Steroid regulatory function at different professional law-enforcement officer groups in dependence from professional load

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Abstract: At the present time occur a lot of political, ideological, religion, economic crises and other conflicts that lead to global changes of social sphere. The frequent cases of local armed conflict, terrorism act takes a considerable mobilization of economic and human resources. As a rule, the professional members of a police task force occupation for maintain securities are with extreme environments. The occupational hazard effect may evident by overstrain and depletion of functional regulatory mechanisms that provide the adaptation. The law-enforcement officers of Ministry of Home Affairs, aged 23-35 years were investigated. In according to professional occupation this one was divided in three groups: combatants that send on a mission to Caucasus for maintenance of law order; law-enforcement school students; policemen that maintain law order in territory without war conflict and never take part in combat mission. The blood serum steroid hormones (cortisol, testosterone, progesterone and estradiol) were determined. It was provided comparative analysis of means between groups: combatants before – after mission; combatant – students – policemen. Analyses of our results are shown that hormonal levels at all persons were in normal physiological limits. Together with it, significant differences of steroid serum hormonal means between comparative groups as for dependent samples well as for independent samples were revealed. The differences of endocrine system index (hormonal levels of steroid hormones) 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.

Keywords: Law-Enforcement Officers, Stress, Adaptation, Cortisol, Testosterone, Progesterone, Estradiol

1. Introduction

At the present time a lot of political, ideological, religion, economic crises and other conflicts occur that lead to global changes of social sphere [1-2].

The frequent cases of local armed conflict and terrorism acts require a considerable mobilization of economic and human resources to be stopped. People who are in charge of confronting social conflicts and security issues do undergo hazard effects of emergency as part of their occupation [3-5].

As a rule, the professional members of a police task force occupation who are in charge of maintaining the security confront extreme work environments. This is determined by severe tactical situation including time shortage, uncertain term and accordance with higher responsibility for a colleague life and operative mission. The different harmful job factors, intensity and exposure time of this effect are promoted to occurring health disturbances from light functional failures to persistent pathology at personal. The occupational hazard effect may evident by overstrain and depletion of functional regulatory mechanisms that provide the adaptation [6-8].

The endocrine regulation is a necessity for adequate maintenance of organism physiological processes and health [9-10].

The functional organ or system surcharge in adaptation accompanied with generalized reaction of defense and compensatory mechanisms. The functional regulatory systems are activated intensity. Its activity directs to

compensation of arise abnormalities from functional optimum [11-13].

The overwhelming majority investigations of disaster fighters (including combatant and policemen) health were described to psychological disturbances consequently professional army occupation [14-16]. However, the endocrine system imbalances in these situations were study not enough [17-19].

In connection with it, the analysis of this system changes at disaster fighters and combatant are actual problem for programming of healthcare and efficient using of personal.

2. Materials and Methods

The healthy men (94 persons), aged 23-35 years living in Archangelsk, Russia, were investigated. Everybody was law-enforcement officers of Ministry of Home Affairs. It was formed three groups in according to professional occupation. The first group takes part combatants (30 persons, mean age 28.28 ± 0.51 year) that send on a war mission (to Chechen, Ingush Republics) for maintenance of law order. The mission duration was 3 months. 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 group 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 fasting blood samples collected by vacuum system ("Vacuette Premium", Austria) from ulnar vein were exercise at all people. The blood serum steroid hormones (adrenal cortex – cortisol; sex steroids – testosterone, progesterone and estradiol) 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 $0.1 < p > 0.05$ 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) we used Mann-Whitney criterion.

3. Results & Discussion

3.1. Figure (SciencePG-Level2-Single-Line)

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 steroid serum hormonal means between comparative groups as for dependent samples well as for independent samples.

On application of mean comparison in combatant group (before and after urgent task) we established significant dynamic only for blood serum cortisol concentrations.

