Muscle Builders

Flip open any fitness magazine and you are likely to find graphic before and after pictures of hulking men and women attesting to supplements that promise to “erupt your anabolic drive,” “dramatically increase protein synthesis,” and “pack on pounds of lean mass...fast!” Do these impressive ads have scientific muscle to back up their claims?

Ergogenic drugs, substances that are used to enhance athletic performance whether legal or illegal, include creatine, androstendione and DHEA. Increasingly, these substances are being used to improve appearance more than they are being used to enhance performance.

Read on to learn...

- Is creatine the magic bullet it is claimed to be?
- Are andro and other pro-hormone supplements safe and effective alternatives to anabolic steroids?
- What are the keys to achieving optimal muscle strength and mass?
- Is there a genetic limit to how much muscle you can gain?
Creatine

What is it?
Creatine is comprised of three amino acids: arginine, glycine, and methionine. It can be made in the body from these amino acids. Because it can be made in the body, there is no dietary requirement for it. We synthesize about 1 gm/day naturally.

Creatine is also a naturally occurring compound found in beef, poultry, and fish. We consume creatine in our diet from these food sources (about 1 gm/day). Vegetarians who do not eat these animal foods tend to have lower creatine levels than meat eaters.

Once creatine is taken up by the muscle, it can combine with phosphate, forming creatine phosphate (CP). CP is a high energy compound stored in muscle that is used during very short, very intense power activities which last only 2-30 seconds (like weight lifting, sprinting, swinging a baseball bat, or slam-dunking a basketball). It's claimed that taking creatine supplements will help you train harder and achieve greater gains in muscular strength and size.

Does it work?
There is convincing evidence that creatine supplementation enhances recovery, and thus improves performance, during repeated bouts of brief, intense power activities. The physiological basis for creatine supplementation is similar to that of carbohydrate-loading routinely practiced by endurance athletes (like long-distance runners and cyclists). While carbohydrate loading increases stores of muscle glycogen (which provides energy during endurance events), creatine supplementation increases stores of CP (which provides energy during short bursts of high intensity exercise). Supplementation with creatine has been shown to increase muscle CP stores by approximately 25%. Because of increased stores, CP is less rapidly depleted and you are able to maintain your high-energy performance longer during repeated bouts of high intensity activity. Some evidence suggests, however, that caffeine counteracts the ergogenic effect of muscle creatine loading.

A common side effect of short-term creatine supplementation is increased body weight (1.5-4.5 lb.). This is probably due to water retention (since water
travels along with creatine into muscles). But, over the long term, there may be some increase in protein synthesis and muscle mass due to increased training capacity. Because of the fluid shifts that occur with creatine supplementation, it's important to drink plenty of fluids while taking it.

**Should you add creatine to your training plan?**

While there is good evidence supporting the positive effects of creatine, it's important to remember that it's no magic bullet. Hard training, combined with adequate calories from whole foods, is what builds muscle. Creatine supplements just give you a little extra edge by maximizing your muscle CP stores, helping in recovery between sets, and allowing you to keep training at a higher intensity.

It works best in people who have marginal creatine stores in their muscles (like vegetarians). If you include a lot of meat, chicken, and fish in your diet, which most power athletes do, your muscles are probably already saturated with creatine, and you may see only minimal gains with supplementation. The average concentration of creatine in muscle is approximately 120 mmol/kg and ranges from 90 to 160 mmol/kg. You cannot supersaturate creatine muscle stores above this level. Once muscle capacity is reached, excess creatine taken from supplements is simply excreted in the urine.

**Is it safe?**

This is an important question to ask yourself before taking any dietary supplement. As for creatine, here's what we know about its safety:

- Taking supplements may suppress your body’s own creatine synthesis, but this reverses when you stop taking it.
- Anecdotal information from athletic trainers suggests a relationship between creatine supplements and muscle cramps, muscle spasms, and even pulled muscles (possibly due to water retention, dehydration, or over-training), but this has not been seen in scientific studies.
- Research studies done in the United States have only been short term (4 days to two months), so the long term safety of taking creatine is unknown. One long-term research study indicated that creatine supplementation up to 21 months does not adversely effect health in intensely training athletes, however prolonged supplementation with creatine could lead to gradual resistance to the compound overtime.
• There are increasing concerns about possible kidney stress and liver damage with supplementation. In one case report, a 20 year old healthy man developed acute nephritis (inflammation of the kidneys) after supplementing with 20 g of creatine daily for four weeks. This exceeds the recommended dosage of 20 g for 5 days, followed by a maintenance dose of 3 g daily. People with pre-existing kidney conditions, family history of kidney disease, and others who are at high risk (such as people with diabetes) should avoid creatine supplements.

