Inhibition of β-adrenergic signalling impairs functional repair of rat skeletal muscle after injury

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β-adrenoceptor (β-AR) mediated signalling plays an important role in muscle regeneration, by altering the β-AR population and adenylate cyclase activity, to enhance cAMP production that promotes protein accretion. The aim was to block β-AR after muscle injury, to assess the importance of β-AR signalling in regeneration. Adult rats were anaesthetised (ketamine 100 mg/kg and xylazine 10 mg/kg, i.p.), and the EDL and soleus muscles of the right hindlimb injected with bupivacaine to cause complete destruction of all fibres. Rats received twice daily injections of the β_2-selective antagonist, ICI-118551 (12.5 mg/kg, i.p.), the nonspecific β_1- and β_2-antagonist, propranolol (12.5mg/kg, i.p.), or saline, commencing 2 days prior to injury and continuing for 14 days post-injury. Rats were anaesthetised (as described above) for excision of isolated muscles and then killed by cardiac excision. Maximum force (P_o) of injured EDL muscles from saline-treated rats was restored to 59% of control values, compared to only 50% and 53% of controls for ICI- and propranolol-treated rats, respectively. For injured soleus muscles from saline-treated rats, P_o was restored to 43% of control values, and only 33% and 38% of controls for ICI- and propranolol-treated rats, respectively. These findings indicate a reduced rate of functional restoration in regenerating muscles with β-antagonist administration, particularly ICI, where P_o of injured EDL and soleus muscles was 15% and 23% lower than for injured muscles from saline-treated rats. The impairment in functional recovery with β-AR blockade highlights the role of β-AR signalling in successful muscle repair.

Supported by the National Health & Medical Research Council.