

TG295

The Warfighter's Guide to Dietary Supplements

What you **REALLY**
need to know.



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Introduction:

What you eat can help you achieve optimal performance in military training and in your day-to-day duties. Nutrition experts recommend a balanced diet that is high in complex carbohydrates and low in fat to help you attain peak performance. While it is true that some supplements may provide health benefits, others are unnecessary since food can generally supply all these nutrients. Additionally, many other supplements cause a risk to one's health if taken incorrectly. There are even some supplements that provide no performance or health benefit, but make an individual feel that they get the advertised results. Advertisements are everywhere promoting a pill or powder to make you lose or gain weight, or promise to make you faster or stronger. This guidebook is written by nutrition experts for those who may be taking supplements or thinking about taking supplements. You need to be a smart dietary supplement consumer.

There is no doubt that what an athlete eats and drinks can affect health, body weight and composition, nutrient availability during exercise, recovery time after exercise, and, ultimately, exercise performance. As the research and interest in sports nutrition has increased, so has the sale of ergogenic aids, supplements, herbal preparations, and diet aids, all aimed at improving

sports performance. The manufacturers of these products frequently make unsubstantiated claims to entice the athlete to use their products. The athlete who wants to optimize physical performance needs to follow good nutrition and hydration practices, use supplements and ergogenic aids carefully, minimize severe weight loss practices, and eat a variety of foods in adequate amounts.

FAQs:

What are **dietary supplements**?

A **dietary supplement** is a product taken by mouth that contains a “dietary ingredient” intended to supplement the diet. The Dietary Supplement Health and Education Act (DSHEA) of 1994 places dietary supplements in a special category under the general umbrella of “foods,” not drugs, and requires that every supplement be labeled a dietary supplement. The “dietary ingredients” in these products may include: vitamins, minerals, herbs or other botanicals, amino acids, and substances such as enzymes, organ tissues, and gland tissue or secretions. Dietary supplements can also be extracts or concentrates, and may be found in many forms such as tablets, capsules, gel caps, liquids, or powders. They can also be in other forms, such as a bar. Information on their label must not represent the product as a conventional food or a sole item of a meal or diet.

What is an **ergogenic aid**?

An **ergogenic aid** is anything that helps enhance energy utilization and performance in the body. Nutritional supplements such as sports drinks for instance or the timing of meals are ergogenic aids.

What is an **ergolytic agent**?

An **ergolytic agent** is anything that possesses the ability to decrease work output. Sometimes what is intended to enhance physical performance actually hinders performance. For example, alcoholic beverages consumed immediately before an event were once thought to be ergogenic for endurance athletes, but may have actually been ergolytic.

Be a smart consumer...

The law requires products to be properly labeled. However, manufacturers may purchase and use ingredients without adequately testing for ingredient purity and/or quality. The product may not contain what is listed on the label, could contain contaminants, or higher than reported levels of active ingredients.

Before using a supplement consider:

- The risk(s) of consuming the supplement.
- Whether claims of effectiveness are backed up by independent research on humans (not rats).
- Whether the supplement will help you achieve your performance goals.
- Manufacturer practices are not regulated. Therefore, products may contain harmful contaminants.
- If its use will compromise your health or well-being.
- Whether the substance interacts with prescribed medications.
- If consumption of the substance interacts with a particular health condition.
- Whether the product claims to replace food or good training practices.

Further reading should provide some guidance in answering the above questions.

***Be careful about reading health books.
You may die of a misprint.***

Mark Twain

Food First: Using food to achieve performance goals.

During times of high physical activity, energy and nutrient needs—especially carbohydrate (CHO) and protein intake—must be met in order to maintain body weight, replenish energy stores, and provide adequate protein for building and repair of tissue. Fat intake should be adequate to provide the essential fatty acids and fat-soluble vitamins, as well as to help provide adequate energy for weight maintenance.

Overall, diets should provide moderate amounts of energy from fat (20% to 25% of energy); however,

| What's the cost? | | | |
|---|--------------------------|-----------------|-------------------|
| Food First! | | | |
| | If you consume 2 per day | for the Month | for the Year |
| 1 cup skim milk | .56 | \$16.80 | \$201.60 |
| 1 package instant breakfast | <u>.60</u> | <u>\$18.00</u> | <u>\$216.00</u> |
| Total | \$1.16 | \$34.80 | \$417.60 |
| Plus tastes great and contains more vitamins and nutrients. | | | |
| Vs | | | |
| Popular Protein Powder | | | |
| 1 serving | \$4.98 | \$149.40 | \$1,792.80 |
| Do the math...you don't have to spend a lot of money to achieve your goals. | | | |

there appears to be no performance benefit to consuming a diet containing less than 15% of energy from fat. Body weight and composition can affect exercise performance, but should not be used as the primary criterion for sports performance. Daily weigh-ins are discouraged, unless being used to determine fluid losses or needs. Consuming adequate food and fluid before, during, and after exercise can help maintain blood glucose during exercise, maximize exercise performance, and improve recovery time. Athletes should be well-hydrated before beginning to exercise and drink enough fluid during and after exercise to balance fluid losses. Consumption of sport drinks containing carbohydrates and electrolytes during high intensity exercise will provide fuel for the muscles, help maintain blood glucose, and decrease the risk of dehydration. If an athlete is consuming a balanced and varied diet choosing from all food groups, vitamin and mineral supplementation may not be necessary.

Nutrient requirements

- Carbohydrates are important to maintain blood glucose levels during exercise and to replace muscle glycogen. Recommendations for athletes range from **6 to 10 g/kg body weight** per day. The amount required depends upon intensity and duration of workout, type of sport performed, environmental conditions, and individual athlete differences.
- Protein requirements are slightly increased in highly active people. Protein recommendations for endurance athletes are 1.2 to 1.4 g/kg body weight per day, whereas those for resistance and strength-trained athletes may be as high as 1.6 to 1.7 g/kg body weight per day. Protein intakes can generally be met through diet alone without the use of protein or amino acid supplements, if energy intake is adequate. No additional benefits are gained with protein intakes greater than 2.0 g/kg/day.

