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EFFECTS OF TRAINING AND ANTIOXIDANT SUPPLEMENTATION ON OXIDATIVE BALANCE IN MARTIAL ARTS

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Introduction

Kickboxing is a martial art having fighting style and technique derived by the traditional Thai martial art, in which the use of punching, kicking, and, under some rules, kneeling, and elbowing are permitted, with possible injury (Young, 2002). The popularity of kickboxing is increasing as the self defence and physical fitness benefits are promoted (Gartland et al, 2001). Despite this increase in popularity, however, very little is known about the relationships between this martial art and oxidative stress, which is a pathological condition due to an imbalance between pro-oxidant and anti-oxidant factors in a living organism (Halliwell and Gutteridge, 1999). Therefore, the aim of the present study was to monitor for two months, before and after the training, the oxidative balance in apparently healthy half-professional of kickboxing, before and after a vitamin-C and -E-based natural supplementation.

Materials and methods

A total of 10 apparently healthy male individuals, half-professional players of martial arts, mainly kickboxing, 27.5 years aged (range 20 to 30 yrs) were recruited in this trial for an observational period of two months. All the competitors were non smoking peoples, no alcohol consumers. During the study period, every day, all the subjects had four feedings, with a carbohydrate-based breakfast and a protein-based dinner. Moreover they did not take neither drugs nor other supplementation except for that of the study protocol (see below). The duration of each training session (4.3 per week, range 3 to 6 hrs) was 120 min (30 min race, 60 min fighting technique, 20 min weight lifting, and 10 min stretching). At the time of the inclusion in the study (T_0), after the first month (T_1) and at the end of the second month (T_2) all the subjects – after giving their informed consensus – undergo oxidative stress evaluation by means of d-ROMs test and BAP test, to measure total oxidant status and biological antioxidant potential, respectively (Diacron International srl, Grosseto, Italy), as previously described (Alberti et al, 2000; Cesarone et al, 1999; Cornelli et al, 2001; Dohi et al, 2005). Both the tests were performed on capillary blood with a dedicated photometer (FRAS4 System, H&D srl, Parma, Italy). Normal values for d-ROMs test and BAP test were considered 250 to 300 CARR U (were 1 CARR U is equivalent to

0.08mg/dL of H_2O_2 solution) and over than 2200mM reduce iron, respectively.

According to the study protocol, d-ROMs test was performed at the time T_0 , 30 min before the training, at the time T_1 12 hours after the training and at the time T_2 , 24 hours after the training, while BAP test was performed, together with d-ROMs test only at the time T_0 and T_2 . During the second month only, all the subjects were supplemented with Cucumis melo concentrated juice (36 mg/day), vitamin C (240 mg/day) and vitamin E (24 mg/day) according to a commercially available formula (Sodox, Pentamedical, Italy, two tablets/day).

Statistical analysis

Data were expressed as mean \pm SD and the paired Student's t-Test was used for comparisons.

Results

All the subjects regularly followed the dietary recommendations and all completed the supplementation during the second month of the study period. No unwanted side-effect were reported. No injury nor major trauma were observed during the study period.

The oxidant status, at the time T_0 , as measured by means of the d-ROMs test increased from 292.00 ± 50.26 CARR U (before the training) to 362.20 ± 38.00 CARR U (24 hours after the training) and decreased at the end of study, T_2 , to 234.60 ± 27.76 CARR U (Table 1). All the changes were statistically significant (T_0 , before *vs.* after training, $P=0.0000011770$; T_0 , before training, *vs.* T_2 , $P=0.0000408367$; T_0 , after training, *vs.* T_2 , $P=0.0000000035$) (Table 1). The antioxidant status, as measured by means of the BAP test, increased from 2759.00 ± 556.53 mM reduced iron to 2833.30 ± 524.75 mM reduced iron, but the change was not statistically significant ($P=0.6516738232$) (Table 1).

Discussion and conclusions

The herein presented data indicate that martial art amateurs show a significant increase of d-ROMs test values, a reliable oxidative status biomarker, after a training session. This datum, which is in agreement with previous studies on treadmill (Cornelli et al, 1999), can be reasonably explained by the increased reactive oxygen species production in the mitochondrial respiratory chain. Indeed, no trauma or other accidents, a possible cause of inflammation and hence of oxidative stress were recorded during the whole study. However, after two months of study, the d-ROMs test

Table 1. Oxidative balance evaluation in kickboxing amateur

Subject n.	d-ROMs test values (CARR U)			BAP test values (mM reduced iron)	
	T ₀ (before training)	T ₀ (after training)	T ₂	T ₀ (before training)	T ₂
1	221	289	199	2641	2792
2	239	315	203	2222	3200
3	246	336	215	3000	2323
4	261	357	221	3154	3354
5	289	368	229	2401	2793
6	291	376	233	2654	2693
7	315	388	244	3473	2681
8	343	393	251	3701	3908
9	351	399	262	2021	2171
10	364	401	289	2323	2418
Mean ± SD	292.00 ± 50.26*	362.20 ± 38.00*	234.60 ± 27.76*	2759.00 ± 556.53	2833.30 ± 524.75

*Statistically significant changes: T₀, before vs. after training, $P = 0.0000011770$; T₀, before training, vs. T₂, $P = 0,0000408367$; T₀, after training, vs. T₂, $P = 0,0000000035$.

values significantly decreased compared to the time of the competitors inclusion in the trial (either before of after the training). This datum can be considered a consequence either of the antioxidant supplementation during the second month of study or the potential activation of endogenous antioxidant system. Indeed, the total antioxidant capacity, as measured by means of the BAP test, showed a trend towards an increase of its values, although the results did not reach the statistical significance. The sensitivity of d-ROMs test to antioxidant supplementation is agreement with that reported for cyclists (Iorio, 2004). In conclusion, the above results, although in a small sample of subjects, provide the first evidence in literature that martial art amateur, like other competitors, can undergo oxidative stress after a physical effort. However, an adequate supplementation with natural product, including powerful antioxidant vitamins C and E can favour, together a balanced diet and exercise training, the reduction of plasma biomarker of oxidative status. Because the oxidative stress is a recognised emerging health risk factor (Ridker et al, 2004) also in athletes (Karlsson, 1997) and martial art amateurs are prone to tissue injuries (Zazryn, 2003) the control of oxidative balance by means of reliable routine test like d-ROMs and BAP test, can be very useful in the choice of training regimen, in the diet formulation and in the evaluation of antioxidant supplementation efficacy, thus avoid the vicious cycle (mitochondrial activation and trauma) definitively responsible of oxidative stress.

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