

Muscle fatigue

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Intense, repeated activation of skeletal muscles causes a decline in performance known as muscle fatigue. The decline in performance includes reduced force production and slower contractions. Changes in many properties may be involved in fatigue development, including impaired neural activation of muscle cells (central fatigue) as well as impairments intrinsic to the muscle cells (peripheral fatigue). Peripheral fatigue may include defects in action potential propagation, sarcoplasmic reticulum Ca²⁺ handling and/or the function of the contractile elements. A range of mechanisms have been identified which may contribute to the decline in performance during fatiguing contractions and these include changes in ionic composition, metabolite concentration, phosphorylation status and production of reactive oxygen/nitrogen species (Allen *et al.*, 2008). Moreover, the recovery of contractile function after induction of fatigue can be very slow and several factors contributing to this delayed recovery have been identified. Many different activities cause fatigue and an important challenge is to identify the relative importance of various mechanisms in different conditions. Most of the mechanistic studies of fatigue and recovery have been performed on isolated muscle and another major challenge is to use the knowledge generated in these studies to identify the mechanisms of fatigue and recovery in humans under normal conditions and in association with various diseases.

Allen DG, Lamb GD & Westerblad H. (2008). Skeletal muscle fatigue: cellular mechanisms. *Physiological Reviews* **88**, 287-332.