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The Creatine Myth: A Rebuttal

Part 2

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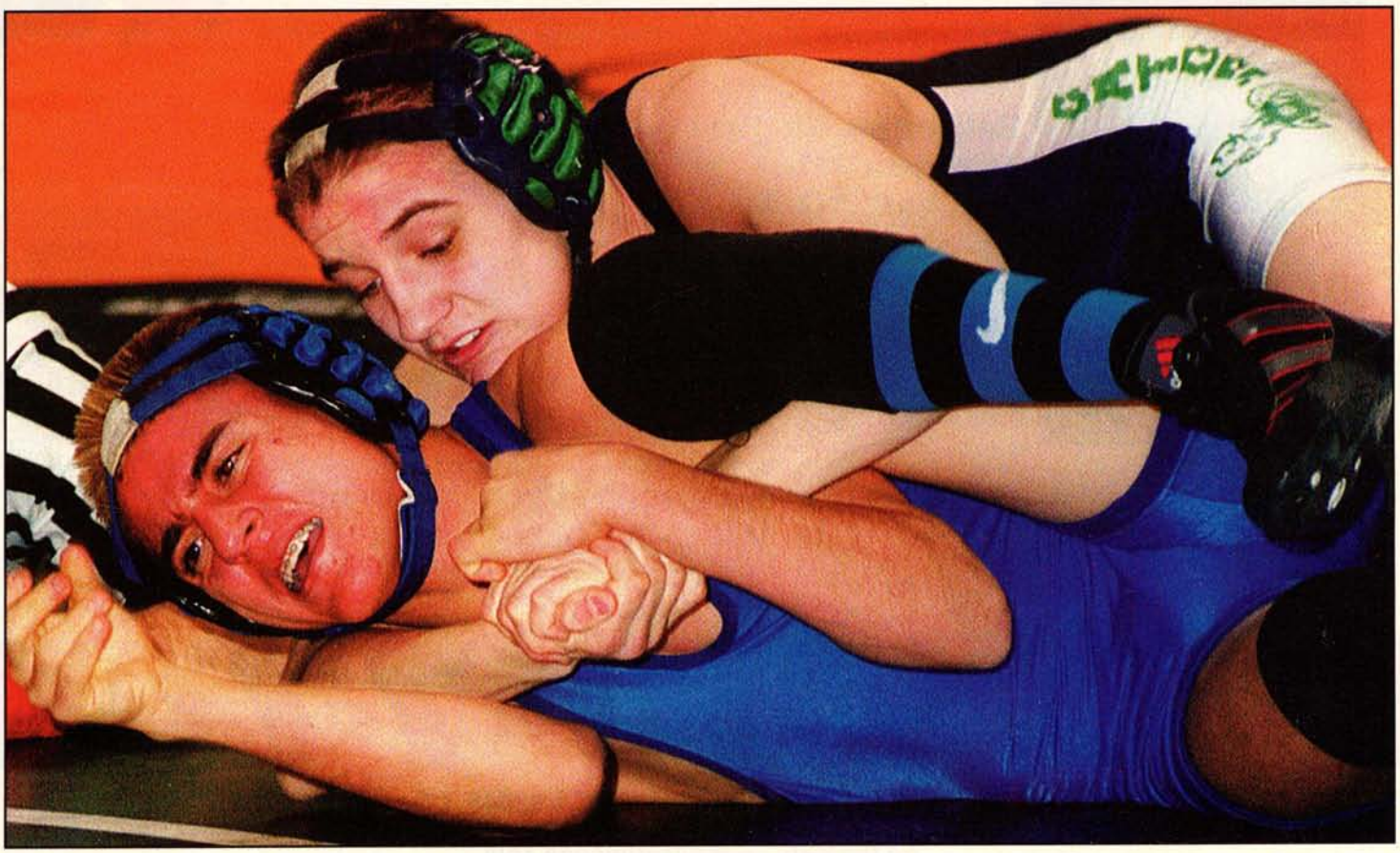
The April 15, 2000 issue of Wrestling USA Magazine featured an article entitled "The Creatine Myth" which was written by Steven Plisk. In his article, Mr. Plisk endorsed the safety (and effectiveness) of creatine supplementation.

IS CREATINE SAFE?

