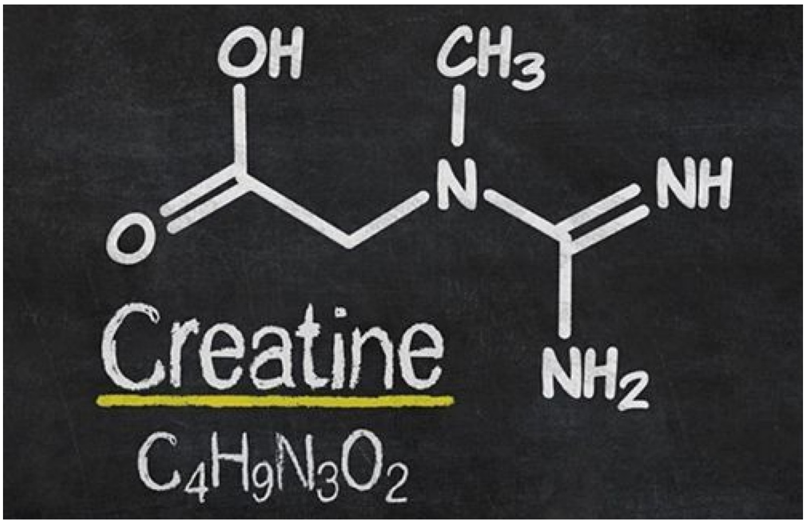
Dynamic Chiropractic



VITAMINS / SUPPLEMENTS

Creatine: The Game Changer

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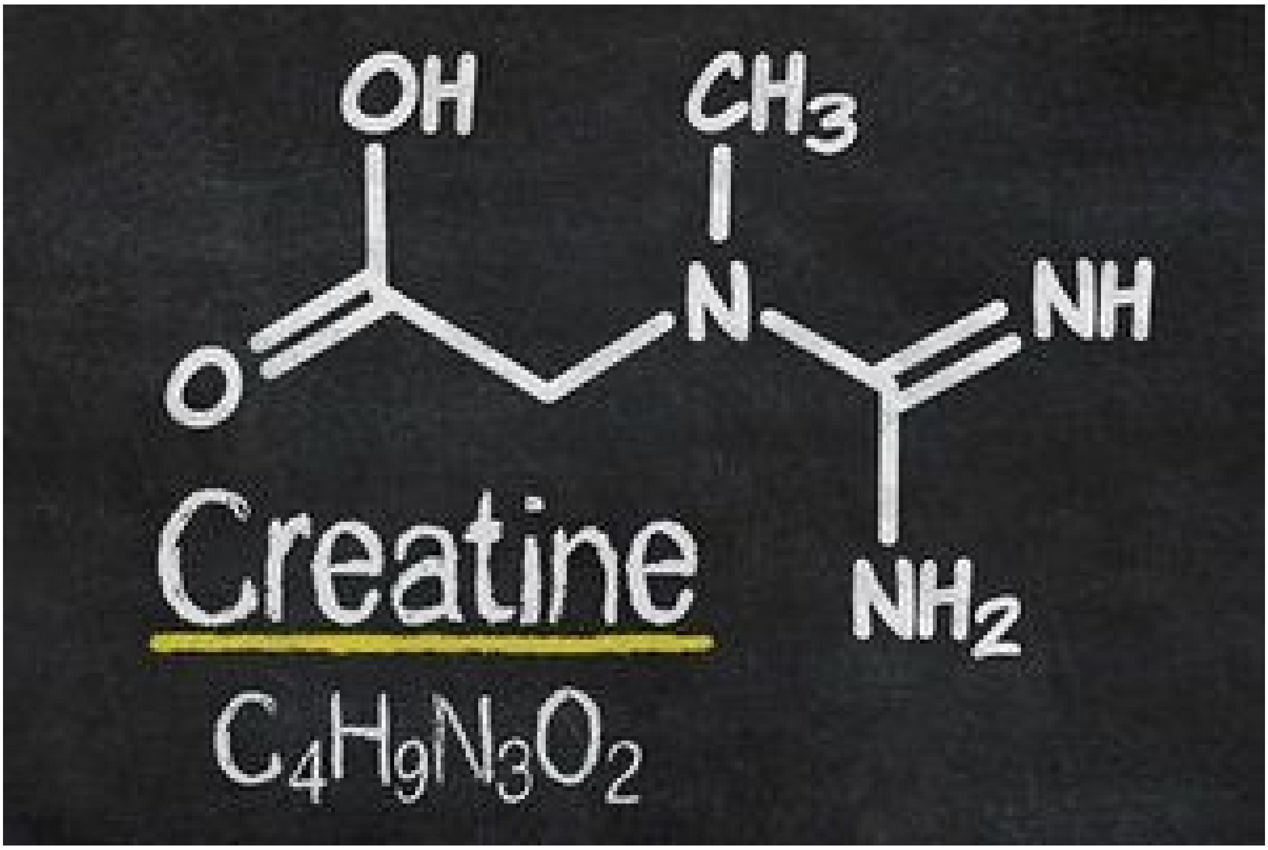
Currently, plant-based diets are being touted as the ultimate form of sustenance for athletes to enhance their performance and overall health. At some point because of the hype surrounding these claims, your patients will be asking your opinion. In educating your patients, it's important to communicate the fact that well-orchestrated documentaries promoting such claims cannot reconfigure human physiology, no matter how appealing the marketing, how loud the shouting or how well-intended the wishful thinking.

