

Suspected Dietary Supplement Injuries in Special Operations Soldiers

MAJ John Hughes, MC, SSG Byron Shelton, 18D, Maj Teresa Hughes, BSC

Abstract

Evidence suggests that a number of Special Operations Soldiers are using dietary supplements to augment their physical training programs and that some of these supplements are not entirely benign. This article presents a series of case reports of Soldiers who suffered adverse effects that may be at least partially attributable to the use of dietary supplements. Given that many Special Operations Soldiers train at the same level as world class athletes and the use of supplements is common among world class athletes, the use of supplements is not likely to stop. To this end, the purpose of this article is to provide awareness of the problem, discuss some of the harmful effects of dietary supplements, make a recommendation for education to help reduce the number of injuries resulting from the use of dietary supplements, and recommend that scientific studies be done to prove the benefits and risks of taking dietary supplements.

Introduction

The Dietary Supplement Health and Education Act of 1994 stated that responsibility for the safety of dietary supplements lies with private manufacturers, not the Food and Drug Administration (FDA). In other words, the FDA does not regulate dietary supplements for safety and efficacy before they are marketed. Additionally, the FDA does not evaluate the validity of their claims of enhancement. Consequently, individuals may be putting themselves at risk for unknown benefits if they have little understanding of the product's ingredients, if they do not use the product according to the package instructions, and/or if several products are used in combination. Just as with prescription medications and illegal drugs, any substance introduced to the body can have adverse consequences. Additionally, consumers must trust that the labeling on the package is accurate and/or do their own in-depth research to determine the potential risks of taking a particular supplement or a combination of supplements. However, for simplicity, the authors grouped these substances together in this article since the Soldiers were using substances for one goal: performance enhancement. The authors recognize that some of the various substances discussed in this article are categorically different from each other. For example, ergonomic aids are used to enhance performance, but are not typically referred to as supplements. Anabolic steroids are illegal and designed to enhance muscle growth. Finally vitamins are considered supplements and are mostly benign, even if taken in excessive doses.

There is a non-profit, non-governmental organization, NSF, that has a multifaceted certification process that verifies that dietary supplement makers are using Good Manufacturing Practices. Athletes can use NSF certification to feel confident that the product label accurately describes the substances contained in the product. However, even this is not all-inclusive as the NSF does not conduct scientific research to determine the efficacy of the product, to validate recommended dosages, or to study adverse effects. Additionally, the NSF will not certify illegal or banned substances such as anabolic steroids or steroid precursors.

This may be of particular concern to the U.S. Army since injuries resulting from the use or misuse of supplements can directly affect a service member's deployability. Supplement use is common across the Army. Additionally, anabolic steroids, which are illegal, are also used by a

small number of Soldiers. According to research conducted by Johnson et al. in the 2007 *Journal of Special Operations Medicine*, 37% of U.S. Army Rangers who responded to a survey indicated they used dietary supplements. The most frequently used agents were protein (63%), creatine (45%), thermogenics (44%), androstenedione (27%), amino acids (8%), and anabolic steroids (1.8%). The article also cited that the most common sources of information about the dietary supplements were other Soldiers (59%), fitness magazines (46%), and the internet (18%). The authors discussed the effects of the supplements, but did not elaborate on any observed ill effects or injuries from the use of the dietary supplements.¹ In 1999, a survey of 2,212 males (ages 18-47 years) undergoing Ranger and Special Forces training revealed that 64% were using training supplements. In 2002, a survey of enlisted Soldiers in the conventional Army stationed in the Continental United States showed that 65% were using dietary supplements.² Given the reported high level of use of supplements in the Johnson et al. article, it can be inferred that supplement use is similarly widespread in comparable Special Operations units, although the results may not be generalizable to conventional units.

United States Special Operations Command (USSOCOM) Policy Memorandum 08-01 prohibits all supplement use for students going to specific Special Operations schools and also prohibits the use of any supplement specifically banned or made illegal by the FDA or US law. For the remainder of supplements, it recommends that service members educate themselves before use. As of the writing of this article, SOCOM is revising this policy. The authors could not identify any other existing policies within USSOCOM or the U.S. Army Special Operations Command (USASOC) that would regulate supplement use.

Case reports of supplement injury are found sporadically in the literature, but most are deduced through indirect data. Few, if any, prospective controlled trials directly measured the injuries and most of these are performed in animal studies. This article also presupposes adverse effects were directly related to supplement use since most of the Soldiers reported the supplement used and the symptoms resolved in most cases after the Soldier discontinued the use of supplements.

