Robust store-operated calcium entry in aged mammalian skeletal muscle

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Store-operated Ca^{2+} entry (SOCE) is a specialized mechanism in muscle, involving extracellular Ca^{2+} entry in response to depleting intracellular Ca^{2+} stores during work. Although a report recently suggested SOCE is compromised in aged muscle (Zhao *et al.*, 2008), we reassessed this with our novel, sensitive techniques (Launikonis & Ríos, 2007). Young (8-20 weeks) and aged (25 months) C57BL/10 mice from the same colony were compared for SOCE functionality and relevant protein abundances. Fluo-5N trapped in the tubular system of skinned fibres was imaged with confocal microscopy. Substitution of the standard intracellular solution with low Mg^{2+} solution induced Ca^{2+} release. There was initial Ca^{2+} uptake in sealed t-tubules, followed by depletion due to SOCE. SOCE deactivation followed Ca^{2+} reuptake into sarcoplasmic reticulum (SR) and reduction in myoplasmic Ca^{2+}. Robust SOCE was observed in all fibres (n=8) from aged mice. In some fibres, subsequent Ca^{2+} waves were observed with defined onset of SOCE, allowing determination of SOCE activation kinetics. Whilst SOCE activation was delayed in aged (38±3.1 ms, n=4) compared to young (27±3.6 ms, n=6, p=0.044) muscle, SOCE deactivation was robust. Of note, rate of SR refilling compared to rate of SOCE deactivation varied between aged fibres (n=8). Furthermore, Orai1 and Stim1 protein levels were also varied suggesting the need for physiological and biochemical measurements on the same aged fibres. We conclude that SOCE continues to work in aged muscle but its deactivation and activation thresholds, as well as the integral SOCE protein levels may vary.

Zhao X, Weisleder N, Thornton A, Oppong Y, Campbell R, Ma J, Brotto M. (2008) *Aging Cell* **7**: 561-568.
Launikonis BS, Ríos E. (2007) *J. Physiol.* **583**: 81-97.