To convert your weight from pounds (lbs) to kilograms (kg), just divide your weight by 2.2.

For example $180 \text{ lbs}/2.2 = 81.8 \text{ kg}$.

So to calculate nutrient requirements just multiply the kg by recommended g per kg per day.

Example: $81.8 \times 6 = 491$; $81.8 \times 10 = 818$.
Daily carbohydrate requirement for a 180 lb man is 491-818 g.

If you are sedentary due to injury or your activity decreases, your nutrient requirements will also decrease to about 4g/kg body weight per day. Example:
 $81.8 \times 4 = 327$

Daily carbohydrate requirement for a sedentary 180 lb man is 327 g.

- Fat intake should not be drastically restricted because it does provide energy, fat-soluble vitamins, and essential fatty acids. Conversely, there is no scientific basis on which to recommend high-fat diets to athletes.
- Water. Dehydration decreases exercise performance; thus, adequate fluid before, during, and after exercise is necessary for health and optimal performance. Athletes should drink enough fluid to balance their fluid losses. Two hours before exercise 14 to 22 oz of fluid should be consumed, and during exercise 4 to 8 oz of fluid should be consumed every 15 to 20 minutes depending on tolerance. After exercise the athlete should drink adequate fluids to replace sweat losses during exercise. The athlete needs to drink at least 16 oz of fluid for every pound (0.5 kg) of body weight lost during exercise.
- The athletes at greatest risk of micronutrient (vitamins/minerals) deficiencies are those who restrict energy intake or use severe weight-loss practices, eliminate one or more food groups from their diet, or consume high-carbohydrate diets with low micronutrient density. Athletes should strive to make dietary choices that include all food groups daily. This will ensure that the recommended daily allowances for all micronutrients are met from food thus minimizing the need for supplementation.

Protein needs of athletes have received considerable investigation, not only in regard to whether athletes' protein requirements are increased, but also in relation to whether individual amino acids are a benefit to performance. The research literature does support increased

protein requirements for athletes because of the need to repair exercise-induced microdamage to muscle fibers, use of small amounts of protein as an energy source for exercise, and the need for additional protein to support gains in lean tissue mass. If protein needs are increased, the magnitude of the increase may depend on the type of exercise performed (endurance vs resistance), the intensity and duration of the activity, and possibly the gender of the participants.

For endurance athletes, nitrogen balance studies in men suggest a protein recommendation of 1.2 g/kg/ day. Little information is available regarding requirements of endurance athletes who are women. Resistance exercise is thought to increase protein requirements even more than endurance exercise, and it has been recommended that experienced male bodybuilders and strength athletes consume 1.6 to 1.7 g/kg body weight per day to allow for the accumulation and maintenance of lean tissue. Again, data on female strength athletes are not available. Athletes should be aware that increasing protein intake beyond the recommended level is unlikely to result in additional increases in lean tissue because there is a limit to the rate at which protein tissue can be accrued. It must be ensured that energy intake is adequate—otherwise, protein will be used as an energy source, falsely elevating estimates of the requirements under conditions of energy balance. It is worth noting that the customary diets of most athletes provide sufficient protein to cover even the increased amounts that may be needed.

*The Athlete does not embark upon a sport
but upon a way of life.*

W.R. Loader
Writer

What is an athlete? (Where do you fit?)

Sedentary & untrained

Training for general health & fitness:

0.5 to 1 hour, 3-5 times per week

Recreational athlete:

1-1.5 hours, 3-5 times per week

Well-trained athlete:

1.5-3 hours, 5-7 times per week

Elite/World Class athlete:

2-6 hours, 6-10 times per week



Although resistance exercise usually requires less energy than endurance exercise, the total energy needs of athletes participating in strength training and bodybuilding may be as high as those of endurance athletes because of their increased body size and high levels of fat-free mass. In circumstances in which an increase in lean body mass is the goal, energy intake

must be sufficient to meet the needs for muscle growth. Thus, many strength athletes may need 44 to 50 kcal/kg body weight/day, and those in serious training may have even higher energy requirements (more than 50 kcal/kg body weight/day). Be honest in how you classify yourself. If your activity ranges from sedentary to a recreational athlete, your goals can be achieved through smart food choices and training. Even with well-trained or elite athletes, supplementation does not guarantee success.

Nutrient Needs of Athletes – Nutrient Dense Diet

| | General Health & Fitness | Recreational | Well Trained | Elite |
|---------------------|-------------------------------------|---------------------|---------------------|------------------|
| Carbohydrate | 5-8 g/kg/day | 5-8 g/kg/day | 8-10 g/kg/day | 8-10 g/kg/day |
| Protein | 1-1.5 g/kg/day | 1-1.5 g/kg/day | 1.5-2.0 g/kg/day | 1.5-2.0 g/kg/day |
| Fat | 0.5 – 1 g/kg/day | 0.5 – 1 g/kg/day | 0.5 – 1 g/kg/day | 0.5 – 1 g/kg/day |

Timing of meals

Snacks Before Exercise should:

- Provide sufficient fluid to maintain hydration.
- Be relatively low in fat and fiber to facilitate stomach emptying.
- Be relatively high in carbohydrate to maximize blood glucose maintenance.
- Be a smaller meal consumed in close proximity to the event to allow for stomach emptying.
- Be moderate in protein.
- Be composed of foods familiar and well tolerated by the athlete.

Snacks During Exercise should:

- Replace fluid losses and provide carbohydrates (approximately 30-60 g/hour) for blood glucose level maintenance. This is especially important for endurance events lasting longer than an hour, when the athlete has not consumed adequate food or fluid before exercise or if the athlete is exercising in an extreme environment.
- Be moderate in protein.
- Be composed of foods familiar and well tolerated by the athlete.

