen, Ingush Republics) for maintenance of law order. The mission duration was 3 month. The total number of missions to war conflict territories in all service life was 2-3 times. The investigation of combatants were doubly: before 2 day from mission to war conflict territory and in 2 days after returning to principal place of service (Archangelsk city, Russia). The second category of law-enforcement officers includes law-enforcement school students. At last, the third group consists from policemen that maintain law order in territory without war conflict and never take part in combat mission.

The fasting blood samples from ulnar venous were exercise at all people. The blood serum thyrotrophic hormone (TSH), thyroxin (T₄) and triiodothyronine (T₃) were determined by enzymoimmunoassay (commercial assay kit "Monobind Inc." USA).

The database was analyzed statistically by computer programme (SPSS 15.0). The significance critical level (p) in check of statistic hypothesis was taken low than 0.05 but 0.1 estimated as tendency. For estimation of universe distribution we used Shapiro-Wilk normality test that revealed abnormal distribution in all groups. In connection with it comparative analysis of means provided by nonparametric criterions: for dependent samples (combatants before and after mission) we used Wilcoxon criterion, but for independent samples (combatant – students – policemen – civilians) we used Mann-Whitney criterion.

Result: Analyses of our results are shown that hormonal levels at all persons were in normal physiological limits.

Together with it, we revealed significant differences of hypophysis and thyroid gland serum hormonal means between comparative groups as for dependent samples well as for independent samples.

The maximal blood serum TSH mean were detected at before mission combatants and in law-enforcement school students, but minimal this ne index were at policemen and civilians.

The blood serum thyroid hormones (thyroxin and triiodothyronine) in different groups of law-enforcement officers are vary in dependence from professional stress. At law-enforcement school students and before mission combatants a T₄ were minimal in comparison with policemen and after mission combatants. In th § time as to T₃ were revealed counterpositions that's law-enforcement school students and before mission combatants have maximal levels but policemen and after mission combatants – minimal levels.

Conclusion: The revealed differences of endocrine system indexes in law-enforcement officer group with intense load are probable adaptive reactions to extreme professional factors. This one provides optimal physiological adjustments to military stress etc.

Keywords: law-enforcement officers, thyrotrophic hormone, thyroxin, triiodthyronine, stress, adaptation

Introduction

The law and order authority service including military are characterized with higher physical exercises and psychoemotional stress^{1,2}. This one establishes pre-conditions that modulate a specific regulation system functions in human organism^{3,4}. Endocrine system (hypothalamus – hypophysis – thyroid, - adrenocortical etc. axis) determines an elevation or depression of nonspecific organism resistance to environment and life activity^{5,6}. The long-term adaptation processes are activated during the different services, especially military⁷. In this time the thyroid hormones play a main role for organism adaptation. This one appears in changes of biosynthetic

processes cooperation. The thyroid impact to total metabolism and energy exchange realized in short-term (transient) adaptation^{8,9}.

The disturbances that occur after a short-term severe environment influences are disappearance without a trace on condition that this factors terminates quickly. In long-term exposure of severe factors in hypothalamus – hypophysis – thyroid regulation system can occur changes that reflect in another links of regulatory mechanisms. This one results in adaptive transformations with according of energy exchange and metabolism modifications in tissues and organs^{10,11,12}.

So, endocrine system play very important role in adaptive response and form functional system in organism as well as heterochronia and cascade interaction in dependence from environmental, social etc. factors^{13,14,15}. The studying of hormonal status and change its in every field of activity is actual scientific, medical and practical problem.

The aim of our investigation is analysis of hormonal supplying by hypophysis – thyroid regulation system at different law-enforcement officer groups in dependence from professional stress.

Material and Method

The two healthy men group (130 persons), aged 23-35 years that living in Archangelsk (Russia) were investigated. The first group is Ministry of Home Affairs law-enforcement officers (94 persons), but second group is civilians unrelated to law-enforcement service (36 persons). In according to professional occupation the first group was divided in three categories. In first category were combatants that send on a mission to Caucasus (Chechen, Ingush Republics) for maintenance of law order (30 persons), mean age 28.28 ± 0.51 year. The mission duration was 3 month. The total number of missions to war conflict territories in all service life was 2-3 times. The investigation of combatants were doubly: before 2 day from mission to war conflict territory and in 2 days after returning to principal place of service (Archangelsk city, Russia). The second category of law-enforcement officers includes a law-enforcement school students (33 persons), mean age 28.29 ± 1.68 year. At last, the third group consists from policemen (31 persons) that maintain law order in territory without war conflict and never take part in combat mission mean age 28.56 ± 1.89 year. The civilian group was defining as comparable with combatants and policemen 28.16 ± 1.57 year.

The fasting blood samples from ulnar venous were exercise at all people. The blood serum thyrotrophic hormone (TSH), thyroxin (T_4) and triiodothyronine (T_3) were determined by enzymoimmunoassay (commercial assay kit “Monobind Inc.” USA).

The database was analyzed statistically by computer programme (SPSS 15.0). The significance critical level (p) in check of statistic hypothesis was taken low than 0.05 but 0.1 estimated as tendency. For estimation of universe distribution we used Shapiro-Wilk normality test that revealed abnormal distribution in all groups. In connection with it comparative analysis of means provided by nonparametric criterions: for dependent samples (combatants before and after mission) we used Wilcoxon criterion, but for independent samples (combatant – students – policemen – civilians) we used Mann-Whitney criterion.

