Effects of protein ingestion on muscle protein synthesis and mRNA expression following consecutive resistance and endurance exercise

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We determined the effect of protein supplementation on anabolic signaling and rates of myofibrillar and mitochondrial protein synthesis after a single bout of concurrent resistance and endurance exercise. Using a randomized cross-over design, 8 healthy males were assigned to experimental trials consisting of resistance exercise (8 × 5 leg extension, 80% 1-RM) followed by cycling (30 min at ~70% $VO_{2\ peak}$) with either post-exercise protein (PRO: 25 g whey protein) or placebo (PLA) ingestion. Muscle biopsies were obtained at rest, 1 and 4 h post-exercise. AktSer473 and mTORSer2448 phosphorylation increased 1 hr after exercise with PRO (175-400%, $p<0.01$) and was different from PLA (150-300%, $p < 0.001$). MuRF1 and Atrogin-1 mRNA were elevated post-exercise but were higher with PLA compared to PRO at 1 h (50-315%, $p < 0.05$), while PGC-1α mRNA increased 4 h post-exercise (620-730%, $p < 0.001$) with no difference between treatments. Post-exercise rates of myofibrillar protein synthesis increased above rest in both trials (75-145%, $p < 0.05$) but were higher with PRO (67%, $p < 0.05$) while mitochondrial protein synthesis did not change from baseline with either exercise or PRO. Our results show that a concurrent training session promotes anabolic adaptation responses and increases in metabolic/oxidative mRNA expression in skeletal muscle. Moreover, protein ingestion after combined resistance and endurance exercise enhances myofibrillar protein synthesis and attenuates markers of muscle catabolism. Protein ingestion with concurrent training allows anabolic adaptation and thus may promote/protect muscle mass and reduce the potential interference effect of endurance exercise on hypertrophy.