運動對於人體血液及尿液中8-Hydroxydeoxyguanosine含量之影響

Effects of Physical Exercise on the 8-Hydroxydeoxyguanosine in Human Blood and Urine Samples

中文摘要

規律的運動有益身體健康，並能減少罹患心血管疾病的機率，這是眾所皆知的事，但在運動的同時，體內需氧量大量增加、代謝加速，這時便會產生許多含氧自由基，過量的含氧自由基會引起氧化性壓力，造成潛在性的傷害。然而，運動是否會引起氧化性傷害方面的研究結果常常互相矛盾，且大多研究又多著眼於單次且極費力之運動且樣本數偏低，實難斷定氧化性壓力於運動傷害中所扮演的角色。8-hydroxydeoxyguanosine（8-OHdG）是DNA上的鹼基鳥糞 呤C8位置受到氫氧化的產物，它時常被當作DNA氧化性傷害的生物標記，而尿液中的8-OHdG是DNA修補後的產物。本研究探討單次劇烈運動前後、長期規律性運動前後及其兩者氧化性傷害之比較，研究對象包括29位劇烈運動1-2小時之大學生，平均運動強度爲8.13 MET（metabolic equivalents，休息代謝率），分別收集其運動前後血液及尿液，和32位每週運動2-3次，持續12週之大學生，平均運動強度爲6，分別收集其運動前後之血液及尿液，測定其8-OHdG及dG之含量。結果顯示單次劇烈運動前後每毫升尿液中8-OHdG值分別爲3.14 ±1.45及4.82 ± 2.19(n=10)，雖有上升趨勢但無顯著的差異，而血液中8-OHdG/105dG比值運動前後分別爲26.18 ± 3.79及29.29 ± 5.54(n=29)，亦無顯著的差異;而長期規律性運動前後每毫升尿液中8-OHdG分別爲1.22 ± 0.5及12.55 ± 6.93（n=8），達邊緣性顯著差異（marginal significance），而血液中8-OHdG/105dG比値運動前後分別爲86.51 ± 22.98及 27.31 ± 4.47（n=32），明顯的下降，並達到統計上的意義。若將所有運動前及長期規律性運動後之樣本進行比較，運動後血液中8-OHdG/105G比值較運動前爲低（28.57及53.33），達到邊緣性顯著差異（P=0.1），每毫升尿液中8-OHdG含量，運動後則較運動前爲高（16.71及2.52），並達到統計上之意義（P=5.82x10-6）。本研究證實了運動確實增加體內的DNA氧化性傷害，長期規律性運動者體內修補系統能力似乎較單次劇烈運動者爲佳。由於在實驗設計之初挑選研究對象並未注意其是否有規律運動之習慣，因此單次劇烈運動前樣本之條件可視爲和長期規律性運動前相同。

英文摘要

Regular physical exercise is beneficial to health. For example, it reduces risk of

cardiovascular diseases. It is known that exercise enhances oxygen consumption and accelerates metabolism, thereby generates reactive oxygen species (ROS), which could have adverse health effects. Findings of exercise-induced oxidative damage have been controversial. Additionally, most studies use single and exhausting exercise, and have small study sample size. 8-hydroxydeoxyguanosine (8-OHdG) is an oxidized DNA adduct of guanine and is mutagenic. Urinary 8-OHdG is a product resulted from DNA repair. In this study, we determined the 8-OHdG levels of venous blood and urine, collected from 29 college students before and after single exhausting exercise (1-2 h; average metabolic equivalents: 8.13), and from 32 college students before and after regular exercise (1-2 h/time, 2-3 times/week, 12 weeks; average metabolic equivalents: 6). For single exhausting exercise group, the average 8-OHdG levels in urine and blood before and after exercise were 3.14 ± 1.45 ng/ml and 4.82 ± 2.19ng/ml, respectively (n=10). The levels in blood before and after exercise were 26.18 ± 3.79 8-OHdG/105dG and 29.29 ± 5.54 8-OHdG/105dG, respectively (n=29). No significance was found in the 8-OHdG levels in blood or urinary 8-OHdG before and after exercise. For regular physical exercise group, urinary 8-OHdG levels were 1.22 ± 0.5 ng/ml and 12.55 ± 6.93 ng/ml before and after exercise (n=8), respectively, with marginal significance (P=0.09). For blood 8-OHdG/105dG, ratios were 86.51 ± 22.98 and 27.31 ± 4.47 before and after exercise, respectively, with significant difference. When all study subjects were pooled, blood 8-OHdG/105dG ratios were lower after regular exercise when compared with all before-exercise subjects, with marginal significance (P=0.1). Regular exercise increased urinary 8-OHdG levels significantly (P=5.82×10-6). These results indicate that exercise induces oxidative stress People who exercise regularly may have better repair capacity against the oxidative DNA damage when compared with those who exercise exhaustively and occasionally.