Snacks After Exercise should:

- Provide adequate energy and carbohydrates to replace muscle glycogen and to ensure rapid recovery.

For instance:

- If an athlete is glycogen-depleted, a carbohydrate intake of 1.5 g/kg body weight during the first 30 minutes and again every 2 hours for 4-6 hours will be adequate to replace glycogen stores.
- Protein will provide amino acids for the building and repair of muscle tissue.
- Athletes should consume a mixed meal providing carbohydrates, protein, and fat soon after a strenuous competition or training session.
- 4 g carbohydrate to 1 g protein ratio is best for recovery and rebuilding.



Special Environmental Conditions

- **Hot and humid environments.** The risks of dehydration and heat injury increase dramatically in hot, humid environments. If the ambient temperature exceeds body temperature, heat cannot be dissipated by radiation. Moreover, if the relative humidity is high, the potential to dissipate heat by evaporation of sweat is substantially reduced—at a relative humidity of 100%, evaporation of sweat does not occur. Instead, in humid environments, sweat drips from the body, leading to nonfunctional fluid loss. When temperature and humidity are both high, there is a very high risk of heat illness.
 - **Cold environments.** Although the risk of dehydration is greater in hot environments, dehydration is not uncommon in cool or cold weather. Factors that could contribute to dehydration under these conditions include respiratory fluid losses in cold dry environments, as well as sweat losses that may be high if insulated clothing is worn during intense exercise. Dehydration could also occur as a result of low rates of fluid ingestion: if an athlete is chilled and available fluids are cold, the incentive to drink would clearly be reduced. Finally, the difficulty of removing multiple layers of clothing to urinate may cause some athletes, especially women, to voluntarily limit their fluid intake.
-

- **Altitude.** Exposure to altitudes higher than 2,500 m (8,200 ft) may result in fluid losses beyond those associated with any exercise that might be performed. These losses are the result of diuresis (increased excretion of urine) and high respiratory water losses, accompanied by decreased appetite, which lead to an increased need for fluid intake. The diuresis is considered by some to be an indication of successful acclimatization, although others have suggested that at least part of the diuresis can be minimized by adequate energy intake and maintenance of body weight. Under circumstances of weight maintenance, this diuresis is of a magnitude of about 500 mL per day and lasts for about 7 days. Respiratory water losses may be as high as 1,900 mL per day in men and 850 mL in women. Thus, fluid intake at high altitude should be increased to as much as 3 to 4 L per day to assure optimal kidney function.
-

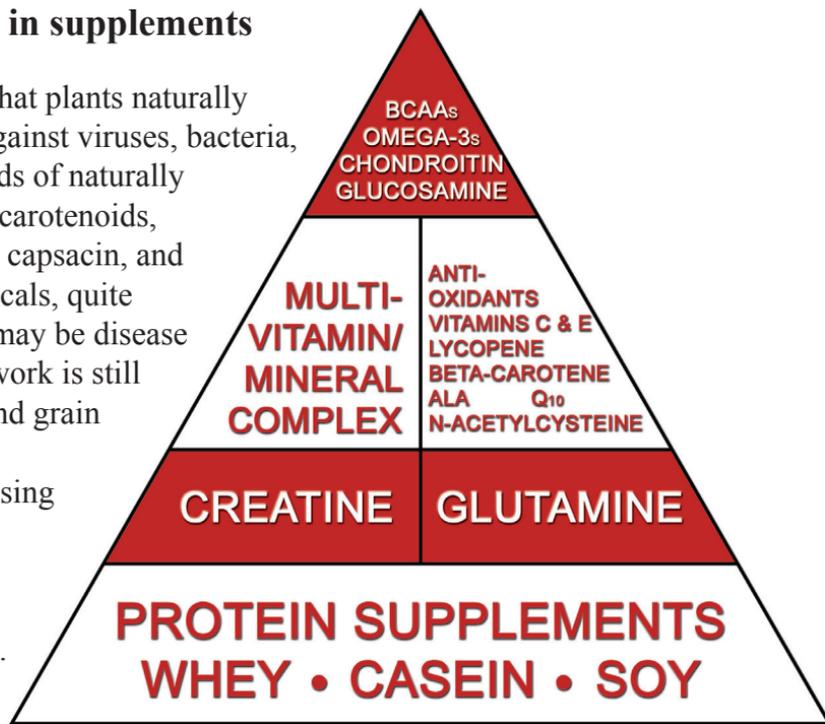
Benefits of food not found in supplements

Phytochemicals are substances that plants naturally produce to protect themselves against viruses, bacteria, and fungi. They include hundreds of naturally occurring substances, including carotenoids, flavonoids, indoles, isoflavones, capsaicin, and protease inhibitors. Phytochemicals, quite simply are plant chemicals and may be disease fighters. How phytochemicals work is still unclear, but fruits, vegetables, and grain products are “hot” health foods.

Increase your “phyto’s” by choosing yellow-orange and dark green vegetables and fruits such as broccoli, spinach, tomatoes, apricots, cantaloupe, and carrots.

Nuts and seeds contain phytochemicals too, so add

them to salads, casseroles, or eat for a snack. Choose a wide variety of plant foods to get the phytochemicals you need.



***People can be induced to swallow anything,
provided it is sufficiently seasoned with praise.***

Moliere
17th Century Playwright

Supplements

Serious athletes work hard to make their bodies strong and healthy, but are often willing to jeopardize their health if they feel consuming a substance will provide a competitive edge.

Dr. Robert Voy, a former physician for the U.S. Olympic Committee, cited an informal study wherein more than 50 percent of elite athletes stated they would be willing to take a substance that would guarantee them an Olympic gold medal, even if they knew that taking the substance would be fatal in a year. *The Ergogenics Edge Mel Williams*.

