3-day oral N-acetyl-cysteine supplementation alters metabolism but not performance of high intensity aerobic exercise in trained cyclists

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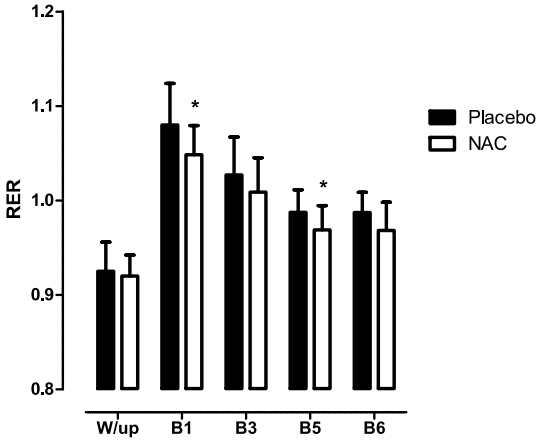
Redox homeostasis is essential for proper functioning of biological systems. Oxidative stress impairs contractile activity in skeletal muscle, and contributes to muscular fatigue during heavy exercise (Barclay & Hansel, 1991; Reid *et al.*, 1992). Accordingly, antioxidant supplements may assist endogenous antioxidants to prevent deleterious effects associated with oxidative stress (Medved *et al.*, 2004; Kelly *et al.*, 2009). In this study we investigated the effect of oral N-acetyl-cysteine (NAC) supplementation on metabolism and high intensity cycling performance. Nine well-trained male cyclists (mean ± SD; 27 ± 6 years of age, VO_{2peak} 69.4 ± 5.8 $ml.kg^{-1}.min^{-1}$) provided written informed consent. In a randomized, double-blind crossover design, subjects performed a 6 × 5 min High Intensity-Interval Training (HIT) cycling session at 82.5% of peak sustained power output, followed by a 10 minute self-paced Time Trial (TT) on two occasions 7 d apart. Prior to one session subjects consumed 5 × 750ml doses (2 × 2 d, 2 × 1 d, 1 × 1 hr pre-trial) of sports drink each containing $100mg.kg^{-1}$ NAC, which was repeated for the other session, but without NAC. Metabolic, electromyographic (EMG), performance data, and blood/plasma samples were collected for analysis before, during, and after the 6 × 5 min HIT bouts and subsequent TT. Respiratory Exchange Ratio (RER) was decreased in the NAC condition throughout HIT exercise, and was significant at bouts 1 and 5 ($p < 0.05$) as shown in The Figure. Compared to placebo, NAC decreased blood lactate during TT and recovery ($p < 0.05$). Both pH ($p < 0.01$), and HCO3 ($p < 0.05$) were reduced throughout exercise and recovery with NAC. In contrast NAC resulted in higher blood glucose concentration during HIT ($p < 0.05$). EMG median frequency of the *vastus lateralis* decreased in HIT bout 6 in the NAC condition ($p < 0.05$). No significant difference was observed in the total work performed in the 10-min TT ($p = 0.16$). These data indicate that NAC does not change performance in a self-paced 10-min TT, but induces a shift in muscle fibre-type recruitment and alters metabolism during high intensity interval exercise, which may provide a glycogen-sparing effect during prolonged exercise.



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