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|  | Introduction  In the past decade their has been a explosion of the use of an amino acid supplement called creatine. Although creatine was discovered almost 160 years ago, it has only recently become well known and wide spread in its use. The results of creatine supplementation were first published in 1990, followed in 1992 by the study of the effects of creatine supplementation in humans. Creatine was first made available to the public for purchase in 1993.**1**  The sales of creatine have jumped incredibly. Sales went from $3 million to $27 million within one year between 1996 and 1997. The Gladiator�s Gym in Manhattan routinely sells out of its supply. Twenty to thirty bottles are purchased every Friday, and by the next Friday they are all sold out.**2** The cost of the supplement is what makes this incredible mass of purchases so hard to believe. One months supply of powder might average $50 dollars.  The uproar about creatine has been the greatest within the last year. The supplement was first questioned when the media brought attention to the deaths of three college wrestlers who had been using creatine. Although it wasn�t proven that creatine played a role in the deaths of the three teenagers, it raised the question of the safety of the product to many.  Following the wrestlers deaths was the news that home-run record holder Mark McGwire was on a heavy regimen of various supplements, including creatine. McGwire�s use of the supplement brought forth issues about the legality of the product in amateur and professional sports. Although the supplement is FDA approved for sale on the health market there are those who believe it is equivalent to illegal steroids.  These issues raised the attention of my partner and I as to the effectiveness as well as the risks of creatine supplements. My partner noticed the large percentage of people using the supplement at her local gym and after discussing their results with many of them she became more curious as to how the creatine works and if the benefits outweigh the risks.  What exactly is creatine? Creatine is an amino acid that the body produces naturally in some of the organs. We also consume large amounts of creatine in foods such as beef, fish, and other meats.There are different types of creatine available on the market. There is creatine kinase, creatine monohydrate, as well as many cheaper and less pure versions of the supplement. However,the idea behind the supplement is essentially the same for all types. Creatine is stored in the muscles and works to power explosive bursts of anaerobic activity. Normal body levels of creatine fall between 121 and 150 grams. The idea behind the creatine supplementation is to increase creatine levels in the muscles so that there are greater stores of ATP, which allows athletes to do more work for a longer time in high intensity exercises.Creatine comes in a phosphate-related form to create high energy phosphate. This high energy phosphate then joins with a molecule of adenosine diphosphate to produce the very high energy yielding ATP. Studies done with groups put on a placebo and groups with the creatine supplement have demonstrated that the creatine allows for extra ATP.Subjects had their blood lactate levels tested after pedaling at 130 revolutions per minute before supplementation. After supplementation their levels were tested for 140 revolutions per minute. The blood lactate levels actually decreased for those who received the supplement, despite the fact that more work was being done.**3** The fact that blood lactate levels decreased even with more work shows that the supplement must affect the muscle metabolism by effectively regenerating ATP more quickly than before supplementation.  The daily natural dosage of creatine in our diets is approximately 2 grams. While taking creatine supplements there is an initial loading phase.The purpose of the loading phase is to saturate the muscles with the supplement. During this loading phase users will take four,5 gram doses of creatine a day for five to seven days. After the loading phase is the maintenance phase. The maintenance phase varies, but is about 5 grams a day for the rest of the time it is in use. Maintenance phase may continue for up to three months. After that it is recommended to stop the regimen for one month to flush out the system. Once the system is flushed the loading phase can start again.**4**  The controversy as to the safety of the supplement falls into the effects of excess levels of the supplement. In many studies done on creatine the results of the creatine leveled off after a certain amount of creatine was saturated into the muscles. The results vary for individuals depending on their body�s natural baseline levels of creatine. Those with lower baseline levels experienced greater benefits. In studies the test subjects would all eventually reach the same exercise intensity after taking the supplement, even if they started at different levels.