ALBION®
HUMAN NUTRITION

RESEARCH NOTES

A COMPILATION OF VITAL RESEARCH UPDATES ON HUMAN NUTRITION

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CREATINE POTENTIAL

Everyone has heard about the potential benefits of creatine supplementation for certain types of sport performance, as well as skeletal muscle enhancement. In the last issue of Albion Research Notes (vol. 8, No. 2, June 1999), the cardiovascular benefits of creatine were reviewed. A key point in that issue was that creatine and magnesium effects have a definite overlap in specific areas of muscle energy biochemistry, particularly in the generation of the ATP needed for muscle contraction.

Research findings on the potential applications of creatine, as well as those for magnesium, are continuing to expand. It is interesting to surmise how the benefits and application overlap may eventually be traced to their obvious biochemical interrelationship.

Let's take a brief look at some other findings of note on creatine, taken from its now mushrooming library of research.

Blood Lipids

In a randomized placebo controlled trial (Clinical Science 91:113-118 1996), creatine's effect on the blood lipids was evaluated on a group of 34 patients (18 men, 16 women). The creatine supplemented group showed significant reductions in plasma total cholesterol, triglycerides and VLDL-C. This study, although preliminary, clearly indicated that creatine supplementation had a modulating effect on lipid metabolism.

Neuromuscular

A recently completed study at McMaster University Medical Center [Neurology 52(4):854-7, 1999 Mar 10] evaluated the effects of creatine monohydrate supplementation on patients with neuromuscular disease. Creatine was found to increase all measured induces in the study, most importantly: handgrip, dorsiflexion, and knee extensor strength. The patients studied were suffering from diseases such as muscular dystrophy and amylotrophic lateral sclerosis (Lou Gehrig's) and had 10% to 15% improvements in their ability to perform high intensity exercises on the creatine monohydrate program.

Even more recently, another study [Muscle Nerve 22(9):1228- 33, 1999 Sep] was conducted on an array of related neuromuscular disorders. There is a group of neuromuscular disorders with associated reductions in intramuscular ATP and/or phosphocreatine. In this study, the researchers prospectively studied total creatine, phosphocreatine and ATP in muscle biopsies of normal patients and those from mixed groupings of neuromuscular diseased patients via direct biochemical analysis. The overall finding of reduced high energy phosphate compounds in the neuromuscular patients provided the researchers with evidence that these patients would benefit from creatine supplementation.

Cardiovascular

There have been more than a few studies that have looked at the effects of administrating creatine to patients with heart disorders, and in particular, congestive heart failure or disease. In a published study [Clin Ter 144(4): 34-8 1994 Apr], the hemodynamic effects of the acute and continued use of creatine (as phosphate) on a group of patients suffering from heart failure was evaluated. The acute dose of creatine by I.V. caused a significant improvement in cardiac ejection volume and contractility and over the course of the continued used of creatine, further significant improvements in cardiac function were seen.

It was further shown in a double-blind, placebo-controlled study [Clin

Cardiol 19(9):699- 703 1996 Sep] that patients suffering from a particular form of congestive heart disease benefited from the administration of creatine while receiving conventional congestive heart drug therapy. The patients receiving creatine in this study exhibited significant improvements in eight different measures of cardiac function.

It is important to note that in an even more recent related study [Eur J Clin Invest 29(6):469-77 1999 Jun] that evaluated the myocardial energy metabolism of the human heart at end-stage heart failure, the researchers concluded that despite different mechanisms causing the heart failure in the patients studied, the actual metabolic changes were basically the same. All suffered depletion of heart muscle creatine levels.

Mixed Message to Diabetics

It has been observed that creatine may well offer some protection to diabetics [Med Hypotheses 45,1:41-4 1995 Jul]. Diabetics exhibit a greater incidence of cardiovascular disease than non-diabetics. The atherosclerotic changes in diabetes involve glycation of heart muscle cell membrane proteins. It is believed that elevated creatine levels may protect against the formation of glycation producers.

A study (Nephron 67;2:214-7 1994) on creatine in diabetic animals has also pointed out that creatine, at a dose of 50mg/kg/day, reduced the aberrant formation of collagen type IV in the diabetic kidney.

Diabetics are prone to lose lean muscle mass, and ingestion of supplemental creatine has been seen to have a positive effect on lean muscle mass. Certainly, one could see a real rationale for recommending creatine supplementation for certain diabetic sufferers.

On the other hand, the research on enhancing retention or muscle accumulation of creatine can cause some concern. Current thinking has carbohydrate (mostly sugar) ingestion viewed as preferred with creatine dosing. Green, et al [Acta Physiol Scand 158(2):195-202 1996 Oct) found that the administration of 5 grams of creatine along with 93 grams of simple carbohydrate (sugar) augmented creatine retention, and mentioned the insulin level spike seen with this program as an important factor. In a later study, at the same institution (A J Physiol 275: E974-9 1998 Dec), it was observed that insulin can enhance muscle creatine accumulation in humans, but only when present in high or supraphysiological concentrations. This is probably due to an insulin-mediated increase in muscle creatine transport.