Mr. Plisk stated that "despite extensive and expanding use, no scientific studies have reported any negative side affects [sic]." This statement, in itself, is quite puzzling. While there certainly has been "extensive and expanding use" of creatine, it has absolutely nothing to do with what has been reported in "scientific studies" with respect to "negative side affects [sic]." Be that as it may, the fact of the matter is that there have not been any adverse side effects reported in studies using 20 – 30 grams of creatine per day for up to seven days. Nor have there been any adverse side effects reported in studies using smaller dosages of 2 – 3 grams of creatine per day for longer periods up to seven weeks. However, this is nowhere near the months -- or years -- that an athlete might use creatine. Countless scientific, medical and nutritional authorities agree that the long-term effects of creatine supplementation are unknown. In fact, a 1998 study — co-authored by Mr. Plisk — stated that "little data are available evaluating the medical safety of supplementing the diet with creatine during training for prolonged periods of time." There is also a concern that many individuals typically exceed the "recommended dosage" — undoubtedly putting them at greater risk for incurring negative side effects.

And while there have been no adverse side effects reported in scientific studies conducted in a laboratory setting, those of us "in the trenches" have heard an endless exchange of anecdotal accounts from around the world concerning athletes who have taken creatine and experienced an abundance of adverse side effects. Although these observations are anecdotal, their sheer volume is such that they cannot be ignored. It is also important to consider a 1999 study published in a peer-reviewed

Colorado - 112 lb. Standley Lake High School's Chris Nissen cradles Paul Lopez of Thornton on his way to a technical fall 17-0. Nissen worked his way through the state tournament field. Nissen becomes Standley Lakes second state champion in his high schools short history. Photo by Dean Vande Berg.



journal that surveyed 52 baseball and football players who voluntarily took creatine. Of the 52 athletes, 14 (26.9%) did not report any adverse effects. Stated otherwise, 38 (73.1%) reported at least one adverse side effect.

Due to individual variability, some may be more susceptible to adverse side effects than others. However, the following potential side effects are of greatest concern:

Water Retention

During the first few days of the "loading phase," there is an increase in the retention of water within muscle cells and a concomitant -- and significant -- decrease in the production of urine. As noted in Part 1 of this rebuttal, the retention of water probably accounts for the rapid increase in body mass that accompanies creatine supplementation. In all likelihood, a rapid increase in body mass would hinder performance in mass-dependent activities such as running and swimming. In addition, unintentional weight gain may be a concern for wrestlers and other competitive athletes who must "make weight."

Intracellular water retention would also result in muscle enlargement. This muscular hypertrophy is transient, however, and unrelated to the long-term, adaptive increases in muscular size that occur in response to progressive-resistance exercise.

Muscle Cramping

One of the most frequently reported side effects of creatine supplementation outside a laboratory is muscle cramping — which is often described as being "severe." In the aforementioned 1999 survey, 13 of the 52 athletes (25.0%) who used creatine reported muscle cramps. The large fluid shift into skeletal muscle (intracellular water retention) that is caused by creatine supplementation is thought to dilute electrolytes, thereby increasing the potential for muscle cramps. If creatine does induce an electrolyte imbalance, athletes who are not well hydrated and/or are training intensely in hot, humid environments where sweat rates are high would have a greater-than-normal risk of muscle cramping.

Dehydration/ Heat-Related Illness

In 1998, the wrestling community was shocked by the deaths of three wrestlers in a period of 32 days: Freshman Billy Jack Saylor of Campbell University (NC) on November 7, senior Joseph LaRosa of Wisconsin-LaCrosse on November 21 and junior Jeff Reese of the University of Michigan on December 9. One common thread connecting the wrestlers is that all three died while trying to lose a fairly substantial amount of weight in a relatively short period of time. The manner in which all three attempted to lose weight was certainly unsafe and they were severely dehydrated. But the methods that they used in an attempt to lose weight had been quite commonplace in wrestling: restricting food and fluid intakes, wearing "sauna suits" and exercising in hot environments. Yet, there's no record of a similar death in collegiate wrestling. Actually, according to the National Collegiate Athletic Association (NCAA) there's no other instance of any college wrestler ever dying in any manner. Think about it: No deaths in a period of about one century and then three in a period of about one month. The Centers for Disease Control and Prevention determined that the wrestlers died because they "used vapor-impermeable suits and exercised vigorously in hot environments" which "promoted dehydration and heat-related illness."

At the time of their deaths, many quickly pointed an accusatory finger at creatine. The reason is that one of the most commonly reported side effects related to the use of creatine is dehydration. In the previously noted 1999 survey, 7 of the 52 athletes (13.5%) who took creatine reported dehydration. Ironically, the increased water retention within muscle cells that is associated with the use of creatine increases the risk of dehydration and heat-related illness. This is because the fluid shift into skeletal muscle reduces blood plasma volume which, in turn, reduces the ability to dissipate heat. Although it was not linked to the deaths of the wrestlers, some believe that creatine could intensify an already dehydrated state, resulting in heightened

thermal stress and a resultant life-threatening situation.

