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Effects Of A Three-day Period Of Intense, Intermittent Exercise On Oxidative Stress And Inflammation.

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Abstract:

It is documented that strenuous and prolonged exercise induces oxidative stress and inflammation, with the associated muscle damage and fatigue compromising performance. Little is known about the oxidant effects of intense, intermittent exercise, as performed daily by elite athletes competing in team sports. **PURPOSE:** To assess the short-term effects of a 3-day period of intense, intermittent exercise on biomarkers of oxidative stress and inflammation in trained athletes. **METHODS:** Ten trained athletes (age: 32.11 ± 1.91 yrs; mass: 66.33 ± 1.95 kg; maximal oxygen uptake (VO_{2max}): 51.44 ± 1.59 mL \cdot kg \cdot min⁻¹) completed a high-intensity, intermittent exercise protocol (90-minute intermittent treadmill run, $\sim 70\%$ VO_{2max}) on three consecutive days and were compared to a control group (N=10). Blood samples were collected immediately pre (T1) and post (T2) the 3-day exercise protocol, then 21h- (T3) and 42h-post-exercise (T4); and assayed for Total Antioxidant Status (TAS), Thiobarbituric Acid Reactive Substances (TBARS), Interleukins (IL-6, IL-8 and IL-10), C-Reactive Protein (C-RP) and Lactate Dehydrogenase (LDH). Data were corrected for plasma volume change; results presented as $M \pm SE$. **RESULTS:** No significant differences were observed between the exercise and control group at T1 (TAS: 1.20 ± 0.14 mmol.L⁻¹ vs. 1.18 ± 0.11 mmol.L⁻¹; LDH: 302.14 ± 16.24 U/L vs. 295.27 ± 31.26 U/L; TBARS: 6.21 ± 1.09 μ M vs. 5.88 ± 1.00 μ M; and IL-6: 0.67 ± 0.70 pg/ml vs. 1.12 ± 0.28 pg/ml). The 3-day exercise period caused a significant increase in LDH (413.24 ± 35.27 U/L, $P = 0.029$), IL-6 (2.54 ± 0.35 pg/ml, $P = 0.037$) and TBARS (7.00 ± 0.61 μ M, $P = 0.042$) at T2, with the effects of TBARS remaining above baseline at T4 (6.43 ± 0.79 μ M, $P = 0.043$). TAS increased post-exercise with a significant difference observed between groups at T2 (1.86 ± 0.21 mmol.L⁻¹ vs. 1.20 ± 0.13 mmol.L⁻¹, $P = 0.006$), T3 (1.86 ± 0.28 mmol.L⁻¹ vs. 1.30 ± 0.14 mmol.L⁻¹, $P = 0.010$) and T4 (1.71 ± 0.22 mmol.L⁻¹ vs. 1.17 ± 0.13 mmol.L⁻¹, $P = 0.014$). IL-8, IL-10, and C-RP did not differ between groups. **CONCLUSIONS:** A 3-day period of intense, intermittent exercise increased oxidative stress and upregulated antioxidants in trained athletes, confirming the current model that exercise-induced oxidants play an important role in intracellular signaling pathways of endogenous antioxidants.