

The Real Story Behind the Amino Acid Leucine

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Developing and preserving lean muscle mass is the secret to weight management, sports nutrition, healthy aging, and overall wellness. On going research is demonstrating the key role that high quality protein, including the amino acid leucine, performs in the process of muscle protein synthesis (MPS). Leucine is a branched chain amino acid that is essential to muscle health. Whey protein is an excellent source of branched chain amino acids, especially leucine, and an ideal way to increase protein nutrition.

The following is a summary of the May 2013 technical seminar presented by Dr. Layne Norton, highlighting dietary factors that affect MPS. Dr. Norton is an expert in protein and amino acid metabolism in skeletal muscle.

Leucine

Our bodies need 9 essential amino acids, but one of them, leucine, serves other functions beyond providing a building block for proteins.

Leucine is exceptional because:

- It performs the key role as a metabolic trigger to initiate the process of muscle protein synthesis.
- The leucine contained in individual proteins ultimately determines the optimal amount of total protein per meal.
- Research has shown that 2.5-3.0 g of leucine per meal are needed to maximize MPS.

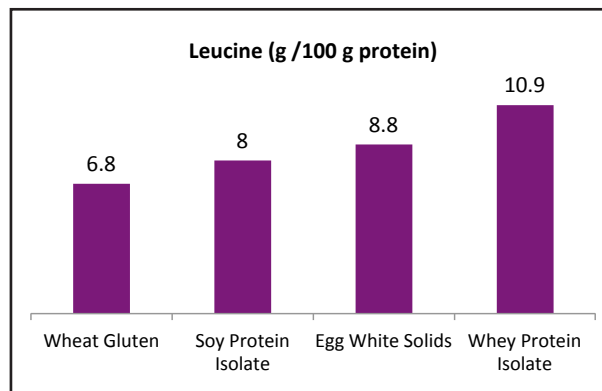


Figure 1. Leucine concentration [from Norton et al 2012]

2.5-3.0 g of Leucine are needed to maximize muscle protein synthesis



Not all proteins are created equal nutritionally. They do not have the same amino acid profile. Some important facts about high quality protein are:

- Higher quality protein sources with more leucine will require lower consumption of protein per meal.
- Whey protein isolate has a higher leucine concentration (~11g leucine/100 g protein) when compared with other protein sources (i.e., wheat gluten, soy, egg; 6.8%, 8.0%, 8.8% leucine, respectively) as shown in Figure 1.
- Since whey protein isolate contains a higher level of leucine, less is needed to achieve the 2.5-3.0 g of leucine to maximize muscle protein synthesis. This translates to lower amounts of protein and lower calories needed to achieve optimal muscle health.

Protein Throughout the Day

One key element of increasing MPS is to maintain an optimum level of protein throughout the day. A continued source of high quality protein is essential because:

- MPS is a cycle lasting only up to 3 hours after a meal that contains adequate protein.
- Eating too infrequently results in limited overall daily stimulation of MPS, while eating too frequently may trigger a sustained resistance response.

It should be stressed that the frequency, quantity and quality of protein consumed throughout the day is critical.

These three factors are more important than the total amount consumed per day. A sufficient amount (approximately 20-30 g) of high quality protein is needed at each meal for optimum MPS. As presented in Figure 2, we often target a total amount per day and settle with a less effective distribution.

This is of critical importance because if the meal has less than 2.0 g of leucine, muscle synthesis will not initiate and the protein is used as calories. The consumption of massive quantities of protein is unnecessary when high quality protein is consumed.

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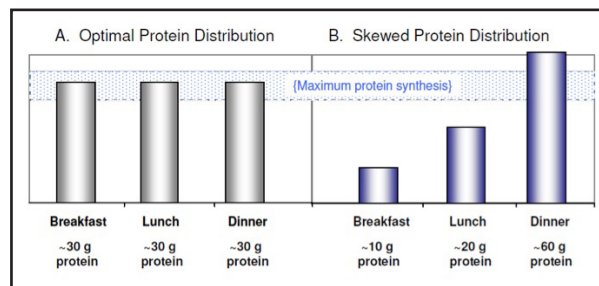


Figure 2. Protein distribution at meals (from Layman 2009)

Meeting Your Daily Protein Needs

So how can ideal protein nutrition be achieved in a daily diet? The following example is for a 200 lb male athlete/bodybuilder.

First, design your day to have 5 separate meals (one meal every 4-6 hours). The goal is to select foods that provide 3 g leucine per meal. This can be achieved by the following selections that result in a total protein intake of 179 g/day:

Meal protein sources:

- 1 meal: eggs (34 g protein)
- 2 meals: chicken (40 g protein at each meal)
- 1 meal: beef (38 g protein)
- 1 meal: whey protein isolate (27 g protein)



Dr. Layne Norton has a PhD in Nutritional Sciences from the University of Illinois with honors and a BS in Biochemistry with honors from Eckerd College. His thesis research focused on protein and amino acid metabolism in skeletal muscle. He has been published in the Journal of Nutrition and presented research at experimental biology and ISSN symposiums. He is a reviewer for the Journal of the International Society of Sports Nutrition. He is also a competitive drug free bodybuilder & powerlifter and a contributing writer for Muscular Development Magazine. Dr. Norton is the owner of BioLayne LLC, a consulting company that focuses on optimizing nutrition and training variables in bodybuilders, fitness enthusiasts, and athletes.

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