REMEMBER:

In the end, a true champion will excel without them!

WARNING: Certain communities have strict guidelines regarding the use of dietary supplements (i.e. aviators and nuclear weapon handlers) while others do not. Therefore, this pocket guide is not intended as an endorsement of dietary supplements, but rather to provide a starting point from which informed decisions can be made.

Legend

*The symbols below are used on the following pages to help describe each supplement. These symbols give a quick view of the research conclusions for each item.

| | |
|--|---|
|  | Documented ergogenic effect. No harmful side effects shown. Use of this substance may be beneficial to some athletes. |
|  | Proceed with caution. Some benefit reported but excess/misuse may cause harm. |
|  | No proven benefit. Can cause harm and should be avoided. |
|  | Strong theoretical rationale. Not enough science to recommend supplementation. Any benefit to be obtained by use of this substance may be obtained through proper nutrition. |
|  | Not worth your money. |
|  | Use of this substance has been linked with death. |

FOR ALL SUPPLEMENTS: Ingredients and amounts listed on labels may not be accurate. May contain contaminants, heavy metals, and other toxic substances. Allergic reactions are always possible.

Glycogen Sparers

During prolonged exercise, fatigue occurs when glycogen (muscle sugar) stores are depleted. The following ergogenic aides have been marketed to improve endurance performance by sparing glycogen stores.

| Product | Claim | Fact | Reported Side Effect |
|--|--|---|---|
| Carbohydrate (CHO)  | <ul style="list-style-type: none"> • Primary fuel source for anaerobic and high intensity aerobic workouts. | <ul style="list-style-type: none"> • Daily food intake should contain 55-65% carbohydrate. • Replenishes stores used during exercise/training. For endurance events greater than 90 minutes, taper training 3-5 days prior to the event. Increase carbohydrate by 200-400 g/day to “supersaturate” muscle and liver glycogen to extend endurance. <p>Reported Dosage: Recreational athletes require 5-8 g/kg body weight per day. Well trained athletes require 8-10 g/kg/day.</p> | <ul style="list-style-type: none"> • For every gram of CHO stored, 2-3 g of water will be stored: Water weight gain. |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|---|--|---|---|
| <p>Glucose Electrolyte Solution (GES), Sports Drinks</p>  | <ul style="list-style-type: none"> • Drinking during exercise allows you to exercise longer before muscles fatigue. | <ul style="list-style-type: none"> • 6-8% concentration beneficial for maintaining hydration in exercise > 60 min. • Preserves glucose levels in endurance events lasting greater than 1 hour. GES promotes greater hydration because of the presence of small amounts of sodium. • Flavored GES solutions that taste good increase total fluid intake. <p>Reported Dosage: For intense competitions lasting >60 min drink 6-8 oz every 10-15 min alternating with water.</p> | <ul style="list-style-type: none"> • Solutions above 8% may cause abdominal/intestinal distress. |

| Product | Claim | Fact | Reported Side Effect |
|--|---|---|---|
| <p>Caffeine</p>  | <ul style="list-style-type: none"> • Promotes use of free fatty acids by muscle. • Spares muscle glycogen and extends endurance capacity. • Increases mental alertness. • Delays fatigue. | <ul style="list-style-type: none"> • A central nervous system stimulant. • Improves performance by promoting release of fatty acids for use as fuel. • May increase mental alertness. • Effects blunted in habitual users. • Caffeine in coffee may not be as effective as pure caffeine. <p>Reported Dosage: 3-6 mg/kg 1 hour prior to the exercise event will produce ergogenic effect. For example: An 81 kg man X 4.4 mg caffeine/kg = 356 mg divided by ~80 mg per cup of coffee = 4.5 cups.</p> | <ul style="list-style-type: none"> • Irritability, nervousness, dehydration, upset stomach. • Tolerance varies among individuals. • Causes diuretic effect, which may accelerate dehydration. • Dangerous when combined with other stimulants (ephedrine alkaloids, synephrine, yohimbine). |

| Product | Claim | Fact | Reported Side Effect |
|---|---|---|--|
| <p>Ginseng</p>  | <ul style="list-style-type: none"> • Provides a stimulant effect that enhances athletic performance. • Relieves stress. | <ul style="list-style-type: none"> • A medicinal root from the Araliaceae plant family. • Insufficient evidence to support effect on athletic performance. 1-8 weeks supplementation showed no benefit in aerobic exercise. • May raise estrogen levels instead of testosterone levels. • Not for long-term use (> 3 months). <p>Reported Dosage: Concentrations vary from product to product and various forms of ginseng. 100-300 mg/day has been reported. One study showed 60% of ginseng supplements tested contained no ginseng at all.</p> | <ul style="list-style-type: none"> • Increases blood pressure. • May cause hypoglycemia. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|--|
| <p>Choline</p>  | <ul style="list-style-type: none"> • Improves energy. • Delays fatigue. • Increases memory. • Prevents cancer. • Improves oxygen use during aerobic events. | <ul style="list-style-type: none"> • A precursor to acetylcholine an important nerve impulse transmitter. Hard exercise decreases plasma levels leading to fatigue. • Easily achieved in the diet. Good dietary sources include eggs, liver and legumes. • No evidence that ingestion improves performance. <p>Reported Dosage: 200 ml solution containing 2.43 g of choline 45 min prior and immediately before exercise.</p> | <ul style="list-style-type: none"> • Diarrhea, nausea, abdominal cramps and a fishy body odor when taking > 5 g/day. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|---|
| <p>Medium Chain Triglycerides (MCTs)</p>  | <ul style="list-style-type: none"> • Improves endurance. • Spares glycogen. • Increases metabolic rate. • Promotes use of fat during exercise. | <ul style="list-style-type: none"> • MCTs are rapidly absorbed fats and available as an immediate energy source. • Studies have not supported benefit from taking MCTs alone or with carbohydrate. <p>Reported Dosage: Doses vary.</p> <ul style="list-style-type: none"> • 25 g MCT + 50 g carbohydrate 1.5 hr before activity. • 4.3% MCT + 6% carbohydrate. 250 ml taken at start of endurance activity and every 15 minutes thereafter. | <ul style="list-style-type: none"> • Upset stomach when intake exceeds 1g/kg. • Diabetics should avoid unless supervised by a physician. • Requires adequate liver function. |

