Exhaustive Exercise Test and Oxidative Stress Response in Athletic and Sedentary Subjects

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ABSTRACT

Exhaustive exercise induces oxidative stress in human with imbalance between free radical generation and antioxidant. The response to exhaustive exercise in human who has irregular or regular exercise (athletics) is very interesting. The aim of this study was to determine the changes of oxidative stress, malondialdehyde (MDA), protein hydroperoxide, glutathione (GSH) and total antioxidant capacity (TAC) in the blood of athletes before and after exhaustive exercise by modified Bruce protocol compared with sedentary group. MDA, protein hydroperoxide and TAC in plasma were detected by TBARs, FOX and ABTS decolorization methods respectively. The GSH in erythrocyte was determined by DTNB. A Mann-Whitney U-test was used for statistical analysis. Before exercise, athletic group showed higher TAC, lower protein hydroperoxide and MDA. After exercise, sedentary and athletic groups showed slight increase of GSH, significant reduction of TAC, MDA and protein hydroperoxide. The changes of all parameters between sedentary and athletic groups were not statistically different except the decrease in TAC after exercise in sedentary group compared with athletic group. This study represented similar response to oxidative stress from exhaustive exercise between sedentary and athletic groups.

Key words: Exhaustive exercise, Glutathione, Malondialdehyde, Protein hydroperoxide, Total antioxidant capacity

INTRODUCTION

Free radicals are capable of independent existence and are produced in all living cells. Reactive oxygen species (ROS) or reactive nitrogen species (RNS), e.g., superoxide (O_2), hydroxyl ($OH^{\bullet}$), alkoxyl ($RO^{\bullet}$), peroxyl ($ROO^{\bullet}$), and hydroperoxide (ROOH) can oxidize other biological molecules, including carbohydrates, amino acids, fatty acids and nucleotides. Previous data shows the high level of lipid peroxidation from detection the malondialdehyde (MDA) represented the oxidative stress in the body (Halliwell and Gutteridge, 1999). Scavenging of all free radicals produced *in vivo* by both enzymatic- and non-enzymatic antioxidants usually occurs. Antioxidant enzymes include superoxide dismutase, glutathione peroxidase and catalase. The main non-enzymic antioxidants include glutathione (GSH), vitamin E and vitamin C (Cooper et al., 2002) proposes to total antioxidant capacity (TAC) in the biological system. The potential sources of free radical generation in exercising muscle are mainly from mitochondria, xanthine oxidase, prostanoid metabolism, catecholamines, NAD (P) H oxidase and secondary sources such are phagocytosis or calcium accumulation