Assessment of DNA-damage in smoker and nonsmoker athletes

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ABSTRACT

DNA fragmentation, apoptosis percentage and frequency of micronucleus (FMN) formation in circulating lymphocytes were measured in the blood of 40 non-smoker and 25 smoker athletes compared to age and socio-economic class matching 20 smoker and 20 non-smoker non-athletes as a control. Results showed that DNA-fragmentation and apoptotic lymphocytes were significantly higher among athletes compared to non-athletes and exhibited the highest levels in athlete smokers followed by control smokers. FMN was significantly high among athlete smokers followed by control smokers and there was no significant differences between non-smokers athletes when compared to non-smoker controls. The results of this work reveal the impact of smoking on the health of athletes.

Key words: *apoptosis percentage, athletes, DNA-fragmentation, frequency of micronuclei, smoking.*

INTRODUCTION

Reactive oxygen (ROS) and nitrogen species (RNS) are continuously generated in the biological system and play an important role in a wide variety of physiological and pathological processes, including cancer and emphysema (Halliwell, 1987). Recent evidence suggests that physical exercise augments the generation of ROS and RNS during strenuous physical activity performance, where oxygen consumption becomes increased by 10 to 15-fold over rest to meet energy demands (Clarkson, 1995). The resulting increase in oxygen consumption leads to the generation of ROS and RNS, which if elevated to a level that overwhelms tissue antioxidant defence systems, results in an oxidative stress. The magnitude of this stress depends on the ability of the tissues to detoxify the generated ROS (Sen, 2001), and consequently damaging cellular lipids, proteins and DNA inducing lipid peroxides, protein carbonyls and DNA damage (Wiesman and Halliwell, 1996).

Cigarette smoke induces cancer, emphysema, arteriosclerosis and other diseases after a delay of years (Wiesman and Halliwell, 1996). Cigarette smoke contains trace amounts of ά-particle emitting radioactive element polonium^{210} (Po^{210}), which is a naturally occurring daughter isotope of radium^{226} (Radford and Hunt, 1964, Little *et al.*, 1965). It also contains a large variety of compounds,