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Contractile performance of isolated muscle from mice over-expressing uncoupling protein 3 and knock-outs

D.C. Bickham^{1,2} and N.A. Curtin,¹ ¹Imperial College London, Biological Nanosciences, Sth Kensington SW7 2AZ, UK and ²University of Southern Queensland, Centre of Systems Biology, Toowoomba, QLD 4350, Australia.

Uncoupling protein 3 (UCP-3) is a member of the mitochondrial transporter superfamily in the inner membrane of mitochondria; it is expressed almost exclusively in skeletal muscle fibres. The contractile phenotype of fast-twitch extensor digitorum longus (edl) and slow-twitch soleus muscles from wild type mice, transgenics over-expressing UCP-3 and knock-outs were investigated in isolated muscle activated by electrical stimulation. The maximum isometric force/cross-sectional area, half times for force rise and for relaxation, maximum velocity of shortening and maximum power output during constant velocity shortening were measured in fully rested muscles. Endurance was investigated using series of repeated brief isometric tetani. All of these measures of contractile performance showed the expected differences between edl and of soleus muscles, but there were no significant differences between genotypes. There is evidence for UCP-3 affecting different aspects of the energy supply process in mitochondria, for example by acting to uncouple oxygen use from ATP synthesis, to enhance fatty acid metabolism, and to limit production of damaging reactive oxygen species. The results presented here indicate that when UCP-3 content is varied, these mechanisms may be affected but they do not influence contraction, or alternatively other processes may compensate for their effects.