| Product | Claim | Fact | Reported Side Effect |
|--|--|---|--|
| <p>Poly lactate</p>  | <ul style="list-style-type: none">• Improves endurance.• Delays onset of fatigue. | <ul style="list-style-type: none">• Serves as carbohydrate source during endurance activity.• Addition of poly lactate to a glucose beverage did not improve performance. <p>Reported Dosage: Prepare as directed on label and consume 5 minutes prior to the event and then at 30 minute intervals during the event.</p> | <ul style="list-style-type: none">• None reported. |

***“Ability is what you’re capable of doing.
Motivation determines what you do.
Attitude determines how well you do it.”***

Lou Holtz
Football Coach
University of South Carolina

Testosterone Boosters

Testosterone is a male sex hormone and can elicit anabolic (tissue building) and androgenic (masculinizing) effects. Testosterone builds muscle tissue so the following agents are marketed as having the ability to increase testosterone levels further and build muscle.

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|--|
| <p>Post Exercise Carbohydrate/ Protein</p>  | <ul style="list-style-type: none"> • Enhances glycogen re-synthesis and protein uptake. • Improves muscle building after exercise. | <ul style="list-style-type: none"> • Combining the right mix of carbohydrate and protein following exercise may promote protein synthesis and glycogen resynthesis – aiding in recovery. • A carbohydrate to protein ratio ranging from 1.5:1 to 4:1 is easily achieved by diet and best when ingested within 60 minutes after exercise then again in 4 hours (meal). <p>Continued on next page.</p> | <ul style="list-style-type: none"> • No side effects noted. |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|---|--|---|---|
| <p>Post Exercise Carbohydrate/ Protein continued</p> | | <p>Reported Dosage: For example an 8 oz glass of skim milk has a 1.5:1 ratio (i.e., 12 g carb with 8 g of protein.)</p> | |
| <p>Androstenedione Androstenediol</p>  | <ul style="list-style-type: none"> • Increases muscle mass and strength. • Decreases body fat. | <ul style="list-style-type: none"> • A naturally occurring hormone that is converted in very small amounts to testosterone. • Though several studies have been conducted, none have been shown to support claims of effectiveness of supplementation for increasing muscle mass. <p>Reported Dosage: One study with men showed no enhancement of muscle strength when taking 200 mg/day orally. Another study showed no improvement in 1 rep max weight lift over the placebo.</p> | <ul style="list-style-type: none"> • Raises estrogen levels in men. • Reduces good cholesterol levels that protect against heart disease. |

| Product | Claim | Fact | Reported Side Effect |
|---|---|--|---|
| <p>Dehydroepiandrosterone (DHEA)</p>  | <ul style="list-style-type: none"> • Slows aging. • Improves memory. • Stimulates libido/increases sex drive. • Alleviates depression. • Boosts energy. • Promotes weight loss. • Builds muscle mass/increases strength. | <ul style="list-style-type: none"> • A hormone produced in all men and women. Appears to be beneficial in persons older than 55 years. • DHEA is converted to both estrogen and testosterone and desired effects may not be reached. • More research is needed to determine if use is safe and improves athletic performance. <p>Reported Dosage: 50-100 mg/day usually cycled two weeks on and one off.</p> | <ul style="list-style-type: none"> • Virilization in women (baldness, deepening voice, growth of body hair), and breast growth in men with high doses. • Can cause positive test for testosterone doping. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|---|
| <p>Yohimbine</p>  | <ul style="list-style-type: none"> • Enhances sexual performance (aphrodisiac and erectile function). • Increases muscle mass. • Boosts testosterone levels. • Promotes weight loss. • Increases energy levels. • Relieves depression. | <ul style="list-style-type: none"> • The active compound is an alkaloid called Yohimbine and is classified as an unsafe drug by the FDA. • No standardization of dosages exists, so consistent intake is difficult to ensure. • Well-controlled research does not substantiate claims as an ergogenic, anabolic or thermogenic aid. <p>Reported Dosage: No standard dosage exists though generally 10-30 mg/day of yohimbine alkaloids is standard dose on many commercial supplement labels. Dosage > 40 mg/day greatly increases risk for side effects.</p> | <ul style="list-style-type: none"> • Anxiety, panic attacks, hallucinations, elevated blood pressure, heart rate, dizziness, headache flushing, nausea, chills. • Avoid if taking prescription monoamine oxidase inhibitors. <p>Continued on next page.</p> |

| Product | Claim | Fact | Reported Side Effect |
|-------------------------------|--------------|-------------|--|
| Yohimbine continued | | | <ul style="list-style-type: none">• Dangerous when combined with other stimulants (EA, caffeine, synephrine).• Avoid if pregnant or plan to become pregnant due to abortion risk. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|--|
| <p>Gamma Oryzanol (GO)</p>  | <ul style="list-style-type: none"> • Increases testosterone levels. • Increases growth hormone. • Increases lean body mass. | <ul style="list-style-type: none"> • A plant sterol (fat-like substance) and ferulic acid. • Absorption rate is only 10%. • Dietary sources include rice and rice bran oil. Believed to increase testosterone and growth hormone levels. • No studies support claims. <p>Reported Dosage: Nine weeks of supplementation with 500 mg/day did not improve strength, body composition or muscle building hormones.</p> | <ul style="list-style-type: none"> • None reported. |

