

« ... (... - ...)», ... 5/7.

ELECTROPHYSIOLOGICAL CHARACTERISTICS OF ATHLETES RELATED TO CONTENTS OF ESSENTIAL ELEMENTS IN HUMAN BODY

E.V. Evstafyeva, I.A. Evstafyeva, O.A. Zalata, E.V. Perecotiy, S.L. Timchenko, S.V. Cherniy

SUMMARY

There is close interaction between the iron and copper, and maintaining their balance is important for the functioning of the central nervous system and all the visceral systems it controls, especially if this interaction is affected by pollution, systematic physical loads etc.). Bio-monitoring and functional examination of 18-20 year-old football players were conducted in order to establish possible dependence of the functional state of their central nervous and cardiovascular systems on the content of copper and iron in the body in a medium-sized city (Simferopol). We revealed a lack of the metals under consideration: 72% of these sportsmen had a total deficiency of iron and copper. No significant effects of these metals on the characteristics of the current EEG pattern were observed. At the same time, significant correlations were found between metals, mainly copper, and characteristics of evoked and event-related potentials recorded in the GO / NO-GO paradigm. There is a relationship between the content of iron and electrophysiological parameters of the functional state of the cardiovascular system recorded by electrocardiography and reography. A quantitative assessment of "neurotropic", "vegetotropic" and "cardiovascular-tropic" effects of metals showed 37, 0 and 8 standard units for copper and 15, 0, 33 standard units for iron. No significant correlations were revealed for the characteristics of the autonomic nervous system. Probably it indicates that the found "cardiovascular-tropic" effects are results of direct action of metals on the metabolism of cells of the cardiovascular system. It should be stressed that under other conditions of the external environment other contents of elements can have other effects on the functional state of the systems.

... (...) (...) 18-20- 72% NO-GO, GO/ « ... » « ... » 37, 0 8 , 15, 0, 33 « ... » « ... »

() [1, 2].

[3].

[4].

[5].

[6,7].

[8].

[9].

[10].

[11].

[12].

[13].

[14].

[15].

u, Zn) , (Pb, Cd, As, Sr)

(Ca, GO/NO-GO «10-20».)

ERP-2 (C3, C4)

GO/NO-GO (30)

18-20 2 4

6 200 400 - 1000

(50%)

45

90 [10].

() .

(Cardio ()).

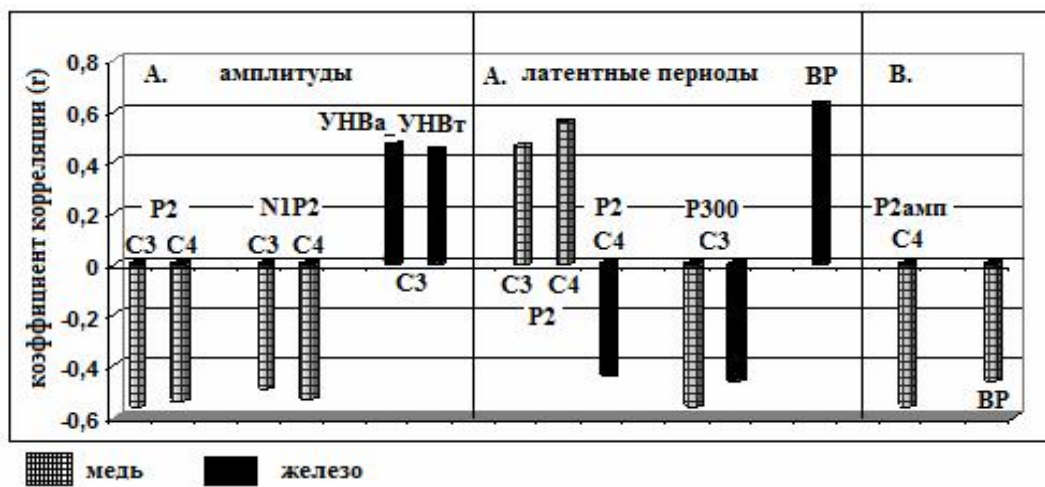
5-10 5

STATISTICA 6.0 (Stat-Soft, 2001).

[16] – SDNN, RMSSD, pNN50, e: RRNN, [17], TP, ²; (r). VLF, ²; (); LF, 0.05, HF, ² (), LF/HF – 91-95%.

