

The Efficacy of Flavonoid Antioxidant from Chocolate Bean Extract: Prevention of Myocyte Damage Caused by Reperfusion Injury in Predominantly Anaerobic Sports

HN Rasyid, MS Orth, YD Ismiarto, MS Orth, R Prasetia, MS Orth

Department of Orthopaedics and Traumatology, Faculty of Medicine Universitas Padjadjaran / Hasan Sadikin General Hospital, Bandung, Indonesia

ABSTRACT

Background: Use of predominantly anaerobic energy systems such as that seen in 800-meter athlete runners disrupts mitochondrial function as an energy source. Furthermore, it produces free radical substances and causes myocyte damage. Malondialdehyde (MDA) plasma concentrations correlate with free radical levels and are therefore predictive of cell damage. **Objective:** To analyse the effect of flavonoid antioxidant from chocolate bean extract for prevention of lipid peroxidation of myocyte membranes caused by free radical substances in athletes partaking in predominantly anaerobic sports. **Materials and Methods:** The study of population consisted of 16 junior athletes who compete in 800-meter races. This was a randomized experimental study. Subjects were divided into two groups, chocolate bean extracts and placebo groups, and then practiced regularly for 14 days. All subjects were assessed on day 15. Results were analysed statistically using paired t test, ANOVA and Duncan tests. **Results:** Concentrations of MDA were reduced in flavonoid group. **Conclusion:** Flavonoid antioxidant from chocolate bean extract may prevent myocyte damage was caused by reperfusion injury.

Key Words:

Chocolate bean extract, Flavonoid, Malondialdehyde

INTRODUCTION

The athlete who runs a distance of 800-meters is considered a middle distance runner. Energy systems for this sport comprises aerobic and anaerobic systems. The predominant energy system used is the lactic anaerobic energy system¹. When athletes compete, practice, or participate in other activities with high intensity under anaerobic conditions, athletes will produce large quantities of free radicals².

Myocytes actively experience ischemic condition during muscle contraction, meaning that xanthine substances

produced from adenosine triphosphate (ATP) and xanthine dehydrogenase (XD) will be altered to xanthine oxide (XO). When muscles relax, myocytes undergo reperfusion, causing a sudden and rapid oxygen concentration increase; at these times, XO continues to transform hypoxanthine to uric acid with oxygen molecules as electron acceptors^{2,5}, eventually producing high quantity of free radicals³.

Free radicals on myocyte sarcoplasm will disrupt energy and can even destroy the mitochondrial lipid membrane, resulting in functional inability of mitochondria. This enables the myocytes to maintain cell membrane integrity and intracellular metabolism. These circumstances cause possible myocyte damage that is the upstream reason for decline in athletic achievement at longer distances.

One of the efforts to improve achievements in these athletes involves supplemental nutrition aimed at prevention of myocyte damage caused by free radicals. There are several experiments that prove the safety and efficacy of such supplements (a variety of antioxidant substances such as flavonoid found in chocolate bean (*Theobroma Cacao*) extract). We assumed such effects correlate with efficacy of the energy producing system⁶. Chocolate beans containing polyphenol substances contain high levels of flavonoid antioxidants⁷. Flavonoid as an antioxidant becomes a free radical scavenger by releasing one electron from its hydroxyl site.

Free radical level calculation in 800-meter distance runners is fraught with error as it is reactive and levels change quickly^{8,9}. Detection of the end product of free radical chain reaction is an alternative approach (i.e., analysis of malondialdehyde (MDA) levels and is predictive of free radical concentration^{10,11}).

The aim of this study was to analyse the effect of flavonoid antioxidants from chocolate bean extract for prevention of lipid peroxidation of myocytes membrane caused by free radical substances in predominantly anaerobic sports.