• Because long term safety data is not available, creatine can no longer be distributed to athletes in the NCAA (National Collegiate Athletic Association). But, unlike many other muscle builders, it is not a banned substance in the athletic world.

• It is expensive and the benefits may not be worth it.

If you decide to try it, be sensible!
Manufacturers typically recommend a loading phase followed by a maintenance phase. In the loading phase, the optimal amount required to increase creatine stores to their maximal level is about 20 g/day for 5 days. To get 20 g of creatine from food, you would have to eat about 10 pounds of steak! The 20 g should be divided into four, 5 g doses and taken every 3 to 4 waking hours. In the maintenance phase, one daily dose of about 3 g is typically sufficient to maintain elevated levels of creatine in muscle.

Don’t bother taking more than these recommended doses. Once your muscles are loaded up, the excess creatine will just be excreted in your urine. And, more importantly, the excess creatine in your body may cause damage to your liver or kidneys.
Other tips for safe and effective creatine supplementation:

- Take each dose with food or beverage—preferably a carbohydrate-rich item that has a high glycemic index plus some protein—to enhance its uptake into muscle.

- Drink plenty of water (especially during the loading phase) to avoid dehydration, prevent muscle cramping, and minimize any potential damage to your kidneys. Remember, as muscle retains the ingested creatine, fluid is retained with it. This leaves less fluid available for the other vital functions it serves in the body, such as body temperature regulation (through sweating), particularly when exercising in hot, humid conditions.

- Monitor your individual response. If you don't see any positive effects within a few weeks (or if you experience any negative effects at all), stop taking it.

- Since we don't know the consequences of long-term supplementation, it's probably a good idea to cycle on and off. In other words, take it for a few weeks or months and then take a break for a few weeks or months.

- Don't worry about a skipped dose. It takes 4 weeks for muscular creatine levels to return to normal after supplementation stops.
DHEA & Androstendione (Andro)

What is it?
DHEA and Andro are precursors (prohormones) to testosterone and estrogen. Both are derived from cholesterol and produced by the adrenal glands. Andro is also produced by the ovaries and testes. The theory is that if you take high amounts of these precursor hormones, you may raise testosterone levels and see the same anabolic effects.

Will taking Andro and DHEA increase testosterone levels?
There is no guarantee that taking more of these precursors will result in increased testosterone levels. Consider these possibilities...

- The body may not produce more of the enzyme needed for conversion of DHEA and andro to testosterone (if no true shortage of testosterone exists in the body).
- Excess may just be metabolized and excreted.
- Excess may be converted to different substances with undesirable side effects. For example, some research shows that excess andro raises estrogen levels. Elevated estrogen levels are associated with increased fat mass (especially in the thigh, gluts, and triceps) and gynecomastia (or breast development in men). Alternatively, it could raise levels of dihydrotestosterone, a potent androgen that causes growth of the prostate (not skeletal muscle) and increases acne and balding.
- A study by King et al (1999) found that 300 mg andro/day in untrained men with 8 weeks of resistance training had no effect on serum testosterone, muscle size/strength, or body composition. However, it did increase serum estrogen levels and decrease the HDL (“good”) cholesterol levels.
- The majority of well-designed studies show that andro supplementation has no effect on serum testosterone.

Are andro products safe alternatives to testosterone?
No. If they do raise testosterone levels, they would be expected to have the same adverse effects as taking testosterone or other anabolic steroids. These adverse effects include increased aggressiveness (“roid rage”), acne, premature baldness, liver dysfunction, heart muscle damage, (in women) excessive facial
and body hair growth and voice deepening, and (in men) gynecomastia or breast enlargement, reduced sperm production, and testicular shrinkage. Despite these similar risks, andro products are easily available over the counter (while testosterone continues to be classified and regulated as a schedule III controlled substance that is only available with a special doctor's prescription). If you decide to use prohormones like androstendione for personal physique and strength enhancement, be sure to consult with and be monitored by a physician who understands all aspects of anabolic, androgenic steroids.

