Sarcopenia is characterized by the slow deterioration of lean tissue with aging, and is linked to poor outcomes such as increased disability and mortality rates (1). Although there are many underlying mechanisms of sarcopenia, a contributing factor may be a reduced ability of skeletal muscle to increase muscle protein synthesis (MPS) in response to ingestion of small quantities of essential amino acids and protein (2,3). In theory, a sustained imbalance between protein synthesis and degradation rates (due to reduced stimulation of MPS with protein feeding) may contribute to loss of lean tissue with aging.

More recently, studies using stable isotope amino acid tracers determined that older adults retain the capacity to maximally stimulate MPS like young adults but required an absolute protein dose of ~25–30 g (4–6). These findings have spurred numerous expert opinions (7–9) supporting the idea that older adults should consume a targeted amount of protein at each meal to sufficiently stimulate MPS. Unfortunately, these data have limited application for healthy individuals with different body weights, lean tissue composition, and age groups.

In this issue of the Journals of Gerontology: Medical Sciences, Moore and colleagues (10) conducted a retrospective analysis from several of their previous protein–dose response studies. The goal was to determine the relative protein dose required for maximal stimulation of myofibrillar protein synthesis in healthy young and older men. Using biphasic linear regression and breakpoint analysis, they found that older men required more protein to maximally stimulate myofibrillar protein synthesis than younger men, after adjustment for body weight (0.40 vs 0.24 g/kg, respectively) or lean mass (0.61 vs 0.25 g/kg, respectively). These data add to the rapidly growing body of evidence that older adults should consume more protein at each meal to maximize muscle protein anabolism.

Secondly, these new data target a larger audience of healthy older adults, particularly those who may have difficulty consuming large protein quantities in a single meal because of their smaller stature. For example, an older adult who weighs 50 kg would only need to consume 20 g of protein with each meal to maximally stimulate MPS. This would be ~20–30% less protein than what has previously been suggested (4–6). Thus, the relative protein doses suggested by Moore et al. (10) are a practical dietary strategy for healthy older populations.

Another intriguing finding was that the relative dose to maximally stimulate MPS was considerably more variable in older versus younger men (as noted by wide 95% confidence intervals). This finding suggests that additional confounders contributed to some older men requiring more (or less) protein to maximally stimulate MPS in response to protein feeding. A likely confounder is the relative level of daily physical activity, which was probably not uniform in the studies of Moore et al. Earlier research suggested (11,12) that reduced physical activity in healthy older adults decreased skeletal muscle sensitivity to stimulate MPS in response to essential amino acid and protein ingestion. Chronic low-grade inflammation that is associated with aging may also reduce sensitivity to protein intake. Recent work by Balage et al. indicated that old rodents with heightened inflammation have a blunted MPS rate in response to a protein meal (compared to old rats with low inflammatory status) (13). These examples should encourage new investigations to determine relative protein doses that maximally stimulate MPS across a broad range of populations, such as inactive or mobility-impaired older adults, those with serious health issues, and the very old.

Likewise, novel, yet straightforward nutritional studies to maximize MPS should be tested. For example, it is likely that the optimal protein dose for maximal stimulation of MPS will be higher in certain populations, making it impractical to consume sufficient protein in one dose. Reducing the bulk of the protein dose might be feasible by enriching food...
sources with an amino acid most likely to stimulate protein synthesis—leucine (14). Alternately, a future nutritional recommendation could be “contract before you eat,” since muscle contraction improves anabolic sensitivity to protein ingestion in young and older adults (15,16). With these and other strategies, the optimal protein dose to maximize MPS could be lowered and thus more likely to be attainable for certain populations.

The work by Moore et al. (10) is just the start of exploring how to optimize maximal stimulation of MPS in response to protein ingestion in older adults. This is an exciting time for nutrition research, with many practical and personalized protein-based strategies yet to be discovered to prevent the onset of sarcopenia in older adults.

References