A novel role for β-adrenoceptor signalling in the regulation of skeletal muscle mass

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Skeletal muscle mass is maintained via a careful balance between protein synthesis and degradation, processes which until recently were though to be regulated in an independent manner (Sandri, 2008). The insulin-like growth factor-I (IGF-I) is perhaps the best documented of the growth factors implicated in the regulation of skeletal muscle mass, which it does predominantly through Akt-mediated activation of mammalian target of rapamycin (mTOR), resulting in an increase in protein translation. In addition to its role in increasing protein synthesis, the IGF-I/Akt signalling pathway has been implicated in the regulation of protein degradation, presumably through Akt-mediated phosphorylation (and subsequent nuclear exclusion) of the forkhead box O transcription factors FoxO1 and FoxO3 (Sandri, 2008). While IGF-I has long been considered the master regulator of Akt activation, a study by Kline and colleagues (2007) implicated a second IGF-I-independent growth pathway involving the activation of β-adrenoceptors and subsequent hypertrophic signalling via mTOR.

While the importance of β-adrenergic signalling in the heart has been well documented and continues to receive significant attention, it is only more recently that we have begun to appreciate the importance of this signalling pathway in regulating skeletal muscle growth and development (Lynch & Ryall, 2008). In addition to the findings of Kline *et al.* (2007), work from our laboratory has identified a novel role for β-adrenoceptors in regulating skeletal muscle regeneration (Beitzel *et al.* 2004; 2007). Further confirmation of the important role these receptors play in regulating skeletal muscle mass has come from our recent investigations utilising transgenic mice that lack β-adrenoceptors ($Adrb1^{-/-}$/$Adrb2^{-/-}$).

These studies have provided important insight into the role of β-adrenoceptor signalling in regulating skeletal muscle size. Importantly, a clearer understanding of the pathways that regulate skeletal muscle mass may lead to the identification of novel therapeutic targets for the treatment of muscle wasting conditions.

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