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Natural antioxidant ice cream acutely reduces oxidative stress and improves vascular function and physical performance in healthy individuals

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ABSTRACT

Objective: The formation of reactive oxygen species (ROS) contributes to the pathogenesis and progression of several diseases. Polyphenols have been shown to be beneficial against ROS. The aim of this study was to evaluate the effects of a natural antioxidant ice cream on oxidative stress, vascular function, and physical performance.

Methods: In this controlled, single-blind, crossover study, 14 healthy individuals were randomized to consume 100 g of either antioxidant ice cream containing dark cocoa powder and hazelnut and green tea extracts or milk chocolate ice cream (control ice cream). Participants were studied at baseline and 2 h after ingesting ice cream. Serum polyphenols, antioxidant status (ferric-reducing ability of plasma [FRAP]), nitric oxide (NOx) bioavailability, markers of oxidative stress (determination of reactive oxygen metabolites [d-ROMs] and hydrogen peroxide [H₂O₂]), endothelium function (flow-mediated dilation [FMD] and reactive hyperemia index [RHI]), and exercise tolerance (stress test) were assessed, and the double product was measured.

Results: Serum polyphenols ($P < 0.001$), NOx ($P < 0.001$), FRAP ($P < 0.005$), FMD ($P < 0.001$), and RHI ($P < 0.05$) increased significantly, oxidative stress decreased (d-ROMs, $P < 0.001$; H₂O₂, $P < 0.001$), and the double product ($P < 0.001$) was improved only after antioxidant ice cream ingestion. No changes were found after control ice cream ingestion.

Conclusions: To our knowledge, this is the first study to demonstrate that a natural ice cream rich in polyphenols acutely improved vascular function and physical performance in healthy individuals through a reduction in oxidative stress.

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Introduction

Oxidative stress promotes aging and related chronic diseases. A healthy diet, rich in fruits and vegetables, is protective against oxidative stress, thus reducing the risk for several conditions (i.e.,

myocardial infarction, stroke, diabetes, and cancer) [1]. Most scientific studies suggest that the cardiometabolic effects of a healthy diet are due to the polyphenol content; these chemicals have powerful antioxidant activities [2,3]. Two reviews showed an inverse association between the dietary intake of polyphenols and the risk for cardiovascular disease (CVD), with $\leq 65\%$ reduction in cardiovascular mortality in clinical trials [4,5]. Studies tested the effect of antioxidant foods rich in polyphenols, such as cocoa, nuts, tea, and red wine, on the endothelial response in terms of the capacity to acutely increase and maintain the endothelium-dependent vasodilation over time in healthy individuals [6–13]. For cocoa consumption, these studies mostly evaluated derivatives, such as chocolate [6]. Cocoa derivatives contain a high amount of caffeine, theobromine, and

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