From June 2007 to November 2009, several of the authors of this article twice served as providers to a Special Operations task force of approximately 500 personnel who deployed to Operation Enduring Freedom. During the two-year period, the providers treated patients in a walk-in protocol for the deployed task force and its multi-service Special Operations attachments while deployed and in garrison. The case series that follows presents adverse effects sustained by Soldiers during deployment and in garrison. References to Soldiers are intentionally ambiguous to protect the patients' confidentiality. The substance used is in most cases generic as many patients would not elaborate further on the substances they were taking. The Chief Complaint listed is the reason for the patient encounter. Often, the reason was unrelated to dietary supplements and the issue did not emerge until lab testing was done for another reason or to investigate possible end organ effects after concerning information emerged in the history that was unrelated to the chief complaint.

Demographics

All patients were active duty, Army Special Operations males between ages 20 and 45. Physical training experience levels of the Soldiers injured by supplements varied from very experienced bodybuilders to novice athletes.

Summary of Supplement-Attributable Adverse Effects

GENDER	SUBSTANCE USED	CHIEF COMPLAINT (Why patient came to sick)	ADVERSE EFFECT	OUTCOME

		call)		
Male (deployed)	Steroid patch Steroid injection Steroid pills Protein Creatine	Patient self-referral for lab work due to concerns resulting from supplement use	↑ liver transaminases ↑ creatinine	1. Lost time (admin duty 3-4 months) 2. Resolved with cessation of supplements and rest
Male (deployed)	Protein Creatine	Peripheral edema	↑ liver transaminases ↑ creatinine Peripheral edema	1. Redeployed 2. Resolved with cessation of supplements and rest
Male (deployed)	Protein Creatine	Hypertension	↑ liver transaminases ↑ creatinine	1. Sent to Landstuhl 2. Resolved with cessation of supplements and rest
Male (deployed)	Mass tabs Muscle Milk NO Xplode™ Megaman MVI™	Jaundice	Cholestatic jaundice Liver Failure Kidney Failure Nearly required liver transplant	1. Redeployed back to home station for evaluation and management 2. Ongoing – not resolved
Male (deployed)	Protein Creatine	Rectal bleeding workup	↑ creatinine	1. Resolved with cessation and rest
Male (deployed)	Multiple supplements (unknown types)	Fatigue	↑ liver transaminases ↑ creatinine	1. Lost time 2. Resolved with cessation of supplement and rest
Male (deployed)	NO Explode™	Palpitations	Palpitations	1. Lost training time (1 week) 2. Resolved with cessation and rest
Male (deployed)	Protein Mass Tabs™, isopure (anabolics)	Fatigue	↑ liver transaminases ↑ creatinine	1. Sent to Landstuhl 2. Resolved with cessation of supplements and rest
Male (garrison)	Anabolics Protein Milk thistle	Periodic physical exam	↑ liver transaminases ↑ creatinine	1. Training time lost doing evaluation 2. Ongoing – not resolved
Male (deployed)	Denied supplements	SOF school physical	↑ liver transaminases	1. Training time lost for evaluation

			↑ creatinine	2. Resolved with suspected cessation of supplement use
Male (garrison)	Protein supplements	Routine physical exam	↑ liver transaminases	Resolved with cessation of supplements and rest
Male (garrison)	Tren™ - anabolic precursor	Breast mass	Breast mass	Surgery to remove mass
Male (garrison)	Animal™ - anabolic precursor	Breast mass	Breast mass	Pending surgical consult
Male (garrison)	Denies steroids	Breast mass	Breast mass	Lost time for evaluations
Male (deployed)	Denies steroids	Breast mass	Breast mass	Lost time for evaluations
Male (deployed)	Denies steroids	Breast mass	Breast mass	Redeployed

Notably, the four Soldiers who denied using supplements (specifically steroids) were suspected of misrepresenting their use based on the results of physical exams, their body habitus, and the presence of breast masses, which can result from steroid use.

Most of the injuries were reported and/or occurred in deployed environments during the summer and early fall when the weather was very hot and dry. Extremely high ambient temperatures place additional stress on the body during physical training by amplifying the rise in body temperature and accelerating dehydration. These training environments may have exacerbated the negative effects of some of the dietary supplements, particularly protein and creatine which are processed through the kidneys and work by raising body temperature and stressing the cardiovascular system. Research on creatine suggests that when used properly, not in combination with other substances, and for short durations it does not cause dehydration, alter thermoregulation,³ or induce kidney dysfunction.⁴ However, little if any research has been done on the long-term effects of creatine, particularly creatine used in higher doses, with other agents, and/or in extreme heat environments. Additionally, most ill effects did not occur with the appropriate use of one agent in isolation. Except for the thermogenic dysregulation and the hormonal fluctuations, all other injuries resulted from the use of multiple agents and are likely the result of the cumulative stress of multiple supplements on the body resulting in organ damage. Fortunately, in all but two cases, the organ dysfunction resolved after several weeks or months of rest and discontinuing the use of the supplements.

