EFFECT OF GREEN TEA COMPARE TO VITAMIN E AND VITAMIN C ON OXIDATIVE STRESS AND MUSCLE SORENESS IN TREADMILL DOWNHILL RUNNING

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ABSTRACT

Vigorous Exercise such as Treadmill downhill running can produce an imbalance between ROS and antioxidants, which is referred to as oxidative stress. Dietary antioxidant supplements such as Vit C, Vit E, and green tea are marketed to and used by athletes as a means to overcome the oxidative stress of exercise. In this study we have evaluated effect of these supplements on strenuous exercise such as downhill treadmill and our study revealed that Green tea as potent antioxidant has reduced significantly the level of catalase, DOMS, CK, GSH. Therefore the consumption of green tea compare to Vit E and Vit C has beneficial effect.

Keywords: Oxidative stress, Downhill treadmill, Vit E, Vit C, green tea.

INTRODUCTION

Untrained individuals develop muscle soreness and increased serum creatine kinase (CK) activity in the blood after strenuous, unaccustomed exercise depending on the nature of the ROS species, some are highly toxic and rapidly detoxified by various cellular enzymatic and nonenzymatic mechanisms [1]. Delayed onset of muscle soreness (DOMS) typically occurs 8–10 h after exercise [2]. Creatine kinase (CK), a marker of muscle damage, has been shown
to increase in the blood after eccentric exercise [3]. Downhill running causes muscle damage, and induces oxidative stress and inflammatory reaction [4]. In this study we have evaluated the level of green tea, Vit C and Vit E on the oxidative stress and DOMS.

**Subjects and Methods**

Healthy, 40 untrained men male Downhill- Treadmill running athletes were recruited to participate in the study. All participants were aged between 20 and 25 yr, were non-smokers, and for at least 3 months before the study did not take any vitamins, minerals, or medication that would affect oxidative stress markers. Subjects were informed of the potential risks involved and gave written voluntary consent before participating in the study. The study was approved by the Human Research Ethics Committee of the University of Azad Khoramabad Iran.

**Study design**

To compare the effect of vitamin E and vitamin C with that of commercially produced green tea extract, two 10 member groups will be involved in the same exercises described above and will be given vitamin E and vitamin C (maximum possible dose of vitamin E,C which is allowed for a normal person) at the same intervals described above. The indicators of oxidative stress and muscle soreness in these groups will be compared with those of the commercially produced green tea extract groups and the control group. The complete form of table has shown in Table 1.

**Table 1: complete description of dosage of Green tea in each group.**

<table>
<thead>
<tr>
<th>No</th>
<th>Type of Groups</th>
<th>Dosage before</th>
<th>type of protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>vitamin E</td>
<td>200 mg</td>
<td>Downhill Running Treadmill</td>
</tr>
<tr>
<td>10</td>
<td>vitamin C</td>
<td>200 mg</td>
<td>Downhill Running Treadmill</td>
</tr>
<tr>
<td>10</td>
<td>Green tea</td>
<td>200 mg</td>
<td>Downhill Running Treadmill</td>
</tr>
<tr>
<td>10</td>
<td>control</td>
<td>200 mg</td>
<td>Downhill Running Treadmill</td>
</tr>
</tbody>
</table>

**Determination of CK**

Creatine kinase (CK, EC 2.7.3.2), Catalse were measured with commercial kits using enzymatic methods (Labtest, Belo Horizonte, Germany).
Blood collection
At the beginning and end of the supplementation period, blood samples were collected from
volunteers by cubital vein puncture and placed in vacuum test tubes containing sodium
heparin. Plasma was obtained by centrifugation at 2500 rpm for 15 min.

Determination of GSH
Total glutathione, which included both reduced glutathione and glutathione disulphide,
content of the plasma was measured using the glutathione reductase–Ellman's reagent
recirculating assay [5]. Due to the very low amount of glutathione present in the plasma, the
above enzymatic cycling was used as it continuously reduces glutathione–Ellman's adduct
using NADPH.

Score of muscle soreness and pain
After the bench stepping exercise, each subject was given an outcome form, which they were
asked to complete at specified times, immediately, 24 and 48 hours after exercise. The
outcome form consisted of a Likert scale as described by High et al (Table2). The outcome
was the mean score of soreness and pain over the tree period. Please tick the sentence below
that best describes your level of muscle soreness over the past 12 hours.

Table 2 - Likert scale of muscle soreness (taken from High et al. 1989).

