Skeletal muscle uncoupling protein-3 expression following endurance swimming training in mice

C M Brennan*, A M McElligott†, S A Warmington* and R K Porter†

Departments of *Physiology & †Biochemistry, Trinity College, Dublin, Ireland

Uncoupling protein-3 (UCP-3), a member of the mitochondrial uncoupling protein family, is preferentially expressed in skeletal muscle (Boss et al. 1997). It has been shown in mice that brief training periods of low-intensity exercise (2 h day$^{-1}$ for 2 weeks) increase UCP-3 mRNA expression 3 h post-exercise, which returns to resting levels 24 h post-exercise (Tsuboyama-Kasaoka et al. 1998). However, it is unclear whether this translates into a change in absolute UCP-3 protein expression following endurance training. Therefore, the aim of this study was to investigate the effects of endurance swimming training on absolute UCP-3 protein expression in mouse skeletal muscle.

Thirteen male CD1 mice (3 weeks; 11 ± 1 g) were used in this study. Animals were assigned to a control ($n = 8$) or training group ($n = 5$). Control animals performed no exercise, while trained animals performed bouts of weighted (up to 3% body mass) endurance swimming for up to 2 h duration, 5 days week$^{-1}$, for 17 weeks. Swimming was performed in a glass tank filled with water maintained to a constant temperature (35 ± 1°C). Animals were humanely killed by CO$_2$ exposure 24 h after the final training session. The hindlimb muscles soleus, EDL, plantaris and gastrocnemius were dissected out whole, and placed in muscle isolation medium comprising (mM): sucrose 100, EDTA 9, EGTA 1, trizma base 100 and KCl 46; pH 7.5. Muscle homogenates were prepared and analysed using Western blot analysis for total UCP-3 protein content and corrected for mitochondrial density.

Figure 1. UCP-3 expression per mitochondrion (mean ± S.E.M.)
These data show that specific (per mitochondrion measured by citrate synthase (CS)) UCP-3 protein expression is unchanged in mouse skeletal muscle following 17 weeks endurance swimming training (Fig. 1; two-way ANOVA). These findings suggest that UCP-3 protein expression is altered by similar levels to mitochondrial content in skeletal muscle following endurance training.

Boss O et al. (1997). FEBS Lett 408, 39-452

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