Table 1. *Blood serum steroid hormones (cortisol, testosterone) at officers of Ministry of Home Affairs in dependence from professional activity (M±m)*

Investigated person (groups)		Index	
		Cortisol (nmole/l)	Testosterone (nmole/l)
Combatants	Before mission (n=30)	404.81±30.20	23.91±1.35
	After mission (n=30)	471.16±27.10	20.92±2.37
Military school students (n=33)		267.22±9.13	18.85±0.82
Policemen (n=31)		327.74±14.87	28.33±1.48
Statistical differences between groups		p_{1-2}=0.03 p_{1-3}<0.001 p_{1-4}=0.07 p_{2-3}<0.001 p_{2-4}<0.001 p_{3-4}=0.03	p_{1-2}=0.21 p_{1-3}=0.03 p_{1-4}=0.03 p_{2-3}=0.79 p_{2-4}=0.01 p_{3-4}<0.001

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

Table 2. *Blood serum steroid hormones (progesterone and estradiol) at officers of Ministry of Home Affairs in dependence from professional activity (M±m)*

Investigated person (groups)		Index	
		Progesterone (nmole/l)	Estradiol (nmole/l)
Combatants	Before mission (n=30)	2.39±0.21	0.13±0.01
	After mission (n=30)	2.33±0.16	0.14±0.01
Military school students (n=33)		1.88±0.15	0.12±0.01
Policemen (n=31)		2.44±0.22	0.19±0.02
Statistical differences between groups		p_{1-2}=0.92 p_{1-3}=0.01 p_{1-4}=0.98 p_{2-3}=0.01 p_{2-4}=0.83 p_{3-4}<0.001	p_{1-2}=0.70 p_{1-3}=0.21 p_{1-4}=0.05 p_{2-3}=0.09 p_{2-4}=0.07 p_{3-4}=0.009

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

So, the mean of cortisol after mission increased (471.16±27.10 nmole/l) in comparative with before mission (404.81±30.20 nmole/l; p=0.03). As concerns of sex steroid hormonal levels we didn't reveal significant differences at combatant before and after mission.

It was revealed a means difference as for cortisol means well as sex steroid hormones. The highest mean of cortisol were detected at after mission combatants (471.16±27.10 nmole/l) in comparison with other officer groups: with law-enforcement students – 267.22±9.13 nmole/l, p<0.001; with policemen – 327.74±14.87 nmole/l, p p<0.001. On the other part, the significant differences of cortisol mean were revealed between combatants before mission and law-enforcement students (p<0.001), but it was detected tendency to higher mean in comparison with policemen (p=0.07). At last, the significant differences between law-enforcement students – policemen (p=0.03) we revealed too.

So, maximal cortisol level was revealed in combatant group after mission, but minimal in law-enforcement students.

The other features we revealed for sex steroid hormones levels. The testosterones mean at combatant group before mission (23.91±1.35 nmole/l) were higher than law-enforcement students (18.85±0.82 nmole/l) significantly (p=0.03). But after mission combatant testosterones level (20.92±2.37 nmole/l) were not differ from before mission combatant and law-enforcement students significantly.

The maximal testosterone mean was detected at policemen group (28.33±1.48 nmole/l). This one was greater than combatant before mission (p=0.03), after mission (p=0.01) and law-enforcement students (p<0.001).

The comparison of progesterone means demonstrated that minimal level was in law-enforcement students (1.88±0.15 nmole/l). It was below than policemen group (2.44±0.22 nmole/l; p<0.001) and combatant (2.39±0.21, 2.33±0.16 nmole/l for before and after mission, consequently; p=0.01 for all cases) significantly.

The progesterone means between combatant and policemen differences were significant (p>0.05).

We revealed just a little significant differences of estradiol means. The maximal estradiol mean was detected in policemen group (0.19±0.02 nmole/l). It's over than law-enforcement students group (0.12±0.01 nmole/l; p=0.009) and combatant before mission group (0.13±0.01 nmole/l; p=0.05). The tendencies to differences were revealed between groups: policemen – combatant after mission (0.14±0.01 nmole/l; p=0.07) and law-enforcement students – combatant after mission (p=0.09).

4. Conclusion

The differences of endocrine system index (hormonal levels of steroid hormones) 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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