

Whey protein supplementation and resistance training to enhance muscle growth in young and older adults

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Background - A major cause of age-related disabilities is progressive loss of skeletal muscle mass (sarcopenia). Protein ingestion and strength exercise have both been reported to increase protein synthesis through signalling cascades resulting in ribosomal activation via activating key components of the translation initiation complex. The extent at which supplemental protein ingestion and strength exercise training activate translation initiation in young and older individuals is poorly understood.

Objective - To determine whether whey protein isolate (WPI) consumed immediately after supervised strength-training exercise in younger and older men increases translation initiation activation.

Design - Skeletal muscle biopsy samples were taken from the thigh (*vastus lateralis*) from young (n=15) and older (n=15) men, after a single bout of exercise (untrained) and again following 12 weeks supervised resistance training with repeated WPI (25 g) or placebo supplementation. The anabolic response was measured by the increase in knee extensor strength, the activation of key translation initiation proteins and expression of genes regulating muscle hypertrophy/atrophy.

Outcomes - WPI supplementation significantly increased eccentric strength after training (25% greater than placebo) in young ($P = 0.03$), but not in older adults. Older participants consuming the WPI supplement demonstrated greater phosphorylation of the translational factor p70-S6K1 after 12 weeks training (2.9 fold increase, $P = 0.03$), when compared to the placebo group. This effect was not observed in the younger groups. Following exercise training older adults consuming WPI resulted in a 17.3 fold increase in Pax7 gene (marker of satellite cell activation) compared to a 2.6 fold increase in the placebo group post training. Only a small increase in Pax7 gene expression was observed in the young groups, with a 2.6 fold increase in the protein group and 1.9 fold increase in the placebo group.

Conclusions - These findings provide molecular evidence of enhanced activation of translation initiation with combining WPI intake and chronic resistance training in older participants. There were no beneficial actions of WPI on p70-S6K1 activation in young male subjects. Analysis of additional translation initiation factors and myogenic genes is ongoing.