Isoproterenol enhances force production in mouse glycolytic and oxidative muscle *via* separate mechanisms

S.J. Blackwood and A. Katz, Department of Physical Therapy, School of Health Sciences, Ariel University, Ariel, Israel.

Fight or fight is a biologic phenomenon mediated by activation of β-adrenoceptors in skeletal muscle. However, the mechanisms whereby force generation is enhanced through adrenergic activation in different fibre types are not fully understood. Accordingly, we studied the effects of isoproterenol (ISO, β-receptor agonist) on isometric force generation and energy metabolism in isolated mouse *soleus* (SOL) and *extensor digitorum longus* (EDL) muscles. Under conditions of maximal force production, ISO enhanced force generation markedly more in SOL (22%) than EDL (8%). Similarly, during a prolonged tetanic contraction (30 s for SOL and 10 s for EDL), ISO enhanced the force x time integral more in SOL (25%) than in EDL (3%). ISO induced a marked activation of phosphorylase in both muscles in the basal state (SOL, ~5% to 25%; EDL ~10% to 40%), which was associated with glycogenolysis (greater in EDL than SOL), and, in EDL only, a significant decrease (16%) in inorganic phosphate (Pi). ATP turnover during sustained contractions (1 s EDL, 5 s SOL) was not affected by ISO in EDL, but essentially doubled in SOL. The results demonstrate that under conditions of maximal stimulation ISO has a minor effect on force generation in EDL that is associated with a decrease in Pi, whereas ISO has a marked effect on force generation in SOL that is associated with an increase in ATP turnover. Thus phosphorylase functions as a phosphate trap in ISO-mediated force enhancement in EDL and as a catalyzer of ATP supply in SOL.