From this it would appear that the factors that optimize creatine retention are at odds with a diabetic's insulin status, as well as their needed dietary restrictions.

Maybe a more physiologically acceptable form of creatine could get around this.

Magnesium Creatine Chelates Outperforms Creatine Monohydrate!

As mentioned in the June 1999, issue of Albion Research Notes (Volume 8, No. 2) and depicted in Figure 1 below, Magnesium and Creatine are intimately intertwined in the energy producing CPK Reaction.

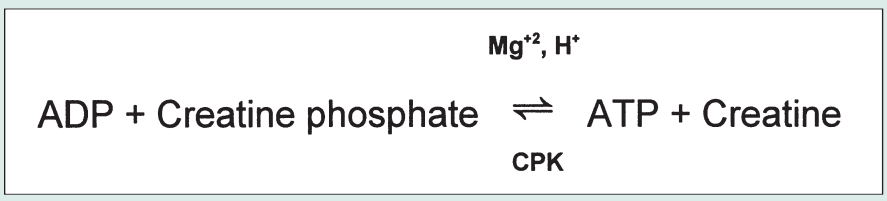

Figure 1

The vast majority of energy required for high intensity, anaerobic activity is derived from the CPK and the Myokinase reactions. The formation of ATP via the Myokinase reaction needs magnesium to catalyze the ATP formation and the CPK reactions require creatine and magnesium, as well, to cycle formation of the ATP needed for muscle contraction. Only Albion has combined the forces of magnesium and creatine into a single synergistic and patented molecule.

Although creatine (as monohydrate) has been shown to be a very

effective substance, it is important to note that creatine is susceptible to cyclization. It may be that the molecular configuration of creatine (Fig. 2 below), with the amino croup (NH) gamma to the carboxylic acid (COOH), makes it prey to acid hydrolysis. Whatever the rationale, it has been clearly shown that creatine has a propensity to form creatinine, under acidic conditions (Fig. 2 below).

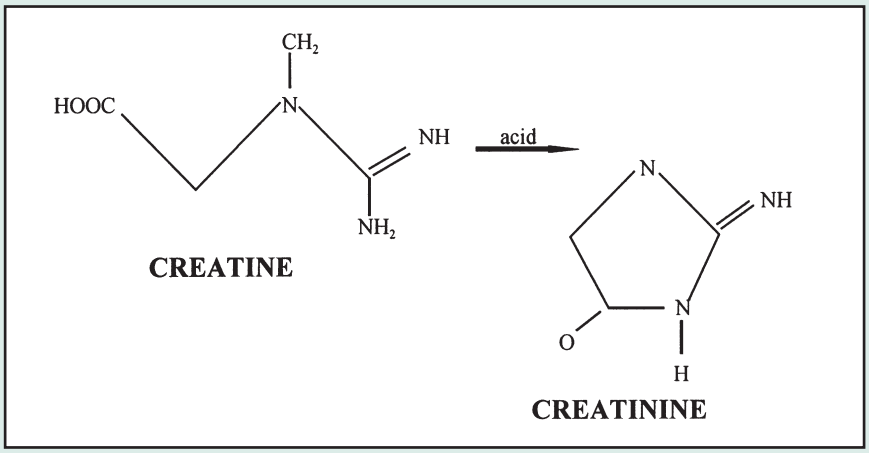

Figure 2

In fact, in acidic aqueous solutions, the formation of creatinine from creatine is nearly total and irreversible. From this, one can see that a great deal of creatine can be transformed irreversibly into creatinine, when exposed to the stomach's acidic conditions. Once creatinine is formed, it is no longer of any physiological benefit. The formation of a chelate of creatine with magnesium using patented Albion technology, can protect the creatine from this cyclization and make higher quantities of the physiologically active form of creatine available to the metabolic activities of the muscle cells and yield a higher energy status. Obviously, the Magnesium Creatine Chelate will also serve to provide effective quantities of bioavailable magnesium, which along with its many other effects, will work intensely along with creatine to increase the muscle's ability to generate and recycle energy in the form of ATP.

Study Shows Magnesium Creatine Chelate Is A Tremendous Energy Source

Study Overview

In a controlled animal study, Albion's new patented Magnesium Creatine Chelate was compared to creatine monohydrate, creatine monohydrate plus magnesium oxide, and creatine monohydrate plus magnesium amino acid chelate. In the study, the animals were given equivalent doses of creatine.

The animals who had magnesium added to the creatine monohydrate, were given equivalent elemental amounts of magnesium, as magnesium oxide or magnesium chelate. The control group received no supplement of creatine or magnesium.

