I Love Leucine
Date: Saturday, March 10 @ 21:41:02 EST
Topic: Supplements

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Here is a question - which of the following macronutrients is "essential" in the human diet?

Your choices are:
A. Carbohydrate
B. Protein
C. Fat
D. All of the above
E. Two of the above

Note: the word "essential" as it refers to our diet means that we need to consume that food or nutrient because our bodies do not make that nutrient naturally. Hence, it is "essential" we get it in our diets.

Did you figure out the answer?

The Answer is…E.

Yes, that's right. Only two of the three are essential. They are **protein** (with amino acids as the building blocks) and **fat** (i.e. the essential fatty acids).

The Need for Protein

In the protein category, there are amino acids that are unique in their own right. They're the branched-chain amino acids (valine, leucine, and isoleucine). Of the three, BCAA leucine is very important. Here's why.

A recent study looked at the effects of dietary leucine supplementation on the exercise performance of outrigger canoeists. Thirteen (10 female, three male) competitive outrigger canoeists underwent testing before and after six-week supplementation with either

capsulated L-leucine (45 mg/kg.d, which is equal to 3.15 grams of leucine for a 154 lb individual) or placebo (corn flour). Testing included anthropometry, 10-second upper-body power and work and a row to exhaustion at 70-75% maximal aerobic power where perceived exertion (RPE), heart rate (HR) and plasma BCAA and tryptophan concentrations were assessed.

What happened?

Leucine supplementation resulted in significant increases in plasma leucine and total BCAA concentrations. Upper body power and work significantly increased in both groups after supplementation but ***power was significantly greater after leucine supplementation*** compared to the placebo.

Rowing time significantly increased and average RPE significantly decreased with leucine supplementation while these variables were unchanged with the placebo. Leucine supplementation had no effect on the plasma tryptophan to BCAA ratio, HR or anthropometric variables. Six weeks' dietary leucine supplementation significantly improved endurance performance and upper body power in outrigger canoeists.[1] As an amateur outrigger canoeist myself, I can testify to the benefits of the essential aminos, especially leucine!

During exercise, muscle protein synthesis decreases together with a net increase in protein degradation and stimulation of BCAA oxidation (the BCAAs are of course leucine, valine and isoleucine). The decrease in protein synthesis is associated with inhibition of translation initiation factors 4E and 4G and ribosomal protein S6 which are under regulatory controls of intracellular insulin signaling and leucine concentrations. In essence, both insulin and leucine are key regulators in muscle protein synthesis![2]

Another interesting tidbit is that leucine by itself increases muscle protein synthesis.[3] By combing leucine with protein and carbohydrate, you get quite the anabolic super-effect.

For example, in one study eight male subjects were randomly assigned to three trials in which they consumed drinks containing either carbohydrate (CHO), carbohydrate and protein (CHO+PRO), or carbohydrate, protein, and free leucine (CHO+PRO+Leu) following 45 min of resistance exercise. They discovered that plasma insulin response was higher in the CHO+PRO+Leu compared with the CHO and CHO+PRO trials. Whole body protein breakdown rates were lower, and whole body protein synthesis rates were higher, in the CHO+PRO and CHO+PRO+Leu trials compared with the CHO trial; moreover, the addition of leucine in the CHO+PRO+Leu trial resulted in a lower protein oxidation rate compared with the CHO+PRO trial.

And to top it off, muscle protein synthesis, measured over a 6-h period of post-exercise recovery, was significantly greater in the CHO+PRO+Leu trial compared with the CHO trial with intermediate values observed in the CHO+PRO trial.[4]

Leucine. It does the body good.

References

1. Crowe, M.J., J.N. Weatherson, and B.F. Bowden, Effects of dietary leucine supplementation on exercise performance. Eur J Appl Physiol, 2005: p. 1-9.
2. Norton, L.E. and D.K. Layman, Leucine regulates translation initiation of protein synthesis in skeletal muscle after exercise. J Nutr, 2006. 136(2): p. 533S-537S.
3. Lang, C.H., Elevated Plasma Free Fatty Acids Decrease Basal Protein Synthesis but Not the Anabolic Effect of Leucine in Skeletal Muscle. Am J Physiol Endocrinol Metab, 2006.
4. Koopman, R., et al., Combined ingestion of protein and free leucine with carbohydrate increases post-exercise muscle protein synthesis in vivo in male subjects. Am J Physiol Endocrinol Metab, 2005. 288(4): p. E645-53.

*You can meet and hear Jose Antonio in person at the **Second Annual Fat Loss Symposium in Dublin, Ireland (August 27-31 2007.)** To register and to take advantage of the early bird special contact Beverly@CharlesPoliquin.com.*