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The effect of high dose vitamin C and E supplementation on VO2max, hemoglobin mass, and endurance performance in well trained subjects

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THE EFFECT OF HIGH DOSE VITAMIN C
AND E SUPPLEMENTATION ON VO₂MAX,
HEMOGLOBIN MASS, AND ENDURANCE
PERFORMANCE IN WELL
TRAINED SUBJECTS

INTRODUCTION

There is a widespread use of antioxidant supplementation in general population and among athletes. A growing body of evidence indicates detrimental effects of high-dose antioxidant supplementation on health and performance benefits of training (Gomez-Cabrera et al., 2008). The aim of this study was to investigate the effects of high-dose of antioxidant supplementation (vitamin C and E) during an 11 week endurance training regime on maximal oxygen consumption (VO_2max), running performance (beep-test; 20m shuttle run), blood volume (BV) and total hemoglobin mass (HbM), as well as oxygen consumption (VO_2), heart rate (HR) and blood lactate concentration (La) on submaximal workloads.

METHODS

Seventeen endurance trained subjects (12 females and 5 males; age: 24 ± 3 yrs, VO_2max 55.0 ± 7.9 ($\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$)) were recruited and randomized in an antioxidant group (AG) and a placebo group (PG). The AG ($n=8$) received 1000 mg vitamin C and 235 mg vitamin E daily, while the PG ($n=9$) received placebo pills. The study had a double blinded design. The training protocol consisted of 3-4 endurance training sessions every week for 11 weeks, combining interval (4 x 4 up to 6 x 6 min; $> 90\%$ HRmax) and continuous running sessions (30 and 60 min; $\sim 85\%$ HRmax and $\sim 75\%$ HRmax), respectively. The subjects were tested before and after 5 and 11 weeks of training and supplementation.

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RESULTS

VO_2max increased by $8.9 \pm 2.9\%$ in AG and by $7.8 \pm 4.0\%$ in PG ($p < 0.01$). PG significantly reduced HR at a workload corresponding to 60% of initial VO_2max by $4.4 \pm 4.6\%$ ($p = 0.02$), while AG had a small increase in HR by $1.3 \pm 3.1\%$ ($p = 0.3$). At a workload of 85% of initial VO_2max , PG significantly reduced HR by $4.7 \pm 5.0\%$ ($p = 0.02$), with AG increasing HR by $1.6 \pm 3.1\%$ ($p = 0.3$ within and $p = 0.01$ between groups). There were no significant changes in blood lactate (La) at the submaximal workloads for either group. Performance in the beep-

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test did not change significantly in AG $3.4 \pm 8.2\%$ ($p=0.3$), but improved running distance in PG by $14.3 \pm 14.1\%$ ($p=0.02$). No significant changes were observed for BV or HbM in either of the two groups.

DISCUSSION

The 11 week endurance training program increased $VO_2\text{max}$ in both AG and PG, with no changes in BV or HbM. Supplementation with large doses of vitamin C and E hindered the training induced reduction in HR at submaximal workloads. Even though there were no group differences in performance changes in the beep-test, only the PG increased significantly their performance. Our results suggest that antioxidant supplementation may hamper endurance training induced adaptations related to performance.

REFERENCES

Gomez-Cabrera, M. et al. 2008. Am J Clin Nutr, 87(1), 142-149.