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EFFECTS OF STRETCH-SHORTENING CYCLE-INDUCED MUSCLE INJURY ON GENE EXPRESSION

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Investigation of gene expression due to contraction-induced injury would be beneficial in elucidating the mechanisms involved in skeletal muscle response and repair.

PURPOSE

To investigate the effect of stretch-shortening cycle ROM (range of motion) on gene expression in rats.

METHODS

Testing was performed on dorsiflexor muscles of Sprague-Dawley rats in vivo. Animals were randomly assigned to a long ROM group (L-Inj), short ROM group (S-Inj), or isometric control group (CON). The injury protocol consisted of 7 sets of 10 S-S cycles at 500°/s. The S-Inj group received S-S cycles between 70°-120°, whereas the L-Inj group received S-S cycles between 90°-140° ankle angle. The CON group received muscle stimulation only at 90°. Dorsiflexor muscles were stimulated for 2.8 s each set, and sets were administered at 1-min intervals. Rats were sacrificed at 6 and 48 hours postinjury. Following sacrifice, tissue was excised, weighed, sectioned, quick-frozen, and stored at -80°C. Tissue samples were homogenized directly in Lysis buffer, quick-frozen, and stored at -80°C until RNA isolation. RNA was isolated, followed by reverse transcription (RT) and polymerase chain reaction (PCR). Changes in the expression (mRNA) of several genes of interest were measured by real-time PCR.

RESULTS

No significant differences were found with respect to collagen-III, IL-1[beta], neonatal myosin, desmin, or IGF-1, whereas significant differences were found with MGF (muscle growth factor). MGF displayed a significant treatment-time interaction ($p < 0.05$). Post-hoc analysis indicated S-Inj at 48 hr was greater than CON at 48 hr ($p < 0.05$). Also, the S-Inj at 48 h was greater than the S-Inj at 6 hr ($p < 0.05$). Furthermore, the L-Inj at 6 hr was greater than S-Inj at 6 hr ($p < 0.05$). CON at 6 hr was greater than CON at 48 hr ($p < 0.05$).

CONCLUSION

Stretch-shortening cycles increased gene expression of MGF but not IGF-1 in this model over time, and also resulted in elevated levels as compared to isometrically exercised controls. MGF is thought to have an autocrine function while IGF-1 has a systemic function.