| Product | Claim | Fact | Reported Side Effect |
|--|--|---|--|
| <p>Glandulars: Testes, Pituitary, or Hypothalamus</p>  | <ul style="list-style-type: none"> • Elevates testosterone levels. • Promotes muscle growth. | <ul style="list-style-type: none"> • No evidence to support these claims. <p>Reported Dosage: They typically come as a dietary supplement mixed with protein/carbohydrate powders. Do not exceed product information.</p> | <ul style="list-style-type: none"> • Indigestion has been reported. • High doses may decrease testosterone production. |
| <p>Smilax Officinalis (SO)</p>  | <ul style="list-style-type: none"> • Provides androgenic effect increasing male hormone and promoting muscle growth. • Enhances immune function. | <ul style="list-style-type: none"> • A plant sterol structurally related to testosterone. No research studies have linked SO with increases in muscle mass. <p>Reported Dosage: Doses of 500mg/day have been used in studies.</p> | <ul style="list-style-type: none"> • Liver damage reported in animals grazing on plant derivatives. |

| Product | Claim | Fact | Reported Side Effect |
|--|---|--|---|
| <p>Tribulus Terrestris (TT)</p>  | <ul style="list-style-type: none"> • Increases plasma testosterone. • Promotes skeletal muscle hypertrophy. | <ul style="list-style-type: none"> • An herb (puncture vine) traditionally used as a diuretic and for treating high blood pressure, high cholesterol and colic pain. • Studies as an ergogenic aid found no effect on serum testosterone. In cyclists no elevation of testosterone was found after 38 days of consumption nor was there any increase in average power or maximum oxygen uptake during a 12.5 km performance trial. <p>Reported Dosage: Bodybuilders consuming 1.5 mg/pound for two months showed no improvements in body weight, percent body fat, total muscle mass or strength.</p> | <ul style="list-style-type: none"> • No short-term side effects reported in humans. • Sheep who eat T.T. have been found to develop irreversible neuromuscular weakness in their hind legs. |

Intracellular Buffers

As exercise becomes more intense; muscle cells produce lactic acid that builds up to a level too acidic for muscles to function and fatigue results. The body's natural capacity to buffer this lactic acid build up becomes strained over extended periods of time. The following agents are ***proposed*** to help the body buffer muscle acidity, thus delaying the onset of fatigue.

| Product | Claim | Fact | Reported Side Effect |
|--|---|--|---|
| Aspartate Salts (Mg and K aspartate)  | <ul style="list-style-type: none"> • Spares muscle glycogen. • Decreases fatigue. • Increases endurance. | <ul style="list-style-type: none"> • Salts of the non-essential amino acid aspartic acid. • No studies demonstrate clear benefits. <p>Reported Dosage: Studies using 6-10 g over 24 hour period for endurance activities show inconclusive results ranging from increasing time to exhaustion and mobilizing fatty acids and decreased blood ammonia levels to no benefit at all.</p> | <ul style="list-style-type: none"> • No side effects reported for dose of 10 g in 24 hours (short term) or dose of 8 g/day over 18 months. • Diarrhea when dose is large. |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|--|---|---|--|
| <p>Phosphate Loading/ Phosphate Salts</p>  | <ul style="list-style-type: none"> • Delays fatigue during exercise of various durations. • Increases oxygen transport to muscles. • Increases cardiac output/stroke volume. | <ul style="list-style-type: none"> • An essential mineral and component of the bodies buffering system that can delay fatigue. • Some effective results with doses of 4g/day for 3-6 days prior to an endurance event. • Increases in maximum oxygen uptake by 5-10% shown in some endurance athletes. • Phosphates also buffer acid byproducts of metabolism delaying fatigue. <p>Reported Dosage: Most studies report an administered dose of 4-5 g sodium phosphate for 3-4 days.</p> | <ul style="list-style-type: none"> • Stomach upset, diarrhea. • Vomiting and mineral imbalances at greater than recommended dose. • Contraindicated in individuals who consume soft drinks due to the high phosphate content of most soft drinks. • USE ONLY UNDER SUPERVISED CONDITIONS. |

| Product | Claim | Fact | Reported Side Effect |
|--|---|---|--|
| <p>Sodium Bicarbonate (Baking Soda)</p>  | <ul style="list-style-type: none"> • Reduces lactic acid accumulation. • Improves endurance performance. • Increases power output. | <ul style="list-style-type: none"> • A natural buffer that can delay fatigue by neutralizing lactic acid. • May delay fatigue in anaerobic (short duration high intensity) exercises lasting between 1-7 minutes. • In one study performance improved by 14%. In another, a 27% improvement in time to exhaustion occurred. Studies show conflicting results with benefit ranging from 0-42% improvement. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Gastrointestinal upset, nausea, bloating and diarrhea reported in some individuals negating any ergogenic benefit. • Apathy, irritability, cardiac arrhythmias. • Excess intake can cause metabolic alkalosis (too little acid). |

| Product | Claim | Fact | Reported Side Effect |
|--|-------|---|--|
| Sodium Bicarbonate (Baking Soda) continued | | Reported Dosage: A dose of 0.3g/kg (300mg/kg) of body weight dissolved in 500-1000 mL water taken 1-2 hours before exercise may delay fatigue in short (1-3 minutes) anaerobic events that use the lactate energy system. Equivalent to 2-3 tsp dissolved in 2-3 glasses of water. | <ul style="list-style-type: none">• Contraindicated in individuals with high blood pressure.• USE ONLY UNDER SUPERVISED CONDITIONS. |

Energy Boosters

Muscles need energy to function. This energy is called adenosine triphosphate (ATP). Carbohydrates, proteins, and fats undergo chemical breakdown ultimately resulting in the release of ATP for energy. Manufacturers *claim* that energy can be enhanced because the following agents alter enzyme levels involved in the chemical breakdown and/or improve oxygen delivery to the cells resulting in an increase in ATP production and improved performance.