(, /), (, /), (/ ²); [7, 18,19]. 72% (.1).

(/) (n=25) 18-20



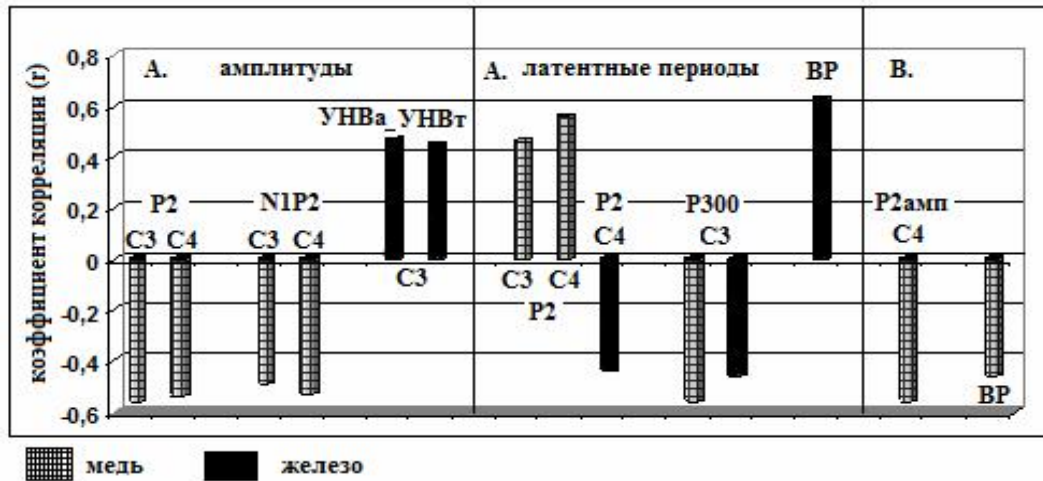
[9].

(r=0,41,

p<0,05),

[3].

(.1),



.1.

.1- ;2- ;3- C ;4- ;5- ;6- (;7- ;8- QRS; 9- QT.

2

« »

(.1).

300

[20],

[21].

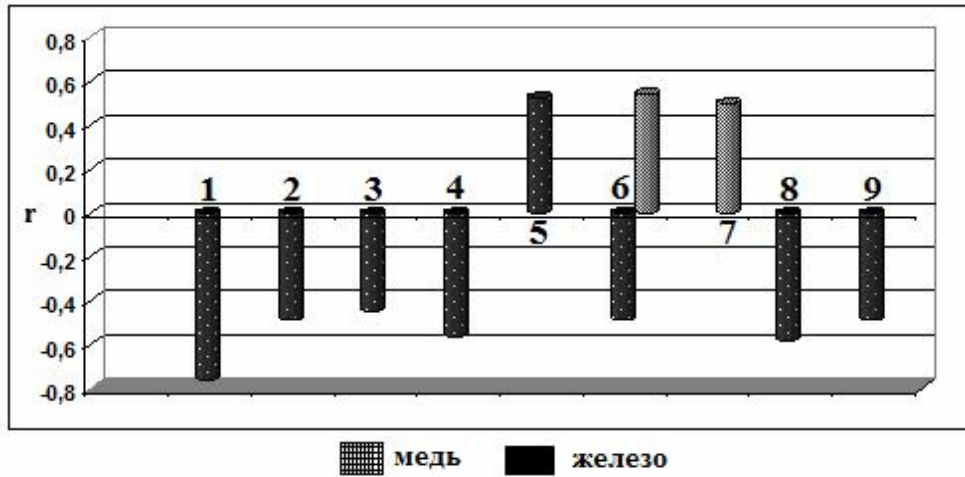
[22]

[9].

[21].

[4].

(.2).



. 2.

1- ; 2- ; 3- C ; 4- ; 5- ; 6- (); 7- ; 8- QRS; 9- QT.

« »

3.

(QRS, QT). PQ QT [23].

(,)

[12],

1.

37

- 4

15 33

2.

1. Murata K. Benchmark Dose Calculations for Methylmercury-Associated Delays on Evoked Potential Latencies in Two Cohorts of Children. / K. Murata, E. Budtz-Jorgensen, Ph. Grandjean // Risk Analysis. - 2002. - V.22, No3. - P.465-474.

