Future Research with GPLC Related to Exercise Performance

Although many athletes may not be highly interested in the scientific research, it is important to understand that anecdotal (i.e., in the gym) accounts related to sport supplements (or anything for that matter) will be more widely accepted if they are supported by hard evidence, gathered in a controlled scientific environment. This is exactly what is currently being done concerning GPLC—rigorous laboratory based scientific research. Two to three new studies involving GPLC should be completed within the next year, pertaining specifically to the exercise performance enhancing aspects of this ingredient. Stay tuned!

References

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White Paper:

Glycine Propionyl-L-Carnitine (GPLC-GlycoCarn®) and Exercise Metabolism

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Introduction

Athletes and fitness enthusiasts are constantly looking for methods to improve exercise performance and to lose additional body fat. In this quest, individuals look towards advanced exercise training methods, dietary strategies, and nutritional supplements. Pertaining to the latter, several products are available, some with a substantial body of evidence in support of their use (e.g., creatine, caffeine), and many more with little to no evidence indicating beneficial effects on either exercise performance or body composition.

The novel ingredient Glycine Propionyl-L-Carnitine (GPLC) is a component of several new nutritional supplements which are now commercially available, with the potential to influence the above parameters. While controlled research studies to support the use of GPLC as a performance enhancer have yet to be conducted, two recent reports indicate a potent effect of this compound on elevating blood nitric oxide (Bloomer et al., 2007; Bloomer et al., in press), as well as decreasing free radical medicated modifications to blood lipids (Bloomer et al., in press). Both of these findings may be linked to improved exercise performance, as nitric oxide is responsible for increasing blood flow to active tissues (Collier and Vallance, 1991), and free radicals are known to interfere with physical performance (Goldhaber and Qayyum, 2000) and to promote greater fatigue rates in skeletal muscle (Reid et al., 2001).

Glycine Propionyl-L-Carnitine is marketed as GlycoCarn® through Sigma-tau HealthScience, Inc. This ingredient consists of a molecular bonded form of propionyl-L-carnitine and one of the carnitine precursor amino acids, glycine. Propionyl-L-carnitine is a form of carnitine with high specificity towards both skeletal muscle and heart tissue, and has been reported to possess benefits beyond those observed with typical L-carnitine (Brevetti et al., 1999; Fritz, 1979). The following text discusses how this novel ingredient might aid exercise performance, while simultaneously leading to body fat loss in certain individuals.

GPLC and Fatty Acid Transport

The process of fat "burning" involves a complex interplay of several factors including 1) Fatty acid mobilization from storage sites (i.e., fat cells), 2) Transport of fatty acids to the target tissue, 3) Uptake of fatty acids into the cell, 4) Activation of fatty acids via an ATP dependent process, 5) Movement of activated long chain fatty acids into the inner mitochondrial matrix (via the carnitine dependent enzymes called carnitine acyl transferase 1 (CAT1) and carnitine acyl transferase 2 (CAT2), 6) Degrading fatty acids into the final products which will be used for energy production (acetyl CoA and the electron carriers NADH and FADH2) via a process called beta oxidation, and 7) Krebs cycle and electron transport chain (the pathways where ATP energy is produced from the products created within beta oxidation). Based on the above, it is evident that this is a rather complex process. Where GPLC may play an important role is step number 5, in which carnitine is essential for the actual transport of fatty acids inside the mitochondrial matrix in order to be oxidized. Without adequate carnitine, this process does not proceed as desired. To this end, GPLC has been noted to result in a modest decrease in body fat percentage in subjects supplemented with this compound for a period of eight weeks, when combined with aerobic exercise (Bloomer et al., in press).

GPLC and Aerobic Exercise Performance

The ability of GPLC to aid in fatty acid transport during exercise has specific implications related to both fatty acid usage and glycogen depletion. That is, when additional fat is used as a fuel source, not only is there a greater possibility of fat loss, but there exists less reliance on stored glycogen (i.e., stored carbohydrate) to fuel exercise. This is particularly important as it relates to long duration exercise during which time glycogen stores may be compromised. An equally important consideration is related to the potential for lower lactate production during exercise, which occurs as a component of carbohydrate (glucose and glycogen) oxidation through a process known as glycolysis. Therefore, less reliance on carbohydrate during exercise may lead to both extended exercise duration (due to more glycogen remaining available for fuel) and less acute muscle pain/burning (due to lower lactate accumulation). Ongoing research studies addressing GPLC and these issues are now being conducted/designed at Universities across the USA.

GPLC and Anaerobic Exercise Performance

First of all, for many athletes participating exclusively in anaerobic exercise such as weightlifting (e.g., bodybuilders), carbohydrate intake is often low in comparison to aerobic athletes. Therefore, the ability of GPLC to enhance fat oxidation to minimize glycogen loss appears to be an important consideration, due to the fact that individuals consuming a low carbohydrate diet may not have abundant glycogen stores to begin with.

In terms of anaerobic performance measures such as reduced recovery intervals between sets and increased rep number per set, GPLC may prove beneficial based on recent work demonstrating an increase in blood nitric oxide production when resistance trained men were supplemented with GPLC (Bloomer et al., 2007). In this study resistance trained men received GPLC or a placebo for four weeks each, with a two week washout period between each four week phase. At the end of each four week phase, blood samples were obtained at rest and in response to isometric forearm exercise. Blood nitric oxide was elevated to a greater extent in response to the forearm exercise with GPLC compared to placebo. This was the first study to demonstrate that a dietary ingredient can stimulate an increase in blood nitric oxide in resistance trained men.

Although this study only measured blood nitric oxide and did not measure indices of exercise performance, it is important to note the potential benefits of increased nitric oxide related to exercise performance, as well as exercise recovery. In terms of performance, the increase in nitric oxide may be associated with an increase in blood flow to working skeletal muscle, which in turn may be associated with a greater delivery of oxygen and nutrients such as fatty acids, glucose, and amino acids. The increase in oxygen and nutrient delivery may increase work capacity during an acute bout of exercise due to greater ATP production. In terms of recovery, greater nutrient delivery may facilitate glycogen resynthesis, as well as promote an anabolic environment (decreased proteolysis and increased protein synthesis). While controlled studies using GPLC have yet to be conducted to test the ability of this ingredient to improve anaerobic exercise performance in trained athletes, PLC alone has been reported to increase lower body strength (Barker et al., 2001). However, the subjects in this study suffered with peripheral artery disease; therefore findings may not be generalized to athletes, as individuals with disease are often carnitine deficient with altered carnitine metabolism. Additional work is needed using GPLC in a sample of trained athletes in order to determine the benefit of this ingredient related to these important issues of exercise performance and recovery.

What are Athletes Saying about GPLC?

Although the following claims and statements in no way represent data obtained in controlled, scientific experiments, athletes conducting "in the gym" testing of GPLC over the past several months have made some interesting comments. A few include "better pumps", "enhanced vigor", "great workout", "increased stamina", "I feel I can keep on going", "shortened recovery between sets", "just a different feeling all together", "a major ingredient in my formula for success" and so on. This may be one ingredient with the potential to make a real impact on the sports supplement market. Keep your eyes open for new products emerging monthly which contain GPLC.