Creatine use by adolescents not recommended due to limited data

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If you have not been asked by a patient or a parent about the use of creatine, you probably will be soon.

Creatine is the most common performance-enhancing substance used by adolescents. Clearly, most of the adolescents who use creatine are athletes.

Both male and female adolescent athletes use creatine, with a preponderance being male. Recent studies among high school athletes reveal that students in almost all sports use creatine. A recent study of Wisconsin high school football players showed that 30% were taking creatine, and more than 50% of the seniors playing varsity football were using the substance.

Creatine is considered a legal substance, and no sports governing body tests for it.

What is creatine?

Creatine, a non-essential amino acid, is formed from arginine, methionine and glycine and is produced by the liver, kidneys, and pancreas. Ninety-five percent of the bodily stores are muscle. Creatine is naturally present in the diet, mainly in meat and fish. The daily requirement of creatine is 2 grams, with half this amount provided from normal diet and half from endogenous production.

How creatine works in cells

Muscle creatine stores are in a balanced equilibrium with creatine and phosphocreatine interconverted via creatine kinase. Phosphocreatine provides energy to the muscle by its dephosphorylation, which donates a phosphate to adenosine diphosphate producing adenosine triphosphate. Phosphocreatine availability is considered the limiting factor in short, high-intensity activities since it provides muscle with the major energy source over the first 10 seconds of anaerobic activity.

Oral supplementation of creatine can cause an approximately 20% increase in muscle phosphocreatine stores, quicken the replenishment of phosphocreatine during recovery and potentially delay muscle fatigue.

Dosing for increased athletic performance

According to the Micromedix Healthcare Series (1975-2007), creatine is recommended to be taken for increased athletic performance in a loading phase, with athletes consuming 5 grams four times a day for the first six days. The standard dose is 2 g/day for the next three months. Creatine taken in excess of this amount is excreted by the kidneys as creatinine (McNaughton LR, et al. Eur J Appl Physiol. 1998;78:236-240).

Effects on athletic performance

Creatine supplementation appears to have athletic benefits in some people. Although creatine has been studied extensively in adults, there is considerably less information on the ergogenic (tending to increase work output) value of creatine in adolescents. In adult studies, approximately 30% of athletes do not receive any benefits from creatine use and are considered “non-responders” who are theorized to have already maximal phosphocreatine stores.

Most common performance effects are seen in increasing strength and outcomes in short duration aerobic events.

Studies in adolescents have shown that creatine did improve athletes’ (mean age 15.3 years) performance in a 100-meter swim. However, creatine use also was associated with decreased swim times in subsequent 100-meter swims.
A study of soccer players (mean age 16.6 years) showed that creatine supplementation improved soccer-specific activities, especially sprint power, dribbling test and vertical jump. Although these limited studies are far from conclusive evidence of the ergogenic benefits of creatine in adolescents, they seem to indicate that some adolescents in some sports may benefit from the use of creatine (Calfee R, Fadale P. *Pediatrics.* 2006;117:577-589).

**Adverse effects of creatine**

At conventional doses, creatine appears to be safe in healthy athletes. Most controlled studies report an absence of significant side effects, do not address the issue of side effects or report no difference in the incidence of side effects between creatine and placebo groups.

There have been two case reports of transient compromised renal function in adult athletes using creatine, one with pre-existing renal disease.

Following are concerns about adolescent use of creatine:

1. Creatine use in adolescent has not been studied extensively and, therefore cannot be recommended.
2. Adolescent use of creatine often is unsupervised, and adolescents may be using more than the recommended amount. The consequences of this are unknown.
3. It is speculated that if adolescents get the desired effect from using creatine, such as increasing muscle size, they may move on to testosterone and other anabolic steroids (“gateway theory”).
4. The purity and safety of any nutraceutical, including creatine, cannot be assured.
5. Creatine is contraindicated in adolescents with renal disease.
6. No studies have examined the long-term use of creatine.

The use of all performance-enhancing substances, including creatine, should be discussed at the time of sports physical exams or any time the use of these substances is suspected.