**5** Therefore the supplementation can only be effective to a certain extent. Those with higher baseline levels who take the same regimen of supplement will have a lot of excess creatine in their system. It is thought that the excess creatine not taken up into the muscles is simply excreted by the kidneys, with no negative side effects. However, since creatine is a protein-like amino acid there are questions as to the actual effects of over dosage. The great protein debate falls into how much does protein actually help athletes. When excess protein is consumed it is either burned for energy or converted to fat. Protein is less effective than carbohydrates at being burned for energy. Excess protein may also lead to dehydration since the kidneys need more water to eliminate the excess nitrogen left by the extra protein. Aside from the risks of excess protein intake are risks from excess amino acid intake. The loading of certain amino acids may prevent the body from absorbing other essential amino acids. The amino acid levels can become unbalanced, actually leading to a loss of protein. Using amino acid supplements may also cause a deficiency of other nutrients typically found in protein-rich foods.**6**  Creatine is also believed to be most beneficial for athletes performing high intensity rather than low intensity endurance work outs. The study mentioned before on pedaling was the high intensity test. As said, the subjects received greater benefits from the supplementation in their ability to keep up the quicker revolution pace and ward off the build up of blood lactose. The subjects were then put through the endurance protocol by running to fatigue on a treadmill. The maximal oxygen uptake was unchanged and had no benefits for those with supplementation. The subjects results worsened in terrain positions . This eliminated the thought that the creatine supplements would aid in the uphill bursts of force. The studies� final conclusion was that the creatine allowed for an increased recovery rate between exercise sprints.**7** It was ineffective in increasing energy for endurance exercises.Body builders, weight lifters, and football linemen would receive the most benefits from creatine supplements, since they are looking for increased muscle mass. It is also presumed that vegetarian athletes would greatly benefit from creatine supplements due to their lower natural creatine stores from the diet.  Although studies have proven that creatine supplements do increase body mass, it is not clear whether this increase is actually from lean tissue or water weight. It is accepted that the increase in mass is not from fat pounds, but there is a large difference between lean tissue and water weight. Ideally creatine would help to increase lean tissue, allowing for more muscle and more strength. If the increase is from water weight there are no real benefits to the user as far as making their metabolism and muscles more efficient.  As mentioned ,the benefits of creatine appear to be an increase in recovery between energy bursts, allowing for athletes to do more reps in a set or simply more sets.The side effects reported, however, have been numerous.Reported side effects include; diarrhea, nausea, dizziness, muscle cramping,tears,pulls, dehydration, even seizures and blackouts. Long term side effects are unknown since efficacy is lacking in the long term use of the product . Questions about the long term effects , however, include the effects on the kidney, liver, and heart.**8**  Problems with the supplement include a lack of real knowledge by the users about the product. Although the supplement does provide a natural body nutrient, it doesn�t provide all the other nutrients that come along with creatine in foods. Users often mismanage their diet while on the supplement. It is still essential to get all of the other necessary nutrients in the body in order for the supplement to work to its greatest potential. Other problems include those who use multiple supplements and other performance enhancers at once.One such gentlemen was reported to have taken Vanadyl Sulphate, three ephedrine tablets, and three tablespoons of creatine in his coffee. He proceeded to do his warmup set and threw up within seconds. Not long after he collapsed and stayed under for approximately a minute.**9** Such drug mixtures are highly dangerous, yet the fact that creatine is sold over-the-counter like candy doesn�t give users the right impression as to its possible effects.  After extensive research into creatine supplements my partner and I chose to put out a survey to examine the effects of creatine on local users. Since creatine is a fairly new product and only recently a popular one there isn�t a lot of detailed information yet about how it works and what exactly its effects are. We figured that we already knew everything that had ever been published about the drug (which isn�t a lot), so we would look at our own results and make our own firsthand decision about this new wonder drug called creatine.  1 Bjorn Ekblom, "Effects of Creatine Supplementation on Performance," The American Journal of Sports Medicine, Nov.-Dec. 1996  2 Hank Gola "Thousands Turn to Creatine to Build Muscle," New York Daily News, April 17, 1998  3 see footnote 1  4 consultant Sandra B. Leonard and Elaine B. Feldman  5 see footnote 1  6 Ellen Coleman and Suzanne Nelson, The Ultimate Sports Nutrition Handbook. p57-64  7 see footnote 1  8 see footnote 2  9 see footnote 2 |

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