Muscle Strains/Dysfunction

It is speculated that the intracellular water retention related to the use of creatine increases the intramuscular pressure which could contribute to muscle strains and/or dysfunction.

Gastrointestinal Distress

Creatine may cause a variety of gastrointestinal disturbances. In the aforementioned 1999 survey, 16 of the 52 athletes (30.8%) who used creatine reported diarrhea. Other gastrointestinal afflictions that are often cited anecdotally include an upset stomach, gastrointestinal pain, flatulence, nausea and vomiting.

Liver Function

Research has shown that when the consumption of exogenous (foreign) creatine is increased, the production of endogenous (natural) creatine by the liver is decreased. It is unclear as to how the long-term use of creatine might influence the function of the liver with respect to endogenous creatine synthesis.

Kidney Function

There is a limit as to how much creatine can be extracted from the bloodstream and stored in muscle. Once this saturation point is reached, additional amounts are excreted by the kidneys. Creatine supplementation can produce astronomical increases in the urinary excretion rate of creatine. In a 1997 study, subjects ingested 20 grams of creatine per day for five days (a typical "recommended dosage" during the "loading phase") and -- in comparison to their "placebo condition" -- experienced an average elevation in their urinary excretion rates of 8,856.7%. The percentage of this "massive urine excretion" -- in the words of the authors -- may have been even greater since this study only used a two-week "washout" period which may not have been enough time to normalize the baseline readings for the placebo condition. There is concern that the increased urinary excretion rate of creatine places excessive strain on the kidneys.

A 1998 study using 25 "healthy" football players found that 28 days of creatine supplementation (15.75 grams per day) produced changes in muscle and liver enzymes -- which are often used as indicators or "markers" of kidney (and liver) function. In this study -- co-authored by Mr. Plisk -- a group who took creatine experienced increases in the levels of four enzymes of 16.5, 16.6, 24.1 and 155.5%. (Astonishingly, the researchers somehow referred to this as a "mild elevation.") In comparison, a group who took a placebo experienced increases in the levels of two enzymes of 11.4 and 70.1% and decreases in the levels of two enzymes of 2.4 and 7.4%. (Analysis of a fifth enzyme showed a very slight elevation in both groups.) Further, two reports of the same 1996 study showed that eight weeks of creatine supplementation (20 grams per day for five days and 10 grams per day for 51 days) produced significant elevations in muscle and liver enzymes. Although the elevated levels returned to normal following a four-week withdrawal of creatine, it still raises fears -- particularly for individuals with impaired kidney (or liver) function.

Case in point: In 1998, a 25-year-old soccer player with a history of kidney disease experienced a sudden and substantial deterioration of his condition while taking creatine. After being advised to stop taking creatine, his kidney function returned to normal. Incidentally, his intake of creatine did not exceed the "recommended dosage." Also in 1998, three physicians reported "renal insufficiency" -- a functional disorder of the kidneys -- in a 19-year-old football player that was induced by regular creatine supplementation. Although his intake of creatine exceeded the "recommended dosage," the grim reality is that many athletes routinely do the same. The physicians who authored this report recommended that athletes who use creatine should have their kidney function assessed.

The sole end product of the breakdown of creatine is creatinine. Serum creatinine is used indirectly as an indicator of kidney stress. The previously mentioned 1998 study -- in which Mr. Plisk was a co-author -- involving 25 "healthy" football players found that creatine supplementation significantly increased serum creatinine levels. Specifically, the group who took a placebo experienced a 4.8% increase in their serum creatinine levels while the group who took creatine (15.75 grams per day for 28 days) had a 22.55% increase. The authors noted that despite the increase, the levels "remained within normal limits for individuals engaged in intense training." The fact is that those who took creatine had serum creatinine levels that were -- on average -- 8.7% higher than the upper limit of "normal." And if the standard deviation of the average value is considered, 16% of those who took creatine had serum creatinine levels that exceeded the upper limit of "normal" by 20%. Regardless of

whether or not the increases "remained within normal limits for individuals engaged in intense training," it is clear that creatine supplementation produced a markedly greater elevation of serum creatinine levels. Along these lines, some have argued that the serum creatinine levels are elevated because creatine supposedly gives athletes the ability to train more intensely or to maintain greater training volume. This appears to be flawed thinking since the subjects in this study (who underwent the same training) did not know whether they were receiving creatine or a placebo and, therefore, would not train any differently.

