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Effects of Remote Preconditioning on Skeletal Muscle Metabolism During Exercise, a Pilot Study

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Introduction
Remote ischemic preconditioning (RIPC) induced by transient limb ischemia releases a dialyzable, circulating, protective factor that reduces ischemia-reperfusion (IR) injury. We have recently shown that RIPC improves competitive, but not submaximal, performance in elite athletes, presumably by modifying skeletal muscle resistance to 'relative ischemia' at maximal effort.

In this study we examine potential mechanisms for the effect of RIPC using magnetic resonance spectroscopy (MRS) to study indices of muscle metabolism and bioenergetics, including measurements of mitochondrial oxidative phosphorylation and anaerobic glycolytic metabolism.

Methods
10 healthy subjects, 20 to 27 years of age, were randomised to RIPC (4 cycles of 5 minutes arm ischemia) or sham preconditioning with cross-over. On each occasion, supine exercise was performed on a calibrated non-magnetic up-down ergometer (Lode AEI Technologies). Each subject performed a 90 second (s) submaximal exercise test at 85% of a previously tested maximal work rate followed by ten 30s bouts at 70% of the maximal work rate each separated by 15s of rest. Magnetic resonance imaging (MRI) and 31P-MRS data were obtained.

Results and Discussion
We observed trends towards an increased in ATP production from the anaerobic glycolytic pathway (0.69±0.35 (sham) vs. 1.10±1.27 , p=0.21), and towards a larger change in cellular pH (-0.28±0.17 (sham) vs.
-0.59±0.93, p=0.16) during exercise, after RIPC. However none of the 24 resting or exercise 31P-MRS parameters reached statistical significance. The lack of effect of RIPC on submaximal performance reflects our previous data on submaximal swimming performance.