The authors acknowledge that elevated lab values do not necessarily constitute injury. Most adverse effects to the liver and kidney were transient but persisted for weeks or months, associated with use of more than one type of supplement, involved use of larger than recommended doses of supplements, and resolved with cessation of the supplements and rest. The injured personnel were otherwise healthy, resilient young males. The concern is that prolonged use of these supplements was associated with persistent elevations of kidney and liver labs and could lead to irreversible organ damage (one Soldier nearly had to have a liver transplant). That being said, the injured Soldiers frequently had to undergo medical testing or evacuation to fully define the scope of injury. This took the Soldiers out of combat or training and placed additional strain on their units.

In late 2009, the FDA added 71 prohormone supplements to the list of recalled supplements. This article still discusses both steroid and prohormone supplements because

Soldiers determined to obtain these supplements will find a means of obtaining them. Furthermore, these substances are widely offered on the internet and supplement companies are quick to offer alternative prohormones and supplements that have different brand names or formulations. The authors of this article acknowledge that anabolic steroids are illegal and do not condone or endorse their use; rather they discourage Soldiers from using them. However, medical personnel still need to be aware of their usage to better counsel Soldier athletes, spot adverse effects, and recognize when Soldiers may be using them in dangerous dosing regimens.

The authors encountered many younger Soldiers who began using a variety of health supplements with little to no knowledge of how they work, how much to ingest, and how often to use them. The authors dealt with these Soldiers by providing education and guidance. The remainder of this article is a compilation and expansion of the education provided to these Soldiers.

Preventive Measures

Restricting supplements through command policy or manipulation of base store policy will most likely fail to curtail supplement use. Soldiers invariably will find a way to get them, especially with the widespread availability of supplements on the internet. Even illegal anabolic steroids are relatively easy to obtain and were used by a fair number of patients seen by the providers. Instead, education will be the most effective countermeasure. Soldiers are inundated with information about dietary supplements on television, the internet, friends, and other athletes. Some information is accurate; much is not. The key will be to find methods for disseminating the most accurate information on proper supplement use, the risks of using supplements, and how to recognize the warning signs of adverse effects to those most likely to use supplements.

Providers in the Special Operations units (physicians, physician assistants, physical therapy specialists, dieticians, and medics) must be educated on health supplements in order to best help their patients. Further, they have to be aggressive in asking Soldiers about usage. Many patients will not volunteer this information due to lack of understanding of any connection to an illness and/or a fear of repercussions of using supplements.

Even more effective, though, will be a deliberate campaign to get information to the Soldiers and their most powerful advisors – their peers. Attached is a proposed information chart of common dietary supplements, the manufacturers' recommended usages/dosage, and the adverse effects of each. The recommended uses and dosages are based on manufacturers recommendations; there is scant scientific data to support their use and dosage claims. The manufacturers' recommendations are included because many of the injuries were seen in soldiers who exceeded these recommendations in dosage, duration or both for long periods of time, intending to accelerate their gains.

Additionally, the Army Office of the Surgeon General Policy on Medical Screening for Dietary Supplement Use, published on 1 May 2000, directs Army health care providers to obtain information about dietary supplement use while taking patient history information and ensure that the information is charted on the Standard Form (SF) 600. Also, it directs Army health care providers to report adverse events (“fatal, life-threatening, permanently/significantly disabling, requires or prolongs hospitalization, or requires intervention to prevent impairment or damage”) to the FDA at <http://www.fda.gov/medwatch/how.htm>. Further, in accordance with the Army Office of the Surgeon General Policy published 12 September 2002, any use of dietary supplements connected to a heat injury is to be reported through the Army Reportable Medical Events System (RMES).

Common Dietary Supplements Used By Athletes

The following provides for informational and educational purposes only a relatively comprehensive list of commonly used dietary supplements. No endorsement of any of the

products is intended. All Soldiers should consult with a health care provider prior to beginning any new supplement or workout regimen. Additionally, all medics, physician assistants (PAs), physical therapists (PTs), surgeons, dietitians, etc. should be familiar with these products to ensure their patients use them correctly and inform the Soldiers on proper usage and dosing, adverse effects, and contraindications. Ideally, information on common supplements should be taught to the medics at least annually.