2. Turgut G. Effect of copper overload together with ethanol uptake on hippocampal neurons" / G. Turgut, I. Akdo Duan, E. Adiguzel, Gen UO Tohoku // J. Exp. Med. - 2003. - V.199, Issue 4. - P.239-245.

3. Sharp . The molecular basis of copper and iron interactions / Proc. Nutr. - 2004. - V.6, 4. - P. 563-569.

4. Zheng W. Regulation of brain iron and copper homeostasis by brain barrier systems: implication in neurodegenerative diseases / W. Zheng, A.D. Monnot // Pharmacol Ther. - 2011. - Vol. 133, 2. - P.177-188.

5. Jomova K. Advances in metal-induced oxidative stress and human disease / K. Jomova, M. Valko // Toxicology. - 2011. - Vol. 283, 2-3. - P.65-87.

6. // , . . . // , . . . - 1997.- 4.- . 5-13.
7. // / . . . -2009.- 1-2.- . 17-22.
8. Speich M. Minerals, trace elements and related biological variables in athletes and during physical activity/ Speich M., E. Pineau, F. Ballereau// *Clinical Chimica Acta*.- 2001.- Vol. 312.- P. 1-11.
9. - - - / . . . // - 2006.- . 38, 2.- . 167-174.
10. - / . . . // - 2009.- 3.- . 81-90.
11. - - - / . . . // - 2012.- IV, 1 ().- . 169-172.
12. William Carpenter E. Qeitraub and Ahenyu Qinzinc, copper, and blood pressure: Human population studies/ E. William Carpenter, Derek Lam, M. Clenn Toney, L. Neal // *Med.Sci.Monit*.- 2013.- Vol. 19.- P.1-9.
13. Tosco A. Molecular bases of copper and iron deficiency-associated dyslipidemia: a microarray analysis of the rat intestinal transcriptome/ A. Tosco, D. Fontanella, R. Danise, et. al.// *Genes Nutr*.- 2010.- Vol. 5 (1).- P 1-8.
14. Rines A.K. Transition metals and mitochondrial metabolism in the heart/ A.K. Rines, H. Ardehali // *J.Mol.Cell.Cardiol*.- 2013.- Vol. 55.- P. 7-50.
15. Wei H. Copper chelation by tetrathiomolybdate inhibits vascular inflammation and atherosclerotic lesion development in apolipoprotein E-deficient mice// H. Wei, W. J. Zhang, T.S. McMillen, R.C. Leboeuf, B. Frei// *Atherosclerosis*.- 2012.- Vol. 223 (2).- P. 13-396.
16. Heart rate variability. Standards of measurement, physiological interpretation and clinical use/ Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology: Membership of the Task Force listed in the Appendix *European Heart Journal*.- 1996.- Vol. 17.- P.334-38.
17. // - 2006.
18. Melvin Williams H. Dietary Supplements and Sports Performance Minerals // H. Melvin Williams// *J Int Soc Sports Nutr*.- 2005.- Vol. 2 (1).- P. 43-49.
19. Wang L. Effects of high-intensity training and resumed training on macroelement and microelement of elite basketball athletes // L. Wang, J. Zhang, J. He W. Wang, H. Huang// *Biol. Trace Elem Res*.- 2012.- Vol. 149 (2).- P. 54-148.
20. Goyer R.A. Metal toxicology/ R.A. Goyer, C.D. Klaassen, M.P. Waalkes et al. // San Diego; New York: Acad. Press.- 1995.
21. Tucker D.M. Iron status and brain function: serum ferritin levels associated with asymmetries of cortical electrophysiology and cognitive performance// D.M. Tucker, H.H. Sandstead, J.G. Penland, S.L. Dawson, D.B. Milne// *Am.J.Clin.Nutr*.- 1984.- Vol. 39(1).- P. 13-105.
22. Hamed S.A. Trace elements and flapping tremors in patients with liver cirrhosis. Is there a relationship? // S.A. Hamed, E.A. Hamed, M.H. Farghaly, K.A. Ezam// *Saudi Med J*.- 2008.- Vol. 29(3).- P. 51-345.
23. - - - / . . . // - 2012.- 4 (39).- . 129-135.
24. - - - // 64809. A61B5/103, A61B5/00, 2012.