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Editorial

Effects of Grape Seed Extract Supplementation on Exercise Performance in Athletes

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Editorial

Reductions in O_2 delivery (blood flow x O_2 content) to contracting skeletal muscle can have adverse effects on physical performance. In this regard, factors that reduce blood flow can promote fatigue by reducing muscle force and/or attenuating the removal of metabolic by products of contraction [1]. Conversely, interventions that enhance O_2 delivery at a given work intensity could potentially reduce muscle fatigue or delay its onset, leading to improved physical performance. Thus, identification and investigation of such interventions represents an important focus of research in sports science. One possible approach involves the study of dietary factors that may act as ergogenic aids via their actions on cardiovascular function. For example, acute supplementation with beet root juice, which is high in nitrates, has been shown to enhance cardiac output and oxygen utilization and reduce vascular resistance and blood pressure at a given sub-maximal work intensity [2,3]. These effects are indicative of increased O_2 delivery to skeletal muscle.

Another potential ergogenic aid capable of enhancing exercise performance is grape seed extract (GSE). It is a major source of polyphenols [4] and contains active compounds such as monomers of (+)-catechin and (-)-epicatechin, and their gallic acid esters [4,5]. In animals, this extract has been found to lower blood pressure; an effect associated with improved endothelial function [6,7]. GSE has also been reported to lower blood pressure (BP) in healthy human subjects [8,9]. Our laboratory recently examined effects of acute GSE supplementation on cardiovascular responses to sub-maximal dynamic exercise in pre-hypertensive's [10]. Compared to placebo conditions, exercising BP, vascular conductance, and work of the heart (heart rate x systolic BP; RPP) were reduced, while cardiac output was increased. In addition, endothelial function in the vasculature of skeletal muscle was enhanced. The GSE-induced enhancements of cardiac output and vascular conductance provide evidence that O2 delivery was also enhanced. Moreover, the improvements in endothelial function suggest an increased capacity for vasodilation; an outcome that would specifically augment O2 delivery to skeletal muscle. Lastly, the lower BP response and RPP indicate a reduced after load on the heart. Taken together, these findings imply that GSE supplementation my act as an ergogenic aid that is able prolong the onset of fatigue during physical activity.

A major mechanism underlying the cardiovascular effects of beetroot juice and GSE supplementation involves an increase in the production of nitric oxide (NO) (i.e., an increase in its bioavailability). This can occur via the nitrate-nitrite-NO pathway [11] (i.e., beet root juice) or activation of the endothelial NO synthase pathway [12] (i.e., GSE). Increases in NO bio-availability lead to activation of proteins in vascular smooth muscle (e.g., guanylate cyclase, cyclic GMP, and protein kinase G phosphorylation) to cause relaxation [12]. Vascular smooth muscle relaxation, in turn, promotes vasodilation, which would be expected to enhance blood flow to contracting skeletal muscle. Potential beneficial effects of GSE on athletes engaged in intense training and/or competition are currently unknown. Thus, future investigations focusing on acute and chronic effects of this extract on exercise performance is warranted. This research should include athletes that perform different types of exercise (e.g., resistance, aerobic or anaerobic exercise). In addition to the effects of GSE discussed previously, it is worth noting that GSE can act as an antioxidant capable of reducing oxidative stress in humans [13,14]. Thus, determination of the potential of GSE to modify oxidative stress-evoked effects on fatigue development during exercise is another area worthy of future investigation. This is important consideration because oxidative stress can provoke fatigue in skeletal muscle by reducing NO bio-availability [15,16], while GSE may increase it.

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