

Single-Leg Resistance Exercise Training in Mice Leads to a Fast Increase in In Vivo Torque of Anterior Crural Muscles

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ABSTRACT

Resistance exercise is known to produce muscle hypertrophy. However, little is known about the role of muscle satellite cells in generating new myofibers or in incorporating satellite cells to live myofibers during exercise training. **PURPOSE:** To investigate whether single-leg resistance exercise training can activate the incorporation of muscle satellite cells in mice. **METHODS:** Transgenic male mice (12 weeks old) that express Td-Tomato fluorescent protein in Pax7+ (i.e., satellite cells) cells (Pax7CreER-Ai9) were treated with tamoxifen (2 mg in corn oil, i.p.) once a day for 5 days. Three days later, mice were single-leg exercise trained (i.e stimulation of the peroneal nerve of the right leg of each mouse to evoke fused tetanic contractions [100 Hz] of the anterior crural muscles), 3x per week for either 1 or 2 weeks. Each training session was composed of 3-s contractions with 7 s recovery between contractions, 10 contractions each set, 5 sets with 5 min rest between sets. Before the first training session and 3 days after the last training session (1 week or 2 weeks training), torque produced by the ankle was measured at different frequencies of pulse-stimulation (1-200 Hz), mice were euthanized, and muscles were frozen for histological measurements. **RESULTS:** During each session of training, peak torque developed at the last contraction was ~30% of the torque developed in the initial contraction of the session suggesting fatigue development. Between sessions of training, initial torque was not significantly different suggesting that muscle recovered function between sessions. Torque measurements at different frequencies of stimulation 3 days after 1 week or 2 weeks of training showed a ~50% increase in maximal tetanic torque relative to the mice body weight, after 1 week of training but there were no additional changes at 2 weeks of training. Tibialis anterior muscle cross sectional area and number of Td-tomato positive myofibers were also measured in these mice. **CONCLUSION:** Resistance exercise training in mice by using single-leg electrical stimulations leads to a fast (i.e., 1 week) increase in muscle force development.