

“Time window” effect of Yoda1-evoked Piezo1 channel activity during mouse skeletal muscle differentiation

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Abstract

Aim: Mechanosensitive Piezo1 ion channels emerged recently as important contributors to various vital functions including modulation of the blood supply to skeletal muscles. The specific Piezo1 channel agonist Yoda1 was shown to regulate the tone of blood vessels similarly to physical exercise. However, the direct role of Piezo1 channels in muscle function has been little studied so far. We therefore investigated the action of Yoda1 on the functional state of skeletal muscle precursors (satellite cells and myotubes) and on adult muscle fibres. **Methods:** Immunostaining, electrophysiological intracellular recordings and Ca²⁺ imaging experiments were performed to localize and assess the effect of the chemical activation of Piezo1 channels with Yoda1, on myogenic precursors, adult myofibres and at the adult neuromuscular junction. **Results:** Piezo1 channels were detected by immunostaining in satellite cells (SCs) and myotubes as well as in adult myofibres. In the skeletal muscle precursors, Yoda1 treatment stimulated the differentiation and cell fusion rather than the proliferation of SCs. Moreover, in myotubes, Yoda1 induced significant [Ca²⁺]_i transients, without detectable [Ca²⁺]_i response in adult myofibres. Furthermore, although expression of Piezo1 channels was detected around the muscle endplate region, Yoda1 application did not alter either the nerve-evoked or spontaneous synaptic activity or muscle contractions in adult myofibres. **Conclusion:** Our data indicate that the chemical activation of Piezo1 channels specifically enhances the differentiation of skeletal muscle precursors, suggesting a possible new strategy to promote muscle regeneration.

<http://dx.doi.org/10.1111/apha.13702>

Keywords

myogenesis, myotubes, Piezo1 channels, satellite cells, skeletal muscle myofibres, Yoda1

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