

# Natural Supplement Delays Muscle Fatigue, Improves Athletic Performance

## Creatine Improves the Ability to Maintain Maximal Performance

Recent studies reveal that creatine supplements can significantly increase exercise and athletic performance by delaying the development of fatigue. Unlike anabolic steroids, creatine does not alter muscle size and structure, but improves the ability to maintain maximal performance.<sup>(1)</sup>

Increasing the muscle creatine content can provide the following benefits:

- Provides a greater initial store of creatine phosphate to make more energy immediately available at the beginning of exercise.<sup>(1)</sup>
- Greater resistance to fatigue caused by build-up of hydrogen ions from lactic acid production.<sup>(1)</sup>
- Allows for faster recovery after exercise.<sup>(1,4)</sup>
- Speeds and enhances muscle recovery following injury.<sup>(6)</sup>
- Reduces the formation of free radicals which are a contributing factor in the development of muscle soreness following strenuous activity.<sup>(1)</sup>
- Suppresses acute and chronic inflammatory responses and exhibits analgesic activity.<sup>(5)</sup>

## Creatine Used by Athletes in 1992 Olympics

In two separate human studies, creatine supplementation significantly reduced fatigue, enabling subjects to perform for longer periods at speeds close to maximum. It is also believed that creatine allows the muscles to recover from intense activity much faster.<sup>(4)</sup>

Prior to the 1992 Olympic games in Barcelona, British athletes were provided with a creatine supplement. Although the dosage given the athletes was lower than that used in the studies, reports that came back were highly encouraging and correlated well with laboratory results. Many of the athletes went on to win medals. Although there is no proof that they would not have won without the supplement, creatine supplements are now widely used by British athletes.<sup>(1,2,4)</sup>

This small molecular weight compound, similar in size to an amino acid, is a natural component of the human diet. Creatine is also manufactured by the liver and kidneys from the amino acids arginine and glycine and stored in the skeletal muscles, heart, brain, spermatozoa and the retina of the eye. The highest concentration is in skeletal

### CREATINE CAPSULES

#### *Pharmaceutical Grade Creatine Monohydrate*

Product No. 895      Fill Size: 180 capsules

Each Capsule Supplies:

Creatine Monohydrate . . . . . 500 mg.

100% pure, pharmaceutical grade creatine monohydrate. Contains no animal products.

Recommended Dosage: Take 5 capsules twice daily (5 grams) with 10-12 ounces of water or juice.\*

### CREATINE POWDER

#### *Pharmaceutical Grade Creatine Monohydrate*

Product No. 825      Fill Size: 100 grams

One Teaspoon Supplies:

Creatine Monohydrate . . . . . 5 grams

100% pure, pharmaceutical grade creatine monohydrate. Contains no animal products.

Recommended Dosage: Take ½ teaspoon mixed with 10-12 oz. of water or juice twice daily.\*

\*A recent scientific study by a major midwestern university concluded that the "loading phase" of creatine supplementation is unnecessary.

muscle, accounting for more than 95% of the total body pool.<sup>(1,3,4)</sup>

## Natural Precursor for Rapid Regeneration of Muscle-Fueling ATP

At rest, between 60% and 90% of creatine stored in the muscle is in the form of creatine phosphate. Creatine phosphate fuels the process of muscle contraction through its vital role in the creation of adenosine triphosphate (ATP), the primary compound which converts food into energy.<sup>(1,4)</sup>

When muscles contract, ATP is broken down to ADP (adenosine diphosphate) and immediate energy is released. Since very small quantities of ATP are stored within the muscle cell, it must constantly be replenished. Creatine phosphate donates its phosphate group to ADP to rapidly regenerate ATP. When high concentrations of creatine phosphate are present, the body can quickly release the large amounts of ATP needed to sustain muscular contractions.<sup>(1)</sup>

Creatine phosphate is also involved in the transfer of energy within the muscle cell. ATP, produced

(over)

in the mitochondria from the aerobic metabolism of fats and carbohydrates, must be transported to the site of muscular contraction.

Creatine and creatine phosphate “shuttle” this energy from the mitochondria to the contractile elements where it can be used to fuel activity.<sup>(1)</sup>

## Creatine Delays Muscle Fatigue and Speeds Recovery

In addition to supplying energy, creatine phosphate is also important in regulating the acidity of the muscle cell. Hydrogen ions released from lactic acid formed during intense activity are absorbed when creatine phosphate is broken down to produce ATP. This prevents a build-up of hydrogen ions which interfere with the contraction process and cause fatigue. This “buffering” action allows the muscle to continue to work at a high intensity for longer periods.<sup>(1)</sup>

Rapid regeneration of ATP by creatine phosphate also prevents the build-up of ADP in the muscle cell. A high concentration of ADP is the starting point for further degradation resulting in the formation of membrane-damaging free radicals. Thus, creatine affords some protection against damage to muscle cells following strenuous activity.<sup>(1)</sup>

Creatine also aids in muscle recovery following injury. Thirty patients over 60 years old suffered from muscle hypotrophy of the lower limbs due to fracture of the thigh. Half the patients were given creatine supplements and all patients had physical therapy. After 20 days, the creatine group had an increase in muscle mass of 4.4 mm; the others increased only 1.5 mm.<sup>(6)</sup>

In animal studies, creatine supplements were as effective as phenylbutazone in suppressing acute and chronic inflammatory responses and did not produce GI ulceration. Creatine also exhibited analgesic activity.<sup>(5)</sup>

### Who Needs Creatine Supplements?

Anyone who exercises can benefit from creatine supplementation, from professional athletes to occasional or three-times-a-week exercisers, to the weekend warrior or gardener, to patients recovering in physical therapy. Increasing muscle creatine content can provide more immediate energy, greater resistance to fatigue, faster recovery rate and reduced formation of free radicals which contribute to the development of muscle soreness following strenuous exercise.<sup>(1)</sup>

The daily creatine requirement of a 160 pound man is estimated at 2 grams per day. Dietary creatine is available in meat and fish. Fresh, uncooked meat or fish contains approximately 4g

of creatine per kg, but this decreases significantly following storage and cooking. The highest consumption of creatine is probably in Japan, where eating sushi may provide up to 2-3 grams per day. In contrast, the typical Western diet may include as little as ½ gram per day and vegetarians don't get any.<sup>(1-4)</sup>

Research has shown that, with regular supplementation, the creatine content of muscle can be increased by up to 50% in some individuals. The greatest increase is seen in those with low muscle creatine content. Those already at the top of the range will see minimal increases.<sup>(1)</sup>

In preliminary trials, even race horses have shown an increase in performance and recovery when given creatine supplements. Although creatine is not a significant component of the horse diet, it may have a very important function in competition and help prevent muscle problems related to acute acidosis.<sup>(4)</sup>

When supplementing with creatine, a daily dose of 2-5 grams is suggested. A recent scientific study by a major midwestern university concluded that initial “loading” with creatine is unnecessary. Because there is a limit to the amount of creatine that can be taken into the muscles, continuous high doses provide no additional benefit. Excesses are excreted in the urine.<sup>(1)</sup>

WARNING: This information is provided for health care professionals only. **This publication and the product contained herein have not been approved or evaluated by the Food and Drug Administration. This publication, and the product contained herein are not intended to diagnose, treat, cure or prevent any disease.** The product relates to nutritional support only.

### References

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