VITAMIN E AND IRON SUPPLEMENTATION IN COMPETITIVE ATHLETES

by

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Sixteen first division basketball players participated in this research project, giving their written consent. They were randomly divided into two groups: experimental (E), supplemented daily with 30 mg of vitamin E and 20 mg of iron and the control group (C), which did not receive any mineral or vitamin supplements. The supplementation period lasted for 8 weeks. During this period of time all of the players conducted the same training program.. In all of these subjects maximal oxygen uptake (VO_2max), anaerobic threshold (VE - ventilatory, LA - lactate method) and the level of hemoglobin were evaluated before and after the 8 week experimental period. As the results show, there were no statistically significant changes in the three considered variables for both the experimental (supplemented) and the control groups. Despite the lack of statistical significance a 5,10% increase in VO_2max in the E group may be of great importance while the improvement for the C group was 3 times smaller and equaled only 1,32%. A similar tendency was observed in the level of AT where the E group improved 3,95% while no change at all was observed for the C group. The level of Hb, increased in the E group by 2,61% while the C group registered a minimal drop in that variable. It seems that the lack of statistical significance can not rule out the possibility of an ergogenic effect of vitamin E and iron in competitive athletes.

Key words: Vitamin E, VO2max, anaerobic threshold, hemoglobin

Introduction

Today it is a well-known fact that vitamins are not structural blocks of the body and are not energetic substrates yet they play an important regulatory role in metabolism acting as enzymes or coenzymes. Physical exercises increase the demand for most vitamins and minerals significantly. Vitamin or mineral deficiency may decrease physical performance, increase restitution time and decrease the immunological capacity of the athlete's body. The increased

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demand for vitamins and minerals related to physical exercise is a consequence of the increased rate of metabolism and a greater loss of most vitamins and minerals with sweat and urine. The concept of vitamin and mineral supplementation for competitive athletes is a worldwide-accepted fact.

This research project was established to evaluate the effect of vitamin E and iron supplementation on aerobic fitness in highly trained athletes. Vitamin E functions as an antioxidant in cell membranes. Theoretically vitamin E supplementation should enhance the entire oxidant potential in the body, helping to prevent the peroxidation and destruction of lipids in red blood cell (RBC) membranes by oxygen free radicals.

By helping to maintain the integrity of the RBC membranes, vitamin E supplementation could help maintain optimal delivery of oxygen to the muscle cell during aerobic exercise [2,10]. Vitamin E may thus be considered as an ergogenic aid for athletes especially those training or competing at high altitudes. As an optimal dose for endurance athletes most experts propose 20-23 mg of vitamin E daily [12].

Iron is an essential mineral for the human organism and may be classified as a nutritional sports ergogenic. The daily demand for an adult not subjected to heavy physical work or exercise ranges from 6 to 16 mg. The demand of athletes, especially those engaged in endurance sport disciplines may rise up to 20-30 mg daily [1]. Iron is a component of hemoglobin in the RBC, myoglobin in the muscle cell and some of the oxidative enzymes within the mitochondria. Hemoglobin and myoglobin are carriers of oxygen, while iron based oxidative enzymes are essential in the formation of ATP in the oxygen energy system. Several research projects have indicated an increased metabolism of RBC in competitive athletes resulting in the so-called sport anemia [9,11]. Large quantities of iron are lost through sweat because each liter of it contains 0,5 mg of iron. Considering that intensively trained athletes lose from 12 to 20 liters of sweat per week, iron looses of 6-10 mg may be common. The significance of iron supplementation rises with female athletes where the daily loss of iron is greater than in men, because of menstruation. Female athletes may loose up to 2,3 mg of iron daily compared to 1,5-mg characteristic for males [3,4].