<u>SUPPLEMENT and DESCRIPTION</u>	<u>MANUFACTURER RECOMMENDED USAGE</u>	<u>MANUFACTURER RECOMMENDED DOSAGE</u>	<u>REPORTED ADVERSE EFFECTS</u>
<p>ANABOLIC STEROIDS - Are related to testosterone, which increases the protein synthesis within a cell. The result of increased protein synthesis inside of cells is the increased rate of anabolism (the process of building) or increasing the amount of energy consumption by the body.</p>	<p>MEDICAL USES - To stimulate bone growth and appetite, treat chronic wasting conditions such as cancer and AIDS, and for Hormone Replacement Therapy (HRT). ATHLETIC USES - To increase hypertrophy, strength, aggressiveness, and energy.</p>	<p>NOTE: Athletic anabolic steroid use is illegal in the US! DOSAGES- Dependant on which anabolic is utilized. (i.e., Dianabol, Winstrol, Halotestin, etc.) For MEDICINAL DOSAGES- The physician will determine the proper dosage for the patient. For ATHLETIC DOSAGES- It is not recommended or legal for athletic purposes. Anyone prescribed steroids by a physician will be assessed for proper health.</p>	<p>SIDE-EFFECTS ARE COMMON WITH ANY ANABOLIC STEROID *Inhibition of natural hormones/sterility *Hypogonadism *Increased work load on kidney and liver leading to renal and hepatic failure *Increased low-density lipoprotein (LDL) with decreased high-density lipoprotein (HDL) *Increased blood pressure (BP) and cardiovascular illnesses *Gynecomastia *Enlarged Prostate *Acne w/possible baldness *Stunted Growth</p>
<p>PROHORMONES (i.e. TESTOSTERONE BOOSTERS) - Essentially, these are substances that the body converts to anabolic steroids. There are no studies that demonstrate product effectiveness or all the possible effects of using these supplements. *Tren X-Treme (aka. P-Tren, extreme tren, trenbolone) or 19-norandrosta-4, 9diene-3, 17-dione-30 *Novedex X-T or dianestrozole 3,6,17-androstenetrione *Mass Tabs- Stenbolone w/ tribulus terrestris *Methyl 1-D- 146-etioallocholan-dione</p>	<p>NOTE: The FDA recalled 71 of the prohormones in 2009. ATHLETIC USES- To increase hypertrophy, strength, aggressiveness, and energy. Since these prohormones crossover with steroid detection tests, users may have a positive lab result for steroids. Although the FDA recalled 71 prohormone supplements, many more are still available. Manufacturers have already modified the names of the recalled products to continue sales.</p>	<p>*Tren X-Treme Dosage - Take 1 capsule every 8 hours. Do not exceed 3 capsules per day. Take for a maximum of 6 to 8 weeks, then stop for at least 4 weeks before starting again. *Novedex X-T Dosage- Take 2 to 4 capsules of Novedex XT at night. For best results, use Novedex XT for 4 to 8 weeks. Do not exceed 8 weeks of continuous use. Stop for at least 4 weeks before starting again. *Mass Tabs Dosage- Take one tablet every day for no more than 4 weeks, 30 minutes prior to training. *Methyl 1-D Dosage- Take 4 to 6 capsules per day in two divided doses</p>	<p>SIDE-EFFECTS ARE COMMON WITH ANY PROHORMONE BUT SOME MORE THAN OTHERS. *Inhibition of natural hormones/sterility *Hypogonadism *Increased workload on kidneys and liver leading to renal and hepatic failure *Increased LDL w/decreased HDL *Increased BP and cardiovascular illnesses *Gynecomastia *Enlarged Prostate *Acne *Baldness *Stunted Growth</p>