Why Creatine Matters

Implementing a diet that minimizes or eliminates meats may actually be a fatal flaw in the pursuit of optimal health and peak athletic performance. A key reason is that plant-based foods do not provide *any* dietary creatine. Other than supplementation, only animal-based foods contain the nutrient creatine.[1] In fact, creatine gets its name from the Greek word *kreas*, which means "meat" or "flesh."[2] And research has consistently shown that creatine enhances athletic performance, especially when the activity is of high intensity and brief duration.[3-4]



First discovered in 1832,[5] creatine is categorized as a non-essential nutrient because it is produced in the human body from the amino acids arginine, methionine and glycine at the rate of about 1 gram per day.[6-7] However, creatine is typically used through daily activities at the rate of about 2 grams per day.[1] As creatine is utilized in the body, it eventually loses a water molecule and becomes creatinine. The creatinine is then transferred to the kidneys via blood plasma and excreted.[8]

But why is creatine so important? Creatine serves a primary role in the *phosphagen system*, one of three systems in the human metabolic process that restores ATP (adenosine *tri*phosphate) as it is used as a source of energy for skeletal muscle contraction. The phosphagen system typically replenishes ATP during brief high-intensity activities and relies on creatine stored in skeletal muscle to do so.[9] The other two systems that also replenish ATP are the *glycolysis* and *oxidative* systems.

Understanding the Physiology

ATP plays a vital role in skeletal muscle contraction. The *sliding-filament theory* of skeletal muscle contraction states that actin and myosin filaments can slide across each other due to myosin cross-bridges attaching to and pulling on the actin filaments. This must occur repeatedly to produce the sliding process, whose successive effect is muscle contraction. That is, as the filaments slide across each other, the skeletal muscle fibers (which are composed of numerous actin and myosin filaments) contract (shorten).[10]

The energy that powers the myosin cross-bridges comes from ATP. During this process, ATP attaches to a receptor site on the myosin cross-bridge. The energy provided to move the cross-bridge utilizes one phosphate group from the ATP. This results in ATP becoming ADP (adenosine *di*phosphate).

For the cross-bridge to move again, ATP will need to be present again, as the ADP won't provide enough energy to cause the reaction (and the resulting muscle contraction). Therefore, ADP (which has two phosphate groups) must be converted back to ATP (which has three phosphate groups) by obtaining a replenishing phosphate group.[11]

The majority of creatine in the human body is stored in skeletal muscle tissue. In the muscle, it may be in the form of creatine or phosphocreatine (typically 60 percent is stored in the form of phosphocreatine).[12] Phosphocreatine is creatine with an added phosphate group. Thus, creatine in the form of phosphocreatine is an important storehouse for phosphate groups.

During skeletal muscle contraction, ADP can be converted back to ATP by picking up the needed phosphate group from the phosphocreatine. This process occurs because of the enzyme creatine kinase: (ADP + phosphocreatine yields ATP + creatine in the presence of creatine kinase).[13]

Basically, the more creatine that is present in skeletal muscle, the more potential for phosphocreatine. More phosphocreatine means more "donor" phosphate groups to restore ATP back from ADP.[14-15]

At some point, depending upon the workload encountered and the intensity of the activities performed, the plant-based diet will result in a reduction of stored creatine (and phosphocreatine) since it can't supply creatine beyond what the body is synthesizing.

Current research suggests a vegan diet undertaken by individuals who were previously eating an omnivorous diet will result in lowered creatine stores within three months.[16] Therefore, it could be argued that creatine is a *conditionally* essential nutrient depending upon one's workload and the frequency the intense workload is encountered.

Beyond Athletic Performance Enhancement

There is growing evidence suggesting creatine has health benefits beyond its ergogenic effects. Creatine is now recognized as an anti-inflammatory agent, has antioxidant properties, and may be a mediator for neuroprotection.[17] Creatine may also play a role in elevating mood, reducing mental fatigue, enhancing cognitive abilities, and improving memory.[18] This further illustrates the importance of dietary creatine and raises the question*: How is one's health affected when the body's creatine levels drop?*

Clinical Recommendations

- A well-balanced omnivorous diet that includes quality meats in sufficient amounts on a regular basis (3.5 ounces of red meat contains approximately 350 mgs of creatine).[19] Note that poultry and fish also contain comparable amounts of creatine.
- Creatine supplementation is necessary if undertaking a diet with reduced or absent animal sources of nutrients. Creatine monohydrate is the preferred source and at least 1.5 grams (1500 mgs) of daily supplementation is suggested.
- Creatine loading to enhance athletic performance can be beneficial for athletes involved in regular bouts of high-intensity activities. This is typically a high dosage of creatine over a 5-7-day period. The recommended dose of 15 to 20 grams would certainly need supplementation with creatine monohydrate, since the food requirements would be quite high in calories and relatively impractical to consume. After the loading phase, a daily

dietary intake of 3-5 grams is advised.[3]

A complete illustration of the physiologic importance of creatine is beyond the scope of this article. However, creatine's potential influence on overall health is being confirmed by research and its importance as a dietary nutrient should not be overlooked. Numerous research studies have also concluded that dietary creatine and the supplemental form of creatine monohydrate are safe for consumption.[3,14,20]

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