Effects of high intensity power resistance exercise and feeding on mechanosensing and stress-related gene expression in human skeletal muscle

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Power resistance exercise, characterized by high-intensity (load and velocity) dynamic muscular contractions, is practiced by athletes to enhance sport performance through improved muscle function. To investigate the remodelling processes that underly improved muscle function, the response of mechanosensing and stress-associated genes were determined in healthy, athletic men following power resistance exercise, with feeding during recovery. Percutaneous needle biopsy samples were obtained from the *vastus lateralis* muscle of resistance-trained males (n = 7; age: 25 ± 5 yr; weight: 82.3 ± 6.3 kg; body fat %: 14.7 ± 3.8) on 3 occasions within a 6 wk period. On each occasion, after an overnight fast, participants were fed (CHO 54.6, FAT 26.4, PRO 19.0; % total kJ) and rested for 90 min. They then completed a 90 min session of power resistance exercise with, or without feeding (CHO 54.6, FAT 26.4, PRO 19.0; % total kJ) directly afterwards, or rested for a further 90 min, without feeding. The exercise consisted of ~1000 intermittent muscular contractions at high (70-96%) intensity, and was expected to induce high mechanical and metabolic stress. Muscle samples were obtained 3 h after the completion of the 90 min exercise/rest session. Total mRNA was extracted from 20-30 mg muscle and mRNA levels quantified using real-time quantitative PCR (TaqMan® Gene Expression Assays). After exercise, mRNA levels increased for, CARP/Ankrd1 (~29-fold) and MLP/CSRP3 (~2.4-fold), titin-associated mechanosensing genes associated with muscle contraction, structure and function. Transcript levels of the cellular stress-associated genes HSP27 and HSP70 also increased after the exercise (~2.3 to ~3.9-fold), whereas levels of MuRF-1 mRNA, a titin-associated E3 ubiquitin ligase gene associated with protein degradation through the ubiquitin proteosome system, was unchanged (~1.4-fold). There was no effect of a post-exercise meal on any of the genes investigated. The upregulation of genes involved in mechanosensing and cellular stress pathways in skeletal muscle following power resistance exercise in well-trained men may contribute to the positive adaptation to high-stress exercise in healthy muscle.