<p>NATURAL TESTOSTERONE ENHANCERS (i.e. HERBS) - *Yohimbe Bark Extract- Stimulant and aphrodisiac primarily used to increase a male libido. It is found naturally in the yohimbe plant. *Tribulus Terrestris- Stimulant and aphrodisiac primarily used to increase male libido. It is found naturally in a perennial plant. *NOTE: Either of these supplements can be purchased by themselves but they are commonly mixed together (example- Liquid MoJo) for a presumed enhanced effect. Neither of these supplements has shown any increased anabolic effect.</p>	<p>MEDICAL USES - *Yohimbe Bark Extract- Can be utilized to stimulate traumatic event recall in patients with PTSD, but is mainly used to increase sexual libido, and can be used to treat sexual exhaustion or sexual dysfunction. *Tribulus Terrestris- Primarily used for increasing sexual libido, but is also used as a natural diuretic and to treat hypertension. ATHLETIC USES- *Yohimbe and Tribulus- Utilized for promotion of testosterone enhancement, which will in turn increase muscle mass, strength, and energy.</p>	<p>for 4 to 6 week cycles. *Yohimbe Bark Extract and Tribulus Terrestris Dosage - There are no dosage protocols established for either of these supplements. It is suggested to start low and slowly progress up to the product label's suggested dosage.</p>	<p>Yohimbe Bark Extract - *Tachycardia *Hypertension *Overstimulation *Insomnia *Panic attacks *Hallucinations *HA, dizziness *Skin flushing *Renal failure *Seizures Tribulus Terrestris - Adverse effects from supplements are rare and tend to be insignificant. However, some users report an <u>upset stomach</u>. Another rare side-effect which has been reported is <u>gynecomastia</u></p>
<p>ESTROGEN BLOCKERS - Used to inhibit the synthesis of estrogen, which is a by-product of taking certain supplements, and is usually used in conjunction with prohormones and anabolics. The side-effects are different depending on which type of blocker is used.</p>	<p>MEDICAL USES - Research shows that they can be used to reduce hot flashes, reduce the risk of osteoporosis, treatment of mastalgia, gynecomastia, and treatments for breast, ovarian, and prostate cancer. ATHLETIC USES - To reduce the side-effects of using anabolic steroids or prohormones. Note: The authors had a novice bodybuilder approach them about the merits of taking this class of dietary supplements after reading about it in a magazine. He didn't know it was taken to counter anabolic steroid effects, didn't know the possible side effects of taking it, and didn't even know how the substance worked.</p>	<p>NOTE - These medications are discouraged for athletic use. DOSAGES- Depends on which estrogen blocker is utilized. (i.e., antiestrogens, aromatase inhibitors, or specific estrogen receptor modulators) MEDICINAL DOSAGES- The physician will determine the proper dosage for the patient. ATHLETIC DOSAGES- Prospective users should consult a physician prior to beginning any estrogen regiment to determine their health and need. The doses are still controversial. Products vary based on type of blocker used. Make sure to follow the directions on each label. Cycling on and</p>	<p>SIDE-EFFECTS ARE COMMON WITH ANY ESTROGEN BLOCKER BUT SOME MORE THAN OTHERS. THESE ARE A FEW OF THE MORE SERIOUS SIDE-EFFECTS. *Blurred vision *Bruising *Angina *Dizziness *Fatigue *Hot flashes *Mood swings *Night sweats *Numbness *Edema *Osteoporosis *Arthritis/Arthralgia *Joint weakness *Cerebrovascular accident (CVA)</p>

		off is necessary to decrease the adverse side effects.	
<p>VASODILATORS (e.g. L-Arginine)- L-Arginine is utilized by the body to create more Nitric Oxide (NO) which relaxes smooth muscle within the vessel walls causing vasodilation or an increased circumference of the vessels. There are multiple studies for medicinal uses and side effects of NO but little research on the efficacy of the product's claimed usage.</p> <p>*NO-Explode- BSN product that is mixed with various other supplements (e.g., caffeine, creatine, and aminos).</p> <p>*Nitrix- BSN product containing fewer other supplements than NO-Explode</p> <p>*Superpump 250- Gaspari product that is comparable to NO-Explode.</p> <p>*Super Charge- Lee Labrada product that contains various other supplements including a proprietary blend.</p>	<p>MEDICAL USES- The over the counter (OTC) L-arginine isn't used medically. Medical grade nitric oxide is used for treatment of angina, strokes, hypertension, PAH (Pulmonary Arterial Hypertension), and CHF (Congestive Heart Failure).</p> <p>ATHLETIC USES- Causes vasodilation and increases heart contractility, allowing more nutrients, hormones, and supplements to be absorbed at a faster rate, and increased endurance and energy levels.</p>	<p>*NO-Explode Dosage- Once the user's tolerance has been established, mix 1-3 scoops with 5-18oz of cold water and consume 30-45 minutes before training. Use approximately 5-6oz of water per 1 scoop of powder.</p> <p>*Nitrix Dosage- Take 3 tablets 3 times daily. Take on an empty stomach (i.e. approximately 30-45 minutes before meals or 2 hours after a meal). Take first 3 tabs before lunch, and final 3 tabs before dinner.</p> <p>*Superpump 250 Dosage- Take 1-3 scoops with 4-12 oz. of cold water or juice 30-40 minutes prior to training. Start by using (1) scoop to assess tolerance. Do not exceed (3) scoops at any given time.</p> <p>*Super Charge Dosage- Mix 1 or 2 scoops with 10-16 oz of water. Take on an empty stomach 15 minutes prior to working out.</p>	<p>SIDE-EFFECTS ARE COMMON WITH ANY VASODILATOR. SOME HAVE INCREASED RISK DUE TO ADDITIVES.</p> <ul style="list-style-type: none"> *Hypotension *Tachycardia *Palpitations *Arrhythmias *Angina *Headache *Nausea / Vomiting *Dizziness *Edema *Bloating *Pruritis *Arthralgia
<p>THERMOGENICS- Stimulate the body's metabolism. Common thermogenic substances are caffeine (regardless of source; i.e. guarana seed extract, yerbe mate, tea, etc.), ephedra, synepherine, bitter orange, and ginger.</p> <p>*Xenadrine RFA-X- Cytogenix product that contains caffeine, yohimbe, and a proprietary blend</p> <p>*Lipo 6 Black- Nutrex product that contains caffeine and yohimbe, and</p>	<p>ATHLETIC USES- Induce weight loss or increase endurance by increasing metabolic rate, generating and increasing heat, and requiring more energy used from food sources to maintain homeostasis. This information is based on the general claim of athletic articles. Research to substantiate these claims has not been effectively accomplished. However, the research does suggest that the stimulants increase endurance and body</p>	<p>*Xenadrine RFA-X Dosage- Take 3 liquid capsules with glass of water 2 times daily, DON'T EXCEED 6 CAPS IN A DAY, approx. 30 to 60 minutes before meals. On days of workout, take one serving before your workout. Consume ten glasses of water per day.</p> <p>*Lipo 6 Black Dosage- Take 3 caps in the morning and 3 caps in the afternoon. Do not take within 6 hours of sleep. NEVER EXCEED 6 CAPS PER DAY. For</p>	<p>SIDE-EFFECTS ARE COMMON WITH ANY THERMOGENIC. SOME HAVE INCREASED RISK DUE TO ADDITIVES SUCH AS EPHEDRINE.</p> <ul style="list-style-type: none"> *Tachycardia *Palpitations *Hypertension *Anxiety/Nervousness *GERD/Esophagitis *Polyuria *Hyperreflexia *Insomnia *Caffeine Tolerance <u>Caffeine withdrawal which can lead to:</u>

