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[4] Mtsqhshnm `mc Lds`anklhrl Fqnto, Sgd Ptddmr Tmhudqrhsx Adke`rs, Fqnrudmnq Qn`c, Adke`rs, AS12 6AI, Mnqsgdqm Hqdk`mcr

[5] Cdo`qsldms ne Og`ql`bx, Tmhudqrhsx ne @sgdmr, @sgdmr, Fqddbd

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Introduction

It is well known that strenuous high-intensity exercise can lead to disturbances in antioxidant homeostasis by elevating the concentration of free radicals and other reactive oxygen species (ROS) (Urso & Clarkson, 2003). ROS pose a serious threat to the cellular antioxidant defense system and has detrimental effects on exercise performance (Powers et al, 2004). To date, there is limited evidence that dietary supplementation with antioxidants improves physical performance (Ji, 1999; Powers et al, 2004; Urso & Clarkson, 2003). How olive oil, a food rich in antioxidant compounds, particularly due to its high content of phenols, affects the oxidative stress of elite athletes is not known. The purpose of the present study was to assess the effects of high and low phenol-enriched olive oil on markers of oxidation, plasma susceptibility to oxidation and antioxidant status of elite athletes. It was hypothesized that supplementation with high phenol-enriched olive oil would provide an enhanced antioxidant defense mechanism during strenuous exercise compared to low phenol-enriched olive oil supplementation.

Methods

Fifteen elite level cyclists with a maximal oxygen uptake of 62.0□6.0 $ml \cdot kg^{-1} \cdot min^{-1}$ were recruited for the study. A double-blind, randomized crossover study was undertaken. The experimental study consisted of two 3-week intervention periods with high and low phenolic content olive oil that were separated by a washout period of 2 weeks. The enriched olive oil contained 30 mg of oleuropein in 30 mL of oil. During the intervention periods, 30 grams of olive oil (approximately 2 tablespoons) were provided to each athlete per day. The athletes were blind to the type of olive oil given.

Training during the two intervention periods comprised of prolonged endurance cycling interspersed with at least two high-intensity interval-training sessions per week. Blood antioxidant and oxidative stress markers were determined from two 10 ml samples collected after an overnight fast and after the ingestion of 30 grams of either low or high phenol-enriched olive oil followed by a standardized high-intensity interval-training session at the end of each 3-week intervention period. A two-way repeated measures analysis of variance was applied to all biochemical variables with SPSS for Windows, version 11 (SPSS Inc., IL). All values are presented as mean ± SD.

Results

Both olive oil phenol supplements resulted in significantly higher concentrations of Vitamin C (P=0.001). The lipid hydroperoxide concentration increased only after supplementation with the low phenol olive oil (P=0.03). No significant differences were found in any of the other measured antioxidant markers as a result of the olive oil phenols

Table 1. Oxidative and antioxidant markers concentration pre and post high and low phenol interventions (n=15)

Dependent Variable	Low phenol		Hi phenol	
	Pre	Post	Pre	Post
LDL lag time (minutes)	65.6 ± 11.8	64.2 ± 10.2	69.9 ± 11.4	65.5 ± 9.3
Lipid Hydroxyperoxides (μmol·L^{-1})	0.80 ± 0.3	1.10 ± 0.6*	1.00 ± 0.5	1.15 ± 0.3
Vitamin C (μmol·L^{-1})	27.80 ± 17.2	64.13 ± 30.0**	37.81 ± 15.7	64.61 ± 22.4**

* P<0.05 from pre-intervention, **P<0.01 from pre-intervention

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Discussion

This investigation is one of the first attempts to examine the effects of olive oil-derived phenols on oxidative damage induced by strenuous exercise in humans. In animals as well as in humans, administration of olive oil phenols results in reduced oxidative damage during resting conditions (Scaccini et al, 1992; Vissers et al, 2004). In the present study, strenuous exercise in combination with administration of the low olive oil phenol supplementation does not appear to produce clinically significant improvements in the oxidative state of the elite athletes. Specifically, exercise resulted in a significant elevation (approximately two-fold) in Vitamin C irrespective of the supplementation with the olive oil phenols. Our findings are in accordance with previous studies showing immediate increases in plasma Vitamin C levels as a result of a strenuous exercise session (Gleeson et al, 1987).

Only small changes in oxidative damage, such as suppression with the high phenol supplementation of lipid hydroperoxide concentration, a known consequence of free radical and ROS generation, as well as a lack of change in LDL lag time, also an indicator of plasma lipid susceptibility to oxidation were found. Such findings could possibly indicate a protective effect of the olive oil phenols on the oxidative damage induced by strenuous exercise, however more research is needed to establish such a phenomenon.

Conclusion

The findings of this study demonstrate a lack of a protective effect of olive oil phenols on the oxidative damage induced by strenuous exercise in elite athletes. It is possible that the background Mediterranean diet as well as the high fitness level of these elite athletes did not allow for an additional antioxidant effect to take place with the olive oil phenol supplementation. Since this is the first study to examine the effects of olive oil phenols on exercise-induced oxidative stress and as there is considerable lack of research on the antioxidant properties of olive oil phenols in humans, let alone athletes, no conclusive statements can be made at this point. Future research is needed to further investigate this issue.

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