| Product | Claim | Fact | Reported Side Effect |
|--|--|--|---|
| Coenzyme Q10  | <ul style="list-style-type: none"> • Slows the aging process. • Increases energy. • Enhances immune function. • Increases endurance in aerobic activities. | <ul style="list-style-type: none"> • A cellular component of energy production and an antioxidant. • Demonstrated benefit in heart patients taking 50 mg/day for 4 weeks. Showed improvement in breathing, blood pressure, heart rate, and swelling in the extremities. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Possible muscle cell damage. • Gastrointestinal disturbances may occur if not taken with food. |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|---|---|--|--|
| Coenzyme Q10 continued | | <ul style="list-style-type: none"> • Less evidence to support Coenzyme Q10 as an ergogenic/performance enhancer in athletic events. <p>Reported Dosage: Daily doses of 50-100 mg appear to be safe.</p> | |
| Inosine  | <ul style="list-style-type: none"> • Increases energy levels. • Increases endurance through increased energy production and oxygen delivery. • Decreases lactic acid production. | <ul style="list-style-type: none"> • A component of metabolism that could have an effect on energy production. • Some evidence exists that it can actually hinder performance in sprinting activities. <p>Reported Dosage: No beneficial effects have been found when doses of between 5-6 g/day have been consumed for a week.</p> | <ul style="list-style-type: none"> • Increased levels of uric acid can build up crystals in joints and lead to a painful arthritic condition known as gout. |

Fat Burners/LBM Enhancers

Free fatty acids (FFA) are a significant energy source during endurance exercise. When the body can rely more heavily on FFA, then muscle glycogen can be spared and prolong endurance exercise. Amino acids can also be used by the body as an energy source. When there is an increase in amino acid synthesis and/or FFA metabolism, lean body mass is enhanced. These ergogenic agents profess to enhance this process.

| Product | Claim | Fact | Reported Side Effect |
|--|--|---|--|
| HMB— Hydroxy- Methyl- Butyrate  | <ul style="list-style-type: none"> • Builds muscle. • Inhibits breakdown of lean tissue during sustained endurance events, or during extended periods of inactivity. | <ul style="list-style-type: none"> • A metabolite of the branched chain amino acid leucine. • May reduce muscle breakdown and protect against muscle damage from over training. Most benefit found in young untrained individuals. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • None reported in doses of less than or equal to 4 g/day. |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|-----------------------------|--|---|----------------------|
| <p>HMB continued</p> | <ul style="list-style-type: none"> • Inhibits loss in muscle strength found in a person who has over trained. | <ul style="list-style-type: none"> • Supplementation of 1.5-3.0 g of HMB for 3 weeks increased muscle mass and strength while minimizing exercise induced muscle damage. • Three g of HMB in trained weight lifters resulted in significant increases in lean body mass and strength and decrease in body fat. No improvements in muscle mass or body fat were found in another study looking at 40 experienced weight lifters engaging in daily resistance training, consuming 3-6 g of HMB. • More data needed to confirm results and claims. <p>Continued on next page.</p> | |

| Product | Claim | Fact | Reported Side Effect |
|--|--|---|--|
| HMB continued | | Reported Dosage: Most studies used a dose of 3-6 g/day for 20-60 days. | |
| <p>Synephrine (Citrus Aurantium)</p> <p>Zi Shi</p>  | <ul style="list-style-type: none"> • Increases metabolic rate. • Increases calorie expenditure. • Burns fat. • Promotes weight loss. • Increases energy levels. | <ul style="list-style-type: none"> • Derived from fruit of a plant called Citrus aurantium. • A mild stimulant that has gained attention as a possible thermogenic aid to promote fat loss. • Marketed as an alternative to ephedra products. • No credible research or scientific results have backed the claims. <p>Reported Dosage: Commercial labels show 4-20 mg/day synephrine providing 200-600 mg of citrus aurantium extract (3-6% synephrine).</p> | <ul style="list-style-type: none"> • May raise blood pressure or exacerbate in those with high blood pressure. • May interact with many medications amplifying side effects. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|---|---|
| <p>Chromium Picolinate</p>  | <ul style="list-style-type: none"> •Increases insulin sensitivity. •Lowers blood sugar. •Decreases body fat. •Suppresses appetite. •Increases lean muscle mass. | <ul style="list-style-type: none"> • A trace mineral that regulates energy metabolism. • Supplementation may help achieve the appropriate daily requirement but not the desired ergogenic effect. • Optimal amounts can be achieved through appropriate meal planning. <p>Reported Dosage: Doses of 200-800 micrograms/day do not support ergogenic claims.</p> | <ul style="list-style-type: none"> • Mild gastrointestinal effects. • Toxic at high levels. |

| Product | Claim | Fact | Reported Side Effect |
|---|---|---|--|
| <p>L-Carnitine</p>  | <ul style="list-style-type: none"> • Enhances use of fatty acids as energy source • Protects heart. | <ul style="list-style-type: none"> • An amino acid found in the diet; transports fat into cell for energy utilization. • Research does not support claims for athletes. • Heart patients taking 2 g/day for 2-6 months showed improved exercise capacity and reduction in cholesterol and triglyceride levels. • Strict vegetarians may show benefit due to low muscle stores of carnitine. <p>Reported Dosage: Most studies used doses of 2-4 g orally for 1-28 days.</p> | <ul style="list-style-type: none"> • Diarrhea with high doses. • Avoid D-carnitine, which displaces the “L” form and is toxic. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|---|
| <p>Ephedrine Alkaloids</p> <p>Look for these on ingredient lists:</p> <ul style="list-style-type: none"> • Ephedra • Ma Huang • Desert Herb • Joint Fir • Poptillo • Sea Grape • Teamster's Tea <p>More on next page.</p>  | <ul style="list-style-type: none"> • Raises metabolism. • Aids in weight loss. • Enhances athletic performance. • Improves alertness. • Improves asthma symptoms. | <ul style="list-style-type: none"> • Ephedrine alkaloids are stimulants that increase cardiac output and muscle contraction, raise blood sugar, and open bronchial pathways for easier breathing. They may also suppress appetite. • Little to no data supports benefit as an ergogenic aid or for long-term weight loss value. • Dangerous. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Nervousness, tremor, irritability, headache, stomach distress, dry mouth, disturbed sleep, irregular heartbeat, seizures, high blood pressure, stroke and death. • Many civilian and several active-duty deaths have been linked with ephedra use. |