<p>a proprietary blend. *Metabolife Extreme Energy- Contains guarana, yerba mate, green tea extract. All of these ingredients contain caffeine and theophylline, a strong cardiac stimulant.</p>	<p>temperature due to increased heart rate and BP.</p>	<p>maximum results do not take with meals. Consume at least 30 minutes prior to a meal. Use in cycles. A max cycle of 8 weeks followed by a 4 week off-period. *Metabolife Extreme Energy Dosage- Take 1 or 2 caplets 3 times per day with a glass of water. Space each serving at least 3 or 4 hour apart and do not exceed 2 servings in any 8-hour period.</p>	<p>*Headache *Irritability *Inability to concentrate *Drowsiness <u>Caffeine intoxication can lead to:</u> *Delusions *Hallucinations *Psychosis</p>
<p>PROTEINS (i.e., SOURCES IN POWDERS)- Composed of essential amino acids involved in almost every role within a cell. *Whey protein- Common type of protein with the highest amounts of essential amino acids. It is absorbed easily and quickly. Therefore, it is best utilized immediately after physical activity. *Casein protein- (or Milk protein) has the highest amount of glutamine, which aids in recovery, and is best used either post workout or before bed. It is absorbed by the body over a longer period of time. *Soy protein- Is an alternative protein for vegetarians that contains all the essential amino acids. *Egg protein- Is a lactose- and dairy-free protein alternative for those who are lactose intolerant. It is also absorbed quickly and easily, but not as quickly as the whey protein.</p>	<p>ATHLETIC USES- Protein is the essential building block for muscle. Protein powder supplement intake in sufficient amounts allows for increased efficiency of growth and repair of muscle tissues broken down during exercise. Consuming complete proteins is preferred to incomplete proteins.</p>	<p>DOSAGES FOR ALL TYPES OF PROTEINS COMBINED REGARDLESS OF THE SOURCE- Proper dosage of protein supplements is a controversial topic. Some articles for bodybuilding and athletic performance state that you can take up to 2g per pound of bodyweight. However, there has not been research substantiating manufacturers' claims. Users should be aware of the effects of overdosing. Taking between 0.5 to 1g per pound of bodyweight has shown sufficient results. Users should consume servings at approximately 3-hour intervals for best absorption.</p>	<p>OVERUSAGE *Increased workload on the liver *Kidney Disease *Kidney Failure UNDERUSAGE ACCOMPANIED BY (MALNUTRITION) <u>Kwashiorkor which has signs and symptoms of</u> *Edema in the presence of malnutrition *Anorexia/Weight Loss</p>
<p>CREATINE- Is a nitrogenous acid, synthesized from 3 specific amino acids, that is mainly processed in the kidneys and liver, and</p>	<p>MEDICAL USES- Scientific research substantiates the use of creatine to treat Congestive Heart Failure patients. Evidence does</p>	<p>DOSAGES- For adults over the age of 18. It is recommended that all users consult a physician before starting any these supplements.</p>	<p>SIDE-EFFECTS ARE COMMON OF ANY CREATINE SOURCE USED- *Heart attack (HA) *Nausea</p>