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A complete absence of soreness</td>
</tr>
<tr>
<td>1</td>
<td>A light pain felt only when touched/a vague ache</td>
</tr>
<tr>
<td>2</td>
<td>A moderate pain felt only when touched/a slight persistent pain</td>
</tr>
<tr>
<td>3</td>
<td>A light pain when walking up or down stairs</td>
</tr>
<tr>
<td>4</td>
<td>A light pain when walking on a flat surface/painful</td>
</tr>
<tr>
<td>5</td>
<td>A moderate pain, stiffness or weakness when walking/very painful</td>
</tr>
<tr>
<td>6</td>
<td>A severe pain that limits my ability to move</td>
</tr>
</tbody>
</table>

Statistical analysis
Results were expressed as the mean ± SD and distributions of all variables were assessed for
normality. 2 × 4 repeated a measure of ANOVA test was used. The level of significance in all
statistical analyses was set at $P\leq0.05$. Data analysis was performed using SPSS software for
windows (version 13, SPSS, Inc., Chicago, IL).
RESULTS

**Fig1:** Effect of Vitamin E, C and Green tea on Creatine kinase

Ck value has been increased when consumed Vit E and Vit C, The level of CK has been decreased by Green tea significantly ($p < 0.05$)

**Fig2:** Effect of Green tea, Vit E, Vit C on DOMS level

The level of DOMS has been decreased significantly ($p < 0.05$) compare to Vit E and C.

**Fig3:** Effect of Green tea, Vit E, Vit C on GSH (Glutathione)

The level of GSH (Glutation) has been decreased significantly ($p < 0.05$) compare to Vit E and Vit C.
The level of catalse in green tea consumption group has been significantly (p<0.05) decreased compare to Vit E and Vit C.

**DISCUSSION**

Antioxidants are compounds that protect cells against the damaging effects of reactive oxygen species, such as singlet oxygen, superoxide, peroxyl radicals, hydroxyl radicals, and peroxynitrite. An imbalance between antioxidants and reactive oxygen species results in oxidative stress, leading to cellular damage [7]. In weight-trained men, Panza et al. (2008) observed protective effects of 7-day intake of green tea on blood markers of oxidative stress after resistance exercise. Tea components possess antioxidant, ant mutagenic, and ant carcinogenic effects and could protect humans against the risk of cancer by environmental agents [8]. Crude catechins reduced the formation of peroxides far more effectively than dl-α-tocopherol [9]. The results showed that eating green tea after exercise can reduce the amount of stress oxidative markers such as Ck, GSH, and Catalse in 24 hr post test rather than control group. Also the results showed that the use of green tea after exercise reduces the sense of muscle soreness. In the case of Ck, group wise comparison revealed that Vit E and Vit C compared to green tea group have higher level. In the case of delayed onset muscle soreness (DOMS) group wise comparison revealed that control group had decrease in mean delayed onset muscle soreness (DOMS) values compared to Green Tea group. In the case of CAT, group wise comparison revealed that both groups had similar level of decrease in their mean CAT values. Few studies are reported in the literature concerning the effects of green tea polyphenols on blood markers of exercise-induced oxidative stress. In rats, green tea consumed for 6.5 weeks lowered renal lipoperoxidation after aerobic exercise [10]. In weight-trained men,[11] observed protective effects of 7-day intake of green tea on blood markers of oxidative stress after resistance exercise. However, there are no reports regarding
the effects of acute ingestion of green tea polyphenols on exercise-induced oxidative-stress biomarkers. In vivo studies showed that green tea catechins increase total plasma antioxidant activity [12, 13]. (Skrzydlewska et al. 2002) suggested that intake of green tea extracts increases the activity of SOD in serum and the expression of catalase in the aorta; these enzymes are implicated in cellular protection against ROS [14]. These results suggest that catechins could have a direct (antioxidant) or indirect (increase of activity or expression) effect. Since catechins can act as antioxidants in vitro, they might prevent the oxidation of other antioxidants, such as vitamin E. However, ingestion of green tea catechins does not modify the plasma status of vitamins E and C in vivo [15]. Nevertheless, one study reported that catechins increase vitamin E concentration in low-density lipoprotein and in this way could protect low density lipoprotein against peroxidation (Yokozawa et al 2002).

CONCLUSION

Our data suggest that green tea consumption has a beneficial effect compare to Vit E and Vit C, by reducing the development or the enhancement of oxidative stress and, therefore, protecting the individual for oxidative stress and also muscle soreness in Downhill treadmill. Moreover, further studies are also needed, to clarify the effect of green tea consumption, the value of regular green tea consumption and the way it should be prepared to reach a healthy effect.

Conflict of interest: The authors have no conflicts of interests that are directly relevant to the content of this paper

REFERENCES

Moradporian et al. World Journal of Pharmacy and Pharmaceutical Sciences


