Ingestion of a protein hydrolysate is accompanied by an accelerated *in vivo* digestion and absorption rate when compared with its intact protein

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Ageing is associated with a gradual loss of skeletal muscle mass, often referred to as sarcopenia. These age-related changes in skeletal muscle mass are attributed to a disruption in the regulation of skeletal muscle protein turnover. Recently published data suggests that the muscle protein synthetic response to food intake is reduced in the elderly (Koopman *et al.*, 2006). The latter is thought to represent a key factor responsible for the age-related decline in muscle mass in the elderly. Reductions in the rate and efficiency of protein digestion and subsequent absorption of the amino acids in the elderly could be responsible for the blunted muscle protein synthetic response to food intake (Boirie *et al*., 1997). As a result, is has been suggested that the ingestion of a protein hydrolysate, as opposed to its intact protein, might accelerate protein digestion and absorption, increase plasma amino acid availability and, as such, augment the postprandial muscle protein synthetic response. However, evidence to support the proposed differences in digestion and absorption characteristics of a protein hydrolysate compared to its intact protein *in vivo* in humans remains lacking. In the present study, we tested the hypothesis whether the ingestion of a protein hydrolysate would accelerate protein digestion and absorption rates, resulting in a greater increase in plasma amino acid availability and muscle protein synthesis rate when compared with the ingestion of its intact protein.

Elderly men (64 ± 1 y, n = 10) were randomly assigned into 2 cross-over experiments in which they consumed a single bolus of 35 g specifically produced intrinsically L-[1-^{13}C]phenylalanine labeled intact (CAS) or hydrolyzed (CASH, PeptoPro®) casein. Furthermore, primed continuous infusions with L-[ring-$^{2}H_5$]phenylalanine, L-[1-^{13}C]leucine and L-[ring-$^{2}H_2$]tyrosine were applied, and blood and muscle tissue samples were collected to assess the appearance rate of dietary protein derived phenylalanine in the circulation, and the subsequent muscle protein fractional synthetic rate (FSR) over a 6 h post-prandial period.

Exogenous phenylalanine appearance rate was greater following ingestion of CASH when compared with CAS ($p < 0.001$). Splanchnic extraction was significantly lower in CASH *vs* CAS treatment ($p < 0.01$), and resulted in a 27 ± 6% higher exogenous phenylalanine appearance rate following CASH ingestion ($p < 0.001$). In accordance, plasma AA concentrations increased to a greater extent following the ingestion of CASH, with ~25-50% higher peak AA concentrations in the CASH *vs* CAS treatment ($p < 0.01$). Muscle protein synthesis rates, calculated from the oral tracer, averaged 0.054 ± 0.0004 and 0.068 ± 0.0006 %·h^{-1} in the CAS and CASH treatment, respectively ($p = 0.10$).

This study clearly shows that the ingestion of a protein hydrolysate, as opposed to its intact protein, accelerates protein digestion and absorption from the intestine and lowers splanchnic amino acid extraction. As a result, ingestion of a protein hydrolysate is an effective strategy to augment post-prandial plasma amino acid availability in vivo in healthy, elderly men, which may increase muscle protein synthesis.

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