Ingestion of 40 g protein prior to sleep stimulates overnight myofibrillar protein synthesis in healthy older men

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Introduction: The loss of skeletal muscle mass with aging has been attributed to the blunted muscle protein synthetic response to protein ingestion. Protein ingestion prior to sleep has been suggested as an effective strategy to compensate for such anabolic resistance. We assessed the impact of ingesting 20 and 40 g protein prior to sleep on protein digestion and absorption kinetics and subsequent overnight myofibrillar protein synthesis rates in older men.

Methods: In a randomized, double blind, parallel design, 48 older men (72±1 y) ingested 20 g protein (PRO20), 20 g protein plus 1.5 g leucine (PRO20+LEU), 40 g protein (PRO40) or a placebo (PLA) prior to sleep. Ingestion of specifically produced intrinsically L-[1-^{13}C]-phenylalanine and L-[1-^{13}C]-leucine labeled casein was combined with intravenous infusions of L-[ring-$^{2}H_5$]-phenylalanine and L-[1-^{13}C]-leucine throughout the night. Blood samples were taken frequently to assess protein digestion and absorption kinetics, and muscle biopsies were taken prior to sleep and after 7.5 h of sleep to assess overnight myofibrillar protein synthesis rates.

Results: Exogenous phenylalanine appearance rates increased following protein ingestion, with more amino acids being released following ingestion of 40 g as opposed to 20 g protein (P<0.05). Overnight myofibrillar protein synthesis rates were higher in PRO40 when compared with PLA (PLA: 0.033±0.002; PRO20: 0.037±0.003; PRO20+LEU: 0.039±0.002; PRO40: 0.044±0.003 mean±SEM %/h, respectively; P=0.02). The incorporation of dietary protein-derived amino acids into de novo muscle protein was greater in PRO40 when compared with PRO20 (0.033±0.002 *vs* 0.019±0.002 MPE, respectively; P<0.001), and tended to be higher compared with PRO20+LEU (0.025±0.002 MPE; P=0.06).

Conclusions: Ingestion of 40 g protein prior to sleep increases overnight amino acid availability and stimulates muscle protein synthesis during sleep in older men. These findings provide a novel basis for nutritional strategies by providing additional protein to preserve muscle mass in both health and disease.

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