Material and Methods

Sixteen, first division basketball players participated in this research project giving their written consent. Their mean weight and height equaled respectively 89,6±7,2 kg and 194,3±5,3 cm. The players were randomly divided into two groups. The experimental group was supplemented daily with 30 mg of vitamin E and 20 mg of iron. The control group did not receive any mineral or vitamin supplements. The supplementation period lasted for 8 weeks. During this period of time all of the players conducted the same training program. In all of these subjects maximal oxygen uptake (direct gasometric method – Beckman metabolic cart), anaerobic threshold (VE - ventilatory, LA - lactate method) and the level of hemoglobin were evaluated before and after the 8 week experimental period.(with the use of cyan-methemoglobin method) The changes in the above mentioned variables were calculated and multiple analysis of variance was used to determine their significance. Tukey post-hoc (HSD Honest Significance Difference) test was used to describe differences between particular variables

Results

The pre- and postexperimental results of maximal oxygen uptake, AT and Hb are presented in table 1. As the table shows there were no statistically significant changes in the three considered variables for both the experimental (supplemented) group and the control group. Considering the high level of fitness of athletes participating in the study it was difficult to assume that significant changes would occur in this group of basketball players. Despite the lack of statistical significance a 5,10% increase in VO_2max in the experimental group supplemented with vitamin E and iron may be of great importance to an already fit athlete. The improvement for the control group was 3 times smaller and equaled only 1,32%. A similar tendency was observed in the level of AT where the experimental group improved 3,95% while no change at all was observed for the control group. The level of Hb, despite high initial values once again increased in the supplemented group by 2,61% while the control group registered a minimal drop in that variable. It seems that the lack of statistical

significance can not rule out the possibility of an ergogenic effect of vitamin E and iron in competitive athletes. From the coaches or exercise physiologist standpoint a minor improvement of a few percent in variables such as Vo_2max or AT can significantly improve performance if all other factors remain at the desired level. Another point worth while considering in evaluating ergogenic effects of vitamin and mineral supplementation is related to inter individual differences. Even in a small population of competitive basketball players the results of VO_2max vary from 42 to 67 ml/min./kg and the level of Hb ranges from 135 to 173 g/l. Individual analysis indicate that players with a low level of VO_2max (42-48 ml/min/kg and Hb 135-146 g/l) improved these variables by 8-10% while no changes were observed for athletes with the highest VO2max (65-67ml/min./kg and Hb 165-173 g/l). This may indicate the necessity of individual fitness and physiological analysis, which result in highly individualized supplementation programs, according to the demand of particular subjects.

Table 1. Pre- and postexperimental values of VO_2max, AT and Hb in the experimental and control groups

	Experimental				Control				p-level		
	Before		After		Before		After		1	2	1x2
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
VO_{2max}	53,88	7,61	56,63	6,44	52,90	3,33	53,60	3,94	0,322	0,392	0,609
AT	218,21	13,87	226,84	10,11	215,64	10,50	215,03	5,91	0,062	0,289	0,223
Hb	151,48	9,42	155,43	6,94	150,43	7,69	150,63	7,02	0,300	0,460	0,504