Mr. Plisk stated that "short-term creatine supplementation seems to have no detrimental effect on hepatic or renal function in healthy subjects." Two points: First, any comment concerning the effects of "short-term creatine supplementation" on liver or kidney function (or anything else) is irrelevant — and not very comforting -- due to the fact that the majority of individuals probably do not use creatine on a "short-term" basis. Second, his statement isn't exactly true. In 1999, a previously "healthy" 20-year-old man who consumed creatine (20 grams per day for four weeks) developed nausea, vomiting and bilateral flank pain. A physical examination revealed dehydration and diffuse abdominal tenderness. The man was hospitalized and a renal biopsy found a kidney disorder known as "acute focal interstitial nephritis." This rare disorder — which occurs in roughly 1 out of 25,000 people — causes a reduction of kidney function ranging from mild dysfunction to acute kidney failure. His condition improved after he stopped taking creatine. The physicians who authored this report warned that the use of creatine may be associated with injury to the kidneys.

CAUTIONARY POSITIONS

In May 1998, the Association of Professional Team Physicians reported that 85% of its members did not recommend creatine. In June 1998, a survey published in USA Today revealed that only five teams in the National Football League approved the use of creatine by their players. A number of teams have written stances on creatine supplementation. For instance, the Tampa Bay Buccaneers distribute a position paper to all of their athletes that details the many potential side effects from creatine supplementation. Their position paper concludes that their organization "does not endorse creatine supplementation as a training adjunct to [their] players." It's safe to say that the reason for such cautionary positions by those entrusted with overseeing the health and safety of professional athletes is because of the potential for side effects from creatine supplementation.

But cautionary positions aren't only recommended for professional athletes. In April 1999, the American College of Sports Medicine conducted an official roundtable on creatine supplementation. The roundtable — which included 12 individuals with either a doctoral or medical degree -- concluded that the data on the side effects of creatine supplementation in those less than 18 years of age are "grossly inadequate" and, therefore, that it is not advised for individuals in that age group. Finally, a large number of authorities — including the Food and Drug Administration -- have advised consumers not to use creatine without the approval of a physician.

THE BOTTOM LINE

Contrary to Mr. Plisk's claim, the "solid research" concerning the effectiveness of creatine supplementation on strength, endurance and lean-body mass in a laboratory setting is inconclusive. And any research that has shown an increase in strength or other performance measures cannot be generalized or applied to athletic situations that are done outside a laboratory. Indeed, the "solid research" concerning the effectiveness of creatine supplementation outside a laboratory has found that it rarely improved the performance of highly trained subjects in actual sports, realistic events or competitive situations. It is also important to note that those who would benefit the most from creatine supplementation include vegetarians and individuals with unusually low levels of creatine in their bodies.

Keep in mind, too, that studies investigating creatine are often funded by grants from supplement companies or have one or more authors who serve as "consultants" for such companies. Needless to say, it's difficult to have faith in the results of studies that have the monetary backing of companies that have a direct financial interest in the outcome of the research.

At this point in time, literally no one knows the long-term effects of creatine supplementation. Promoters of creatine supplementation insist that there are no negative side effects when it is consumed in the "recommended dosage" -- typically 20 - 25 grams per day for 4 – 7 days of "loading" and then 2 grams per day for "maintenance." The unmistakable reality, however, is that the majority of individuals -- thinking that "more is better" -- undoubtedly exceed the "recommended dosage" of creatine on a regular basis. While on the subject, the "recommended dosage" should be relative to body weight. For example, a 140-pound wrestler should have a lower "recommended dosage" than a 240-pound wrestler. Finally, the potential side effects from combining creatine with one or more of the countless nutritional supplements on the market are unknown.

Mr. Plisk stated that "it may be more appropriate to compare creatine supplementation with the practice of carbohydrate loading." Perhaps in the sense that in both types of "loading," there is an attempt to "load" the stockpiles of an energy substrate. But that's where the similarities between creatine loading and carbohydrate loading end. There is really no concern with incurring any adverse side effects from consuming too many carbohydrates as there is with creatine — unless, of course, the carbohydrate loading is based upon the classical glycogen supercompensation model as proposed in the late 1960s which was found to be physiologically distressful.

Near the end of his article, Mr. Plisk advised coaches that "the student-athletes' health and well-being should be our central concern." This is truly of utmost importance. So when it comes to creatine supplementation, the bottom line for coaches and athletes is to be cautious, not careless.