<p>most of it is stored in skeletal muscle as phosphocreatine which binds with adenosine diphosphate (ADP) to increase the amount of adenosine triphosphate (ATP), or energy source in muscle. Fish, meat products, and supplements are the primary sources of creatine.</p> <p>NOTE- Anyone with kidney or liver disease should avoid use of this supplement. Anyone with diabetes or hypoglycemia should use with caution.</p> <p>TYPES- There are several types of creatine supplements (i.e. creatine monohydrate, creatine ethyl ester). Numerous companies sell creatine products. Some claim is the ethyl ester is absorbed much faster than the monohydrate but no significant evidence is available to substantiate this claim. Follow guidelines on the labels. Most of the products contain extra carbohydrates, vitamins, minerals, and amino acids (i.e. BSN Cell Mass, Gaspari Size On) unless the user buys pure creatine powder.</p>	<p>not substantiate the claims that it is efficacious in treating depression, apnea, Chronic Obstructive Pulmonary Disease, Myocardial Infarction, Coronary Heart Disease, muscular dystrophy, Multiple Sclerosis and neuromuscular disorders.</p> <p>ATHLETIC USES- Athletes often use creatine supplements to increase mass, strength, performance and endurance. Research supports the claims of increased muscle mass and strength but does not support the claims of increased endurance and performance.</p>	<p>MEDICAL DOSAGES- The physician will determine the proper dosage for the patient.</p> <p>ATHLETIC DOSAGES- The loading dose of 5g taken 4 times a day for 5-7 days is controversial. Some researchers recommend beginning with the loading dose and then going to a maintenance phase of 2-5g per day while other researchers believe that users should start with the maintenance phase and skip the loading doses.</p> <p>REMEMBER- Talk to your physician prior to starting any regimen and stay hydrated while using this supplement.</p>	<ul style="list-style-type: none"> *Diarrhea *Stomach Discomfort *Dizziness/Syncope *Anxiety/Nervousness *Thirst/Dehydration (disputed) *Heat Intolerance (disputed) *Electrolyte Imbalances *Muscle Cramps
<p>GLUTAMINE- A non-essential amino acid that is the most abundant in the human body and one of the few substances that can cross the blood brain barrier. It is found in the blood stream, skeletal muscle, and lungs. It functions as an anabolic aid to recovery by improving the immune system function and response to infection, and is needed for proper brain functioning. This amino</p>	<p>MEDICAL USES- Animal and clinical studies have shown it is beneficial for wasting diseases (i.e. HIV/AIDS, anorexia), GI diseases and illnesses (i.e. peritonitis, gastric ulcers), injuries, trauma, burns, and surgery.</p> <p>ATHLETIC USES- Athletes primarily use glutamine for faster recovery of overstressed or broken down muscle fibers during times of inadequate</p>	<p>DOSAGES- All adults and children should consult a physician before starting this supplement.</p> <p>MEDICAL USES- The physician will determine the proper dosage for the patient. ATHLETIC USES- The dosages depend on the product used. Users should read all product labels and contact a physician prior to taking the first dose to figure out the correct starting dose. On average, most</p>	<p>CLINICAL STUDIES SHOW NO ADVERSE EFFECT, BUT ALSO FAIL TO SHOW POSITIVE BENEFIT</p>

<p>acid is available naturally through foods such as eggs, dairy products, meats, fish, beans, and some vegetables such as beets, cabbage, and spinach. It is also available in powder, tablet, or capsule form. NOTE- Anyone with kidney or liver disease, Reye's Syndrome, or cancer should avoid taking this supplement.</p>	<p>recovery between workouts. This usage also helps restore immune system functioning that is weakened by persistent trauma to the musculoskeletal system.</p>	<p>companies suggest taking between 2-15g per day by taking 5g post-workout and the remainder in divided doses. Some research has advocated taking 0.1g per kg of weight and taking the dose every 30 minutes for 2-3 hours. Depending on the user's weight, this could total between 30-40g post-workout.</p>	
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NOTE:

Supplements are not required to be reviewed by any regulatory body and they do not have to be approved by the FDA before they are placed on the store shelves. Despite the FDA's recall of 71 prohormone drugs, the supplement manufacturers quickly created new products or brand names to get their products back in the market. All consumers should do their research on the companies that are distributing the supplements and the actual ingredients in the supplement to avoid injury. Additionally, not all of the above described supplements will result in all of the adverse side effects, but most individuals who use them will likely have at least some combination of the listed side effects.

