

Nutrition intervention in sarcopenia

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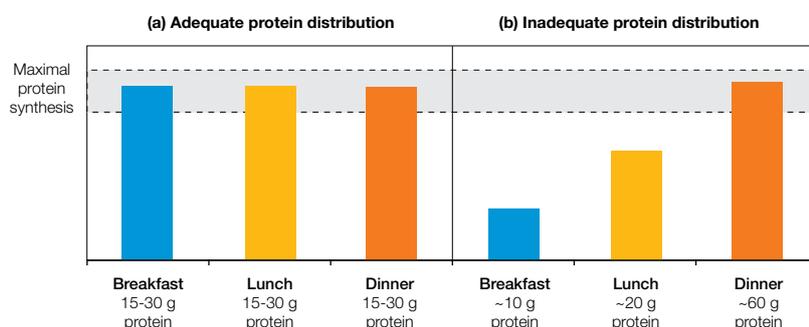
Nutrition intervention and resistance exercise can increase muscle mass and physical function in older people. This presentation reviews recent research identifying the amount, timing, and type of nutritional supplementation needed to help slow or prevent sarcopenic muscle loss and function.

Sarcopenia is an age-related loss of muscle mass that has a negative impact on strength, functional ability, and everyday life activities. In addition to neuromuscular and hormonal triggers,¹⁻² recent studies identify lack of adequate protein in the diet and a blunted anabolic response to protein intake as mechanisms linked to sarcopenia.³ The rationale behind dietary supplementation with protein is based on the hypothesis that it will boost muscle protein synthesis. Studies have shown that moderate-to-large servings of essential amino acids (EAA) can stimulate muscle protein synthesis in older people.³

Protein-rich foods like whey protein or oral nutrition supplements can serve as practical, convenient, and inexpensive ways to deliver added protein. A 4-ounce serving of lean beef can boost protein synthesis 51 percent in an older person in the first 5 hours after consumption.³ Currently there is a vigorous debate over the ideal level of protein intake for elders; the benefits of increased dietary protein consumption to maintain muscle mass are counterbalanced by concerns regarding the effects of high protein intake on kidney function.

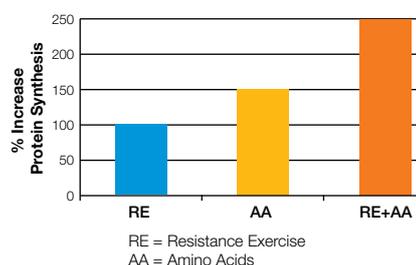
It also seems important to consider not only the amount of protein, but when it is consumed throughout the day. Paddon-Jones suggested that dividing the daily allowance of protein equally across 3 meals could yield maximum protein synthesis (Figure 1).³

Figure 1. Proposed relationship between the amount of protein ingested per meal and the resultant anabolic response (Adapted from Paddon-Jones, 2009)



Recent study results showed that providing a nutrition supplement enriched with the essential amino acids could improve lean body mass, strength, and physical function—even without exercise.⁴ Nevertheless, the positive role of resistance exercise in slowing sarcopenic muscle loss is well known. A properly designed, progressive resistance exercise program can lead to muscle gain and significant gains in strength. Importantly, proper nutrition boosts the benefits of resistance training. Protein synthesis increases after taking an amino acid (AA) supplement or after weight training; however, protein synthesis increases even more after weight training in combination with elevated AA levels than with either intervention alone (Figure 2).⁵⁻⁶ Studies have found that taking a protein supplement immediately after exercise is better than waiting 2 hours.⁷ More studies are needed, particularly testing the impact of protein enriched supplementation with a resistance training program.

Figure 2. Resistance exercise + nutrition (protein) (Biolo, 1997)



HMB (beta-hydroxy-beta-methylbutyrate), a metabolite of the essential amino acid leucine, has shown promise as an effective nutrition supplement. It is believed to increase the rate of protein synthesis and slow protein breakdown.⁸ When older men and women took nutrition supplements with HMB, their functionality, strength, and lean body mass improved,⁹ as did their protein turnover.¹⁰ When older men and women combined HMB supplementation with a resistance training program, they experienced an increase in lean body mass gain and lost more body fat than did the placebo group.¹¹

A program of progressive resistance exercise and a diet including adequate and balanced protein distribution throughout the day appears to be an effective way to treat sarcopenia in older people. For those who are unable to consume adequate protein, use of protein-rich nutrition supplements with added supplies of HMB may be a promising strategy for future clinical success.

Take-home messages

- A diet including adequate protein, along with progressive resistance training, appears to be effective for treating people with age-related sarcopenia.
- Similarly, taking an amino acid supplement, or weight training, increases protein synthesis; however, protein synthesis increases more after taking supplemental amino acids in combination with weight training than with either intervention alone.
- HMB (beta-hydroxy-beta-methylbutyrate), a metabolite of the essential amino acid leucine, has shown promise as an effective nutrition supplement for treatment of people with age-related sarcopenia; lean body mass, strength, and functionality were improved by HMB. HMB is believed to work by slowing protein breakdown and by increasing protein synthesis.

References

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Discussions

Servet Ariogul: I would like to make a comment. Protein intake can be provided not just by beef but also by beans.

Jeffrey Stout: Beans are okay if you add rice. Beans and rice must be eaten together to provide complete protein (beans alone are deficient in the essential amino acid methionine; rice is deficient in lysine). When I work with vegetarians, I have to be sure they consume complete protein. Even then, complete vegetable protein is still inferior to meat when it comes to maximizing protein synthesis.

Servet Ariogul: Is there any study about the effectiveness of proteins that come from nonmeat sources?

Jeffrey Stout: There are studies with head-to-head comparisons of milk proteins (animal source) and soy proteins (vegetable source). The milk proteins were far more anabolic, though soy proteins are still anabolic and still able to accelerate the benefits of exercise, just not to the same extent as milk- or other animal-based proteins. So if someone is vegetarian, I would suggest soy protein as a priority in their diet. But such studies have been conducted in younger subjects; no one has looked at older subjects and soy protein.

Abellan van Kan Gabor: To date, the only thing I can recommend to prevent sarcopenia is physical activity, even though promising molecules are being developed and tested. Do you think we will find a molecule or supplement that will take the place of physical activity? Or will we always need physical activity be part of treatment?

Jeffrey Stout: I have always believed that physical activity is a priority, although a good diet is also important. If a supplement exists, maybe it can be used to enhance the effect of training. I am not a big fan of pills that do everything for you. There is research to show that physical exercise has cognitive benefits in addition to benefits on skeletal muscle function. Physical activity should be the first priority, followed by sitting with a dietitian to improve the diet.

Alfonso Cruz: I think that it is dangerous to tell the population they can eat or drink something or take a pill instead of exercise. Exercise is so good for so many things.

Jeffrey Stout: I showed those data because I wanted to demonstrate how powerful nutrition can be as a component of an overall health care plan, but no way would I want someone to take a pill only.

Juergen Bauer: I can think of circumstances where a pill might be useful, for example in those who cannot move for a certain period of time say, due to an accident. This may be especially important in older individuals. In these circumstances, I would be interested in slowing down muscle loss.