GRÄNDE
CUSTOM INGREDIENTS GROUP®

THE BEST WHEY PROTEIN IN SPORTS NUTRITION

Written by **Dave Taylor, PhD**

THE BEST WHEY PROTEIN
IN SPORTS NUTRITION

UNIQUE CHARACTERISTICS OF WHEY PROTEINS FOR SPORTS NUTRITION

Whey proteins have unique properties that enable them to be the ideal protein source for individuals participating in sports. Whey proteins have a very complete amino acid profile; this profile is almost identical to that of skeletal muscle and thus provides the necessary building blocks for muscle development (Ha and Zemel 2003). In addition, whey proteins ingredients, especially whey protein concentrates and isolates, are high in protein (containing important amino acids) and contain very little carbohydrate. These unique properties make them ideal tools for sports nutrition food formulators.

THE IMPORTANCE OF CYSTEINE & GLUTATHIONE

Cysteine is an amino acid that is responsible for many biological functions that are important to athletes. Cysteine is critical to the body's ability to preserve lean body tissue (muscle) during exercise (Kinscherf and others 1996). Cysteine is also important to the body's immune function, especially during oxidative stress that accompanies exercise (Sen and others 1994, Wu and others 2004). The result is improved exercise and physical performance.

Glutathione is an important part of the antioxidant/immune system that protects the body from illness and stress. One key function of glutathione is to preserve muscle mass and lean body tissue. Whey protein ingredients stimulate the production of glutathione and thus protect the body from illness as well as loss of lean body tissue (Droge and Home 1997).

BRANCHED CHAIN AMINO ACIDS & MUSCLE SYNTHESIS

Many food proteins are "complete" in that they have the necessary amino acids required for health. But many athletes and other sports enthusiasts look beyond basic health and desire muscle protein sources. Recent research suggests that a protein's ability to stimulate muscle development is related to its content of branched-chain amino acids (BCAA). Garlick and Grant (1998) reported that overall BCAA content was one of the most important factors in determining how much muscle synthesis a food protein was responsible for. It was also shown that proteins high in BCAA (such as whey) were much more effective than soy protein in stimulating muscle synthesis (Fouilett and others 2002). BCAA help stimulate the production of glutamine, which is an essential amino acid building block for muscle development (Rowbottom and others 1996).

It was discovered that leucine specifically plays an important role in protein synthesis. Leucine is one of the BCAA and is unusually abundant in whey protein at approximately 10% of amino acids present. Leucine is involved in the phosphorylation of proteins that control mRNA binding to ribosomes (Anthony and others 2001). Without this binding, protein synthesis cannot proceed. Other research showed that leucine may be involved in other signaling pathways vital to protein anabolism (Kimball 2002). This research suggests that any protein's ability to stimulate

muscle synthesis might be directly related to its content of leucine. In addition, leucine works together with insulin to allow skeletal muscle to coordinate protein synthesis with physiological state and dietary intake (Norton and Layman 2006).

Whey proteins are one of the highest sources of both BCAA and leucine among common protein ingredients (see table). Food formulators who wish to incorporate high amounts of BCAA and amino acids should use a whey protein ingredient, such as whey protein isolate or concentrate.

PHOSPHOLIPIDS & SPORTS NUTRITION

Phospholipids are important components of cellular membranes and have many biological functions within the human body. Phospholipids are found in many foods, including whey protein ingredients. Recent research suggests that consumption of phospholipid-enriched foods, primarily before intense physical activity, can improve many aspects of sports performance. Some of the reported benefits of phospholipid consumption include positive mental and physical stress relationships, e.g., reduced muscle soreness after exercise and improved exercise capacity (Jager and others 2007).

CONCLUSIONS

Although the absolute and specific benefits of whey protein in sports nutrition are still being determined, many positive aspects are already studied and apparent. These include the preservation of lean muscle tissue through the amino acid cysteine, muscle synthesis by leucine and other BCAA, and improved exercise capacity with phospholipids. Whey proteins are an important tool for formulators who wish to create products to meet the needs of today's athletes and sports enthusiasts.

REFERENCES

Ha E, Zemel MB. 2003. Functional properties of whey, whey components, and essential amino acids: mechanisms underlying health benefits for active people. J Nutr Biochem 14:251-258.

Kinscherf R, Hack V, Fischbach T. 1996. Low plasma glutamine in combination with high glutamate levels indicate risk for loss of body cell mass in healthy individuals: the effect of N-acetyl-cysteine. J Mol Med 74:393-400.

Sen CK, Atalay M, Hanninen O. 1994. Exercise-induced oxidative stress: glutathione supplementation and deficiency. J Appl Physiol 77:2177-21878.

Wu G, Fang Y, Yang S, Lupton JR, Turner ND. 2004. Glutathione metabolism and its implications for health. J Nutr 134:789-792.

Droge W, Holm E. 1997. Role of cysteine and glutathione in HIV infection and other diseases associated with muscle wasting and immunological dysfunction. FASEB J 11:1077-1089.

Fouillet H, Mariotti F, Gaudichon C, Bos C, Tome D. 2002. Peripheral and splanchnic metabolism of dietary nitrogen are differently affected by the protein source in humans as assessed by compartmental modeling. J Nutr 132:125–33.

Rowbottom DG, Keast D, Morton AR. 1996. The emerging role of glutamine as an indicator of exercise stress and overtraining. Sports Med 21(2):80-97.

Garlick PJ, Grant I. 1988. Amino acid infusion increases the sensitivity of muscle protein synthesis in vivo to insulin. Effect of branched-chain amino acids. Biochem J 254:579–84.

Anthony JC, Anthony TG, Kimball SR, Jefferson LS. 2001. Signaling pathways involved in translational control of protein synthesis in skeletal muscle by leucine. J Nutr 131:856S–860S.

Kimball SR. 2002. Regulation of global and specific mRNA translation by amino acids. J Nutr 132:883–6.

Norton LE, Layman DK. 2006. Leucine Regulates Translation Initiation of Protein Synthesis in Skeletal Muscle after Exercise. J Nutr 136:533S–S537.

Jager R, Purpura M, Kingsley M. 2007. Phospholipids and sports performance. J Int Soc Sports Nutr 4:5.

Layman DK. 2003. The role of leucine in weight loss diets and glucose homeostasis. J Nutr. 261S-267S.

BRANCHED-CHAIN AMINO ACIDS (BCAA) & LEUCINE CONTENT OF SEVERAL PROTEINS

PROTEIN SOURCE	BCAA CONTENT	LEUCINE CONTENT
WHEY PROTEIN ISOLATE	26%	14%
CASEIN	23%	10%
EGG PROTEIN	20%	9%
SOY PROTEIN	18%	8%
WHEAT PROTEIN	15%	7%

Adapted from Layman (2003)