Results and discussion

Analyses of our results are shown that hormonal levels at all persons were in normal physiological limits.

Together with it, we revealed significant differences of hypophysis and thyroid gland serum hormonal means between comparative groups as for dependent samples well as for independent samples (Table 1).

On application of mean comparison in combatant group (before and after urgent task) we established significant dynamic only for blood serum thyroxin concentrations. So, the mean of T_4 after mission increased (99.34 ± 3.37 nmole/l) in comparative with before mission (77.18 ± 3.28 nmole/l; $p=0.002$). As concerns of TSH and T_3 hormonal levels we didn't reveal significant differences at combatant before and after mission.

The comparisons of means in unbound variables (combatants – law-enforcement students, combatants – policemen, combatants – civilians, law-enforcement students – policemen, law-enforcement students – civilians, policemen – civilians) it's revealed differences as for TSH means well as for thyroid hormones (T_4, T_3). The highest mean of TSH were detected at before mission combatants (1.92 ± 0.04 U/l) in comparison with all another groups: with law-enforcement students – 1.83 ± 0.04 U/l, $p=0.05$; with policemen – 1.57 ± 0.16 U/l, $p=0.02$; with civilians – 1.71 ± 0.10 U/l, $p=0.03$. In spite of this one, the significant differences of TSH mean between combatants after mission and other groups were not revealed ($p>0.05$), but it's detected only one tendency to higher mean in comparison with policemen ($p=0.12$).

On the other part, the character feature were significantly higher blood serum TSH mean in law-enforcement students in comparison with policemen ($p=0.01$) and civilians ($p=0.03$).

At last, we weren't revealing a significant TSH difference between policemen and civilians.

So, the maximal blood serum TSH mean were detected at before mission combatants and in law-enforcement school students, but minimal this ne index were at policemen and civilians.

In comparison of blood serum thyroxin we revealed an opposite features concerning TSH. The minimal T_4 mean were registered at before mission combatants (77.18 ± 3.28 nmole/l) and law-enforcement school students (81.66 ± 2.44 nmole/l) in comparison with after mission combatants (99.34 ± 3.37 nmole/l), policemen and civilians (99.71 ± 3.30 и 95.52 ± 2.29 nmole/l, accordingly; $p<0.001$ for all comparisons). Herewith, at before mission combatants were detected tendency to low T_4 mean even with law-enforcement school students comparison ($p=0.12$).

As concerns, of blood serum triiodothyronine means at all professional groups we weren't observe a significance differences. However, it's revealed a tendencies to low blood serum T_3 means at policemen (1.56 ± 0.05 nmole/l) in comparison with before mission combatants (1.75 ± 0.08 nmole/l; $p=0.10$) and civilians (1.74 ± 0.06 nmole/l; $p=0.11$).

So, the blood serum thyroid hormones (thyroxin and triiodothyronine) in different groups of law-enforcement officers are vary in dependence from professional stress. At law-enforcement school students and before mission combatants a T_4 were minimal in comparison with policemen and after mission combatants. In this time as to T_3 were revealed counterpositions that's law-enforcement school students and before mission combatants have maximal levels but policemen and after mission combatants – minimal levels.

Conclusion

The differences of endocrine system index (hormonal levels of hypophysis – thyroid regulation system) at different law-enforcement officer groups with intensive professional stress are reactions for adaptation of organism to extreme factors, probably. They provide optimal adaptive changes to response on environment stress.

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Table 1: Serum thyrotrophic hormone, thyroxine and triiodothyronine at officers of Ministry of Home Affairs in dependence from professional activity (M±m)

Investigated person (groups)		Index		
		TSH (U/l)	T ₄ (nmole/l)	T ₃ (nmole/l)
Combatants	Before mission (n=30)	1.92±0.04	77.18±3.28	1.75±0.08
	After mission (n=30)	1.86±0.17	99.34±3.37	1.63±0.06
Military school students (n=33)		1.83±0.04	81.66±2.44	1.71±0.07
Policemen (n=31)		1.57±0.16	99.71±3.30	1.56±0.05
Civilians (n=36)		1.71±0.10	95.52±2.29	1.74±0.06
Statistical differences between groups		p ₁₋₂ =0.65 p₁₋₄=0.02 p ₂₋₃ =0.83 p ₂₋₅ =0.30 p₃₋₅=0.03	p₁₋₃=0.05 p₁₋₅=0.03 <i>p₂₋₄=0.12</i> p₃₋₄=0.01 p ₄₋₅ =0.41	p₁₋₂=0.002 <i>p₁₋₃=0.12</i> p₁₋₄<0.001 p₁₋₅<0.001 p₂₋₃<0.001 p ₂₋₄ =0.99 p ₂₋₅ =0.22 p₃₋₄<0.001 p₃₋₅<0.001 p ₄₋₅ =0.18
		p ₁₋₂ =0.38 <i>p₁₋₄=0.10</i> p ₂₋₃ =0.62 p ₂₋₅ =0.56 p ₃₋₅ =0.66	p ₁₋₃ =0.71 p ₁₋₅ =0.81 p ₂₋₄ =0.32 p ₃₋₄ =0.45 <i>p₄₋₅=0.11</i>	

Comments: Bold types marked are significance statistical differences between groups; bold italic types are tendency to statistical differences between groups.