**Important Note to Athletes!** All prohormone substances are banned by most athletic associations, including the NCAA (National Collegiate Athletic Association), the USOC (US Olympic Committee), IOC (International Olympic Committee), NFL (National Football League), ATP (Association of Tennis Professionals) and Major League Baseball. Therefore, taking andro, DHEA, and other prohormone products could result in disqualification from your sporting event.

**The Bottom line:**
Taking andro or other prohormone supplements are not recommended. It is still being debated whether or not androstendione actually raises testosterone levels. There is significant evidence; however, that andro raises estrogen levels. In any regard, if andro did raise testosterone levels, it would likely carry the same risks as taking anabolic steroids, so why bother?

**Keys to Maximizing Muscle Gains**
- The most important factor to build muscle is heavy resistance training. No amount of protein (or any supplement for that matter) will promote gains of anything but body fat without consistent work in the weight room!
- Make sure you consume adequate calories to build new muscle tissue. Increase your total calorie intake by 350-500 calories every day to gain about 1 pound per week.
As long as you are working out, the extra calories consumed will go mostly towards building muscle, not body fat.

- Make sure you consume adequate carbohydrate to meet your energy needs for heavy resistance training (and to spare the protein you eat for its building functions). It's especially important to consume carbohydrate, along with protein, immediately after your work-outs to promote optimal recovery and building. A ratio of 3:1 carbohydrate to protein is thought to be best.

- Be sure to consume adequate (but not excessive) protein from a variety of lean animal and/or plant foods. Most students should aim for about 15% of their total calories from protein.

- If you’re on the go and don’t have time to eat protein-rich foods, a high protein sports beverage or bar (with 20-30 g protein per serving) can come in quite handy. Just be sure that it is low in saturated fat and hydrogenated vegetable oils.

- Most supplements are more hype than they are worth. And, some can have undesirable and/or dangerous side effects. If you decide to supplement, be sensible! Take no more than the recommended dose, monitor your individual response, and always discuss what supplements you are taking with a qualified health professional.

- Keep in mind, once you reach your genetic size potential, you cannot get any bigger. There is an upper limit to how much pure muscle your body can acquire (naturally) without further gains in fat mass too.

Can Supplements Overcome Your Genes?

Dietary supplements are a multi-billion dollar industry that feeds on people's false hopes and desperate efforts to achieve something that, for most people, is an unrealistic body ideal. The amount of muscle you can put on and the amount of body fat you can lose is restricted to a great extent by your genetics and your body type.

Further, to maximize what you CAN achieve (given the constraints of your genes) takes a lot of work! It's not as simple as just taking a supplement. To achieve your personal best requires a balanced eating plan and a consistent physical activity program. It takes time, patience, and effort to develop and implement these two things.
The models you see in fitness magazine ads didn’t get there by just taking the supplements they are promoting. They got there with a combination of 1) genetic endowment, 2) a very rigid eating plan (often unhealthfully rigid), 3) hours of hard training every day (they probably are not students at UCLA if they have that much free time), and in many cases 4) illegal anabolic steroids and/or surgical procedures like liposuction and breast enhancement.

For example, consider a male model who weighs 250 lb, and is completely ripped with only 3% body fat:

With this very low level of body fat, this much muscle mass is not possible to obtain naturally without the help of illegal, dangerous anabolic steroids. There is a physiological limit to how much lean muscle mass a man’s frame can hold, given a certain percentage of body fat. In order for him to gain more lean muscle mass, he would have to also gain more fat mass. Most men simply cannot be that BIG and be that LEAN naturally.

Now consider a female model, who is extremely lean, with only 12% body fat, but has very large breasts. With this very low level of body fat, this much breast tissue is not possible. After all breasts are made of fat!

The supplement industry is making lots of money; while consumers are getting more and more obsessed about their weights, diets, and exercise regimens and more and more frustrated, depressed, and angry because they are not able to achieve the stunning results displayed in the ads. Worse yet, hundreds of thousands of consumers are putting themselves at risk, conducting a large-scale experiment on themselves with supplements that have questionable long-term safety.

Consider putting your time, energy, and money in better places. Invest in a fitness pass or a couple of sessions with a personal trainer through the Wooden Center. Focus on living a healthy lifestyle, not on being a certain number on the scale or a attaining a certain size.