The animals in each group were then swam until exhaustion. The mean times required for each research group are listed in the first table. The differences in average time required for each group to reach exhaustion are listed in the "difference" column. The animals were rested for 30 minutes and were swam to exhaustion a second time. The average times required for each group to reach exhaustion are listed in the 2nd swim time column in the first table. The differences are again listed in the appropriate column in this table.

Table 2 lists the swim times for each group that were attained at each swim, along with the change seen in each group from the 1st swim to 2nd swim.

Table 3 lists and ranks the performance improvement seen between the supplemented groups.

The study evaluated the improvement seen in the endurance of the subjects via the various supplement regimens. The improvement in time required to be swam to exhaustion in the 1st, 2nd and total swim times can be used to evaluate the endurance improvement of the various supplement regimens. The changes in time needed to reach exhaustion observed between the 1st and 2nd swim can be used to evaluate the effect that the supplement

Table 1

Group	1st Swim Time	Difference	2nd Swim Time	Difference
Control	178.8 sec		158.0 sec	
Creatine	233.6 sec	+54.8 sec	236.5 sec	+78.5 sec
Creatine + MgO	204.0 sec	+25.2 sec	196.0 sec	+38.0 sec
Creatine + Mg/Chelate	229.3 sec	+50.5 sec	229.4 sec	+71.4 sec
Mg/Creatine Chelate	243.6 sec	+64.8 sec.	249.0 sec	+91.0 sec

Table 2

Group	1st Swim Time	2nd Swim Time	Change
Control	178.8 sec	158.0 sec	-20.8 sec
Creatine	233.6 sec	236.5 sec	2.9 sec
Creatine + MgO	204.0 sec	196.0 sec	-8.0 sec
Creatine + Mg/Chelate	229.3 sec	229.4 sec	+0.1 sec
Mg/Creatine Chelate	243.6 sec	249.0 sec	+5.4 sec

Table 3

Group	1st Swim Time	2nd Swim Time	Total Improvement
Mg/Creatine Chelate	+64.8 sec	+91.0 sec	+155.8 sec
Creatine	+54.8 sec	+78.5 sec	+133.3 sec
Creatine + Mg/Chelate	+50.5 sec	+71.4 sec	+121.9 sec
Creatine + MgO	+25.2 sec	+38.0 sec	+63.2 sec

regimens had on the ability of the subjects to recover from exercise.

Discussion

Albion Laboratories has developed an exclusive improved form of creatine. Using Albion's patented mineral chelate technology, Albion's R & D team developed a true magnesium creatine chelate, from magnesium and creatine. It is believed that by making a true chelate of this form, the benefits of both magnesium and creatine will be magnified due to the better absorption and utilization characteristics of a nutritionally functional chelate.

Although the data depicted are the raw data from a recently conducted animal study, and has not been subjected to statistical analysis, it is apparent that this new patented Magnesium Creatine Chelate out performs creatine monohydrate, as well as other combination regimens of magnesiums and creatine monohydrates in a big way.

The Magnesium Creatine Chelate supplemented group out performed the creatine monohydrate and the magnesium plus creatine monohydrate groups by a wide margin on the initial endurance swim. The Magnesium Creatine Chelate group widened its margin of superiority on the second endurance swim. It is apparent that Albion's Magnesium Creatine Chelate does a tremendous job in enhancing the body's ability to generate and regenerate the ATP needed to provide the energy needed for muscular performance.

Consider This!

In the study just reviewed, Albion's new Magnesium Creatine Chelate clearly outperformed creatine, as well as combinations of creatine with a couple of different forms of magnesium. Given the roles that magnesium and creatine play in the generation of energy needed for muscular performance, it would make sense that a substance that provides both magnesium and creatine in a synergistic form would outperform creatine alone. Empirically, this would surely follow. But why would this new Magnesium Creatine Chelate outperform combinations of creatine and magnesium oxide, let alone creatine and magnesium amino acid chelate?

Here are a few ideas to consider:

1. It is very possible that the formation of the Magnesium Creatine Chelate may protect the creatine from the cyclization of creatine to creatinine in the acidic pH of the stomach, and thus make more active creatine available to the bloodstream for subsequent incorporation into the cells of the muscle.

2. One of Albion's patents involves the ability to target tissues for greater accumulation of their biochemical components through the formation of a chelate that combines the right mineral and ligand components. It may very well be that Magnesium Creatine Chelate is that type of combination. Its performance may be a reflection of the fact that it is behaving as a Chelazone®.

3. The magnesium and the creatine in this new chelate may be more bioavailable than the creatine and magnesium supplements taken separately, and/or the chelate components are retained better by the body's tissues than the separately administered equivalents.

The New Magnesium Creatine Chelate From Albion May Be Opening New Doors To Ways To Improve The Health And Performance Of The Human Body.

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