<p>Supplement info is available from the following sources:</p> <ol style="list-style-type: none"> 1. National Institute on Drug Abuse at www.gdcada.org 2. National Council Against Health Fraud, Article "Thermogenic Products" by William T. Jarvis PH.D. 3. Nobel prize winners Robert F. Furchgott, Fend Murad, and Louis J. Ignarro MD for Nitric Oxide research from www.nobelprize.org, www.ehow.com, and www.fitflex.com 4. Harvard School of Public Health at www.hsph.harvard.edu 5. Journal of Nutrition at www.jn.nutrition.org 6. University of Maryland Medical Center at www.umm.edu 7. www.mayoclinic.com with evidence based research by Natural Standard Research Collaboration at www.naturalstandard.com 8. www.sciencedirect.com 9. www.yourtotalhealth.ivillage.com 10. For all supplement products to include each product's dosing recommendations, ingredients, and suggested usage www.bodybuilding.com was referenced where each product's labels were verified. 11. TG295 The Warfighters Pocket Guide to Dietary Supplements and their suggested resources at http://chppm-www.apgea.army.mil, http://www-nehc.med.navy.mil, and http://www.navigator.tufts.edu
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SUMMARY AND CONCLUSIONS

It is not possible to determine causality of injury or adverse effect from the information presented in this article. However, given the serious nature of several of the adverse effects seen by the authors, research should be conducted to determine the true effects and increase awareness of these substances. The fact that the FDA does not regulate dietary supplements is a major hindrance in investigating the true effects of each supplement and also in enforcing the composition and quality of supplements on the market. Unfortunately, despite the known risks, Soldiers will continue to use supplements. Many have used them successfully without apparent physical harm and others will likely attempt to replicate these results without doing proper research. The purpose of this article is to inform providers and Soldiers that some dietary supplement users may be experiencing significant injuries as a result of using these substances and to recommend that scientifically based research be done on dietary supplements to provide more information on dosing and adverse reactions. Medical professionals have a duty to educate their patients about the potentially adverse effects of supplements to prevent avoidable injuries. Similarly, individual Soldiers must exercise personal responsibility in seeking reliable sources of information about supplements before they use them.

CLINICAL RECOMMENDATIONS FOR PROVIDERS

1. Report possible supplement injuries to the FDA in accordance with MEDCOM policy.
2. Ask every patient about health supplement use in accordance with MEDCOM policy.
3. When treating these patients, ask the brand name, dosage taken, frequency taken, and where supplement information came from.
4. When questioned "off-line" about a supplement, dig further and educate the patient.
5. Educate the patient when possible.
6. When seeing an increased frequency of usage in a team, educate the team medic. Often the team medic will have far more rapport with the team members than a provider echelons above them will.
7. Visit the gyms frequently and get to know the members of the unit. Discuss health supplements "off line" with any Soldiers making unusually large or fast muscle gains.

Disclaimer

The authors do not endorse use of supplements nor any specific supplement brands named in this article. Additionally, some supplements listed in this article may become banned or recalled before this article is published.

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AUTHOR BIOGRAPHY

MAJ John Hughes, USA, is a Special Forces Battalion Surgeon at Fort Bragg, NC. He was the distinguished graduate of the United States Military Academy in 1996 and served as an infantry officer for two years with the 82nd Airborne Division and deployed on a peacekeeping mission to Haiti. In 2002, he

graduated from the Uniformed Services University of the Health Sciences and then completed the Emergency Medicine residency at the San Antonio Uniformed Services Health Educational Consortium. He is board certified in Emergency Medicine. He has multiple deployments to Iraq and Afghanistan with both conventional and special operations units.

SSG Byron Shelton, USA, is a Special Forces Medical Sergeant and the NCOIC of the 1st Battalion, 7th Special Forces Group Medical Detachment. He graduated from the Joint Special Operations Medic Training Center in 2006. He has multiple deployments to Afghanistan with special operations units. Also, he is an amateur competitive bodybuilder and professional fitness trainer.

Maj Teresa Hughes, USAF, is a Licensed Clinical Psychologist. She was a distinguished graduate from the United States Air Force Academy in 1998. In 2002, she graduated from the Uniformed Services University of the Health Sciences with a doctorate in Clinical Psychology and completed residency at Wilford Hall Medical Center, San Antonio, TX. In 2007, she became the Mental Health Element Chief at Pope AFB, lead psychologist for Commander Directed Evaluations, and a rear detachment consultant for numerous complicated psychological cases. In 2008, she became the Family Practice Flight Commander and taught the Body Composition Improvement Program for Pope Air Force Base, NC.