INTRODUCTION

Increasing muscle mass is the goal of many people, athletes, and non-athletes alike.

Although genetics plays a significant role in how much muscle mass a person will have, increasing it can be accomplished through proper workouts and proper nutrition. I often tell athletes that, all things being equal, if their nutrition is better than that of their competitors, they will have the winning edge.

DEFINITIONS

Before discussing some research in the area of muscle protein synthesis, it is important to define the different types of muscle protein synthesis. Muscle hypertrophy, or the increase in muscle size, results from an increase in the size of muscle cells or fibers. There are two known types of muscle hypertrophy: myofibrillar (muscle fiber) and sarcoplasmic (the sarcoplasm of the muscle fiber). Although both types of hypertrophy will increase muscle size, myofibrillar hypertrophy will result in greater strength increases, whereas sarcoplasmic hypertrophy will result in greater muscle size but lesser increases in muscle strength. Myofibrillar protein synthesis refers to the increased synthesis of the proteins involved in generating contractile force, which results in increased strength.

PROTEIN NEEDS FOR ATHLETES

There is a discrepancy between the Recommended Dietary Allowances (RDAs), protein requirements of 0.8 g of protein/kg of body weight per day (3), compared with recommendations for endurance and strength athletes, which range from 1.2 to 1.7 g of protein/kg of body weight per day (5,6). Another disparity lies between the amount recommended for athletes and what the athletes think they should consume to gain muscle and improve performance. The timing of protein consumption is yet another matter that confuses many athletes. Some researchers have worked on finding the answers to both of these issues.

PROTEIN QUANTITY AND TIMING

Areta et al. (1) evaluated both the timing and distribution of protein intake on myofibrillar protein synthesis after an extended recovery from resistance training. There were 24 healthy trained men in their study who were assigned to 1 of 3 groups based on the dose and timing of whey protein intake after resistance training.

A group of 8 men consumed a total of 80 g of whey protein throughout their 12-hour recovery period as every 1.5 hours. Another group of 8 men consumed 20 g of whey protein every 3 hours. The third group of 8 men consumed 40 g of whey protein every 6 hours. Muscle biopsies were taken 5 times during the 12-hour period.

Areta et al. (1) reported that the 20 g of whey protein consumed every 3 hours significantly was better at stimulating myofibrillar protein synthesis throughout the day compared with the other 2 feedings. The researchers concluded that “…the effect of modulating the distribution of protein intake on anabolic responses in skeletal muscle has potential to maximize outcomes of resistance training for attaining peak muscle mass” (1). In a similar study, Moore et al. (4) also established that the timing and amount (20 g of protein every 3 hours) was the most beneficial for muscle protein synthesis in trained men. The aforementioned studies were conducted with trained young men. Would these same responses occur in older men?

Yang et al. (7) examined whether different types and doses of protein similarly would affect myofibrillar protein synthesis in older men. Thirty men, 71 ± 5 years
of age, completed one bout of unilateral knee extensor resistance training before consuming either 0 g of protein or 20 g or 40 g of soy protein isolate. The researchers compared these results with those of a previous study they had conducted where men of a similar age consumed either 20 g or 40 g of a whey protein isolate. They reported that myofibrillar protein synthesis significantly was greater with the whey protein isolate compared with the soy protein isolate in both rested and postexercise conditions. The 20-g dose of whey protein had a greater effect on myofibrillar protein synthesis.

In a similar study, Burd et al. (2) evaluated the effects of casein or whey protein consumption in 14 older men, 72 ± 1 year of age. In this study, two groups of men (seven men per group) performed unilateral leg resistance training. After exercise, the men were given either 20 g of casein protein or 20 g of whey protein. They reported that blood amino acid concentration increased 1 hour after consumption of the protein but significantly was greater after whey protein was consumed. Furthermore, myofibrillar protein synthesis was 65% greater in the rested leg after whey was consumed compared with the casein. They reported similar increases after resistance exercise: the whey protein consumption resulted in greater myofibrillar protein synthesis compared with the casein. The researchers concluded that the increased myofibrillar protein synthesis observed in the older men likely was caused by the increased amino acids in the blood after whey protein consumption (2).

PRACTICAL APPLICATION AND NOTES ON PROTEIN CONSUMPTION

Although the aforementioned studies were conducted using whey, casein, or soy protein isolates, it is important to note that protein consumption should first come from foods and not protein supplements. In fact, one gem to take away from these studies is that consuming small amounts of protein throughout the day is what works best to increase myofibrillar protein synthesis. This approach makes it even more attainable to consume protein from foods rather than supplements. Thus, with each snack and meal, 20 g of protein can be consumed rather easily; there are 7 g of protein in 1 oz of animal products (e.g., chicken, beef, cheese, etc.). Furthermore, milk naturally contains whey protein, and thus, there is no need to include more expensive whey protein powders. If whey isolate protein powders are consumed, mix half of the dose recommended in milk to provide about 20 g of whey protein. This would be good advice to share with clients, as well, to ensure that they are not filling up on protein drinks, and thus, consuming less of a varied diet.

SUMMARY

It seems that dose, timing, and type of protein are all important when it comes to synthesizing muscle myofibrillar proteins. Of course, this all must be in conjunction with training. What is important to note from these studies is that “more” is not better. It is clear that the 20 g of whey protein every 3 hours throughout the day resulted in the greatest increase in myofibrillar protein synthesis in trained young men and in older men. There is a gap in the literature, however, in trained young women and older women. More research needs to be conducted on the dose, timing, and type of protein required for maximum myofibrillar protein synthesis in women.

References

3. Food and Nutrition Board of the National Academy of Sciences, Institute of Medicine.


Recommended Resources


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