American Society of Exercise Physiologists
2nd Annual Meeting, 1999
Abstract # __6___ Submission Category and Topic: __Invited Topic__

Creatine Supplementation: What the Exercise Physiologist Needs to Know

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Creatine is an amino acid that is synthesized endogenously from glycine, arginine, methionine or obtained in small amounts (0 to 1 g/d) from the diet from meat and fish. Normal daily creatine turnover is about 2% or 1-2 g/d. Creatine is primarily stored in the muscle as free creatine and phosphocreatine (PC). Normal muscle creatine content is about 125 mmol/kg dry mass while normal PC content is about 65 mmol/kg dry mass. The muscle has the capacity to retain about 160 mmol/kg dry mass of creatine and 100 mmol/kg dry mass of PC. Over 250 research studies have evaluated the effects of creatine supplementation on muscle physiology and/or exercise capacity in healthy, trained, and various diseased populations. Short-term creatine supplementation (15 to 25 g/d for 5 to 7-d) has been reported to increase total creatine content by 15 to 30% and PC stores by 10 to 40%. Of the approximately 150 studies evaluating the ergogenic value of creatine supplementation, about 65% of these studies report statistically significant results. Remaining studies generally report non-significant gains in performance. No studies report a statistically significant ergolytic effect. For example, short-term creatine supplementation has been reported to improve maximal power/strength (5-15%), work performed during sets of maximal effort muscle contractions (5-15%), single-effort sprint performance (1-5%), and work performed during repetitive sprint performance (5-15%). Moreover, long-term supplementation of creatine or creatine containing supplements (15 to 25 g/d for 5 to 7-d and 2 to 25 g/d thereafter for 7-d to 5-yrs) has been reported to promote significantly greater gains in strength, sprint performance, and fat free mass during training. For this reason, potential clinical uses of creatine supplementation are now being explored in heart failure patients, patients with creatine synthesis deficiencies, patients with neuromuscular diseases, the elderly, and for rehabilitation from musculoskeletal injury. No clinical study has reported any side effects from creatine supplementation other than weight gain. However, concerns have been raised primarily in the popular media regarding unknown long-term side effects on vital organs (e.g., brain, heart, kidney, liver, muscle) and the ethics of taking a performance enhancing supplement. Additionally, there have been anecdotal reports of greater incidence of muscle cramping, heat intolerance, and injury. Although there is no scientific data to support these concerns, they have prompted many athletes and athletic organizations to reconsider whether to take or provide creatine to their athletes. This presentation will provide a comprehensive overview of the literature regarding creatine supplementation so that the exercise physiologist will know fact from fallacy.

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