1 – group (experimental-control), 2 – (before-after), 1x2 - interaction

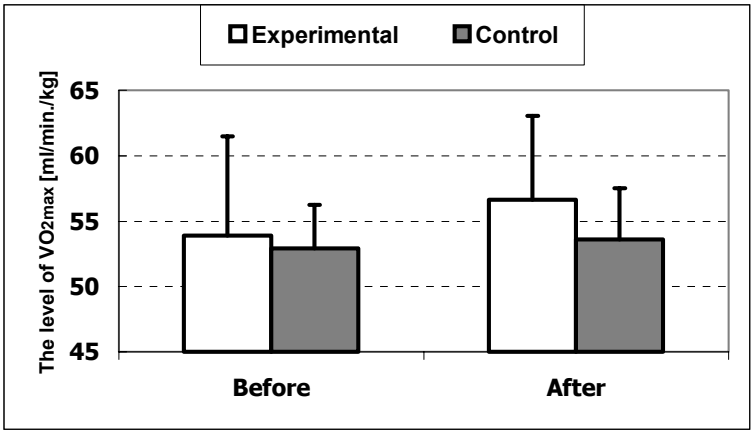

Fig. 1 The level of VO_{2max} in the experimental and control groups

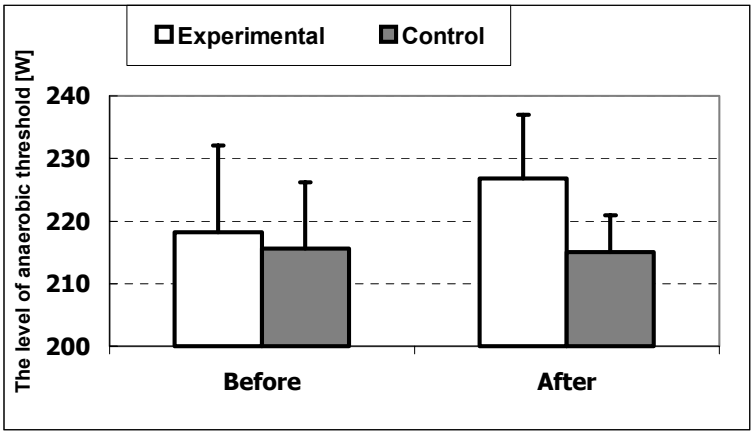

Fig. 2 The level of anaerobic threshold in the experimental and control groups

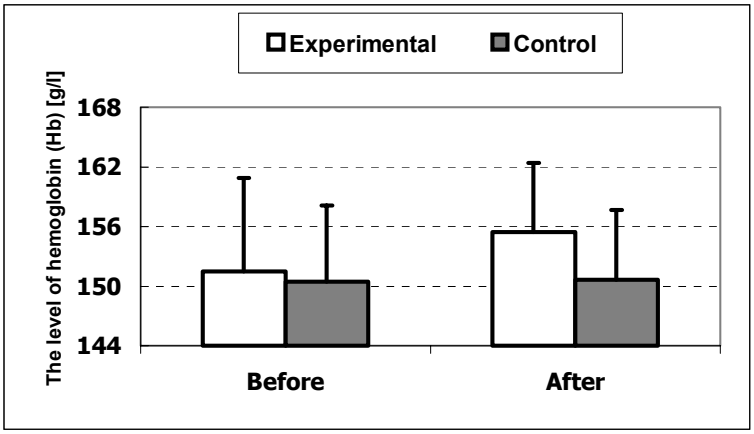

Fig. 3 The level of hemoglobin in the experimental and control groups

Discussion

Although not all metabolic functions of vitamin E have been revealed, there are numerous investigations showing the influence of vitamin E on the electron flow within the mitochondrial respiratory chain and its radical scavenging properties [9,10]. Through these functions vitamin E may promote an economic energy metabolism and act as a stabilizer on membranous structures in the cell by preventing oxidation of polyunsaturated fatty acids in membranes. The above suggested functions of vitamin E in muscle cells have led to a widespread use of the vitamin as an ergogenic aid, especially in connection with aerobic exercise. Most of the studies do not confirm a significant effect of vitamin E supplementation on aerobic fitness [7,8]. Only a few studies indicate a positive effect of vitamin E supplementation on maximal aerobic power, yet all of them were carried out at high altitude [2,10]. Similar results were observed in case of iron supplementation in non-anemic athletes. Little or no ergogenic effects were registered in these athletes [3,4,5]. The benefits of iron supplementation have been observed more often for female athletes, especially those performing in aerobic endurance sport disciplines. This phenomenon may be related to iron lost in sweat and exercise stress and through menstruation [1,6].

The great controversy that arises with vitamin and mineral supplementation may be to a large degree related to the quality of the product used in the researched project. Currently, there are hundreds of products on the market differing significantly in price and quality. The main difference in synthetic, semisynthetic and natural vitamin and mineral supplements relates to the disintegration time, the release of valuable nutrients and their absorption. The following research project has been conducted with the use of NUTRILITE products, which are mostly natural plant extracts.

In conclusion it may be stated that vitamin E and iron supplementation in competitive athletes may be beneficial for the improvement of aerobic fitness yet these changes will be minor because of the already high aerobic capacity. The effect of such a supplementation is strictly dependent on the quality and dose of the used product. When considering competitive athletes the supplementation must be highly individualized and based on regular monitoring of physiological and hematological variables.

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