| Product | Claim | Fact | Reported Side Effect |
|--|-------|--|--|
| <p>Ephedrine Alkaloids continued</p> <ul style="list-style-type: none"> • Yellow Horse • Epitonin • Ephedrine • PPA  | | <p>Reported Dosage: Studies have tested 60-75 mg ephedrine/day divided into 3 doses of 20-25 mg. Ma Huang is usually standardized to 6% ephedra alkaloids (e.g. 356 mg Ma Huang x .06% = 21.36 mg). Other studies have used .5-1 mg/kg ephedrine 1.5-2 hours before activity.</p> | <ul style="list-style-type: none"> • Should be avoided if pregnant, or if taking monoamine oxidase inhibitors. • SHOULD NOT BE TAKEN! |

*The greater our knowledge increases
the more our ignorance unfolds.*

John F. Kennedy

Growth Hormone Releasers

Human growth hormone (hGH) produced by the pituitary gland in the brain facilitates muscle, bone and cartilage growth and energy metabolism. Exercise increases hGH for a short period of time. Because of its unique affect on muscle mass and strength any agent that has been linked to its release has been marketed. The following agents claim to increase the secretion of hGH from the pituitary gland.

| Product | Claim | Fact | Reported Side Effect |
|--|---|---|---|
| <p>Branched Chain Amino Acids (BCAA):</p> <ul style="list-style-type: none"> • Leucine • Isoleucine • Valine  | <ul style="list-style-type: none"> • Prevents fatigue, and prolongs endurance. • Prevents losses in lean body mass. | <ul style="list-style-type: none"> • BCAA can serve as energy for working muscle. • Low BCAA levels linked with fatigue and muscle wasting. • Adding BCAAs to sports drinks expected to reduce fatigue. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Larger doses may lead to gastrointestinal disturbances. |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|----------------|-------|---|----------------------|
| BCAA continued | | <ul style="list-style-type: none">• Scientific data are limited and equivocal (yielding different results equally possible).• Sufficient quantities of BCAA can be achieved through a balanced diet.• Doses of 6 g/day may maintain lean body mass maintenance during times of stress. <p>Reported Dosage: Doses of 5-20 g in pill form and 1-7 g in liquid form have been found to be safe.</p> | |

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|---|
| <p>Arginine Lysine Ornithine</p>  | <ul style="list-style-type: none"> • Stimulates growth hormone. • Enhances lean body mass. | <ul style="list-style-type: none"> • Studies with these amino acids showing improvements in growth hormone did not equate to gains in muscle size. • Most products do not have enough to elicit any ergogenic effect. <p>Reported Dosage: Studies have tested between 2-25 g/day and have found no enhancement of growth hormone.</p> | <ul style="list-style-type: none"> • Physiological imbalances. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|---|--|
| <p>Dibencozide or Cobamamide</p>  | <ul style="list-style-type: none"> • Increases muscle mass. • Increases strength. • Improves aerobic power and endurance. • Induces calm mental state. | <ul style="list-style-type: none"> • A bioactive form of vitamin B-12 and catalyst for DNA dependent processes. • Indirectly contributes to protein synthesis. • No studies document claims. <p>Reported Dosage: Experimental doses of 500 micrograms/day did not find any benefit in claims.</p> | <ul style="list-style-type: none"> • None reported. |

Vitamins/Minerals

Vitamins and minerals can and should be obtained in the diet first. These substances are often taken to obtain an ergogenic effect. The effects of nutrients obtained in food has been proven, ergogenic effect of vitamin and mineral supplements has not. These substances assist in the regulation of normal cellular metabolism. Remember, a poor diet with a supplement is still a poor diet.

| Product | Claim | Fact | Reported Side Effect |
|---|---|---|--|
| <p>Vitamin A</p>  | <ul style="list-style-type: none"> • Prevents exercise induced lipid peroxidation (oxidation of tissues that can lead to soreness and slow recovery). • Boosts immune system. | <ul style="list-style-type: none"> • A fat-soluble vitamin. • Claims that exercise induced lipid peroxidation (oxidative damage to fat stores and blood) can be blocked by Vitamin A have not been documented. <p>Reported Dosage: Studies have looked at 15,000 to 50,000 IU/day.</p> | <ul style="list-style-type: none"> • Excess of 50,000 IU/day can cause toxicity. <p>Continued on next page.</p> |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|---------------------|--|------|---|
| Vitamin A continued | <ul style="list-style-type: none">• Improves vision. | | <ul style="list-style-type: none">• Vomiting, headache, joint pain, skin irritation, gastrointestinal distress, hair loss.• Excess intake (> 5000 IU) can cause birth defects in pregnant women.• Consult physician. |

| Product | Claim | Fact | Reported Side Effect |
|---|--|--|--|
| <p>Vitamin C</p>  | <ul style="list-style-type: none">• Antioxidant potential in athletes.• Improves metabolism during exercise.• Enhances immunity. | <ul style="list-style-type: none">• A water soluble vitamin.• Claims not supported by evidence.• Vitamin C post-intense exercise may decrease upper respiratory tract infections. <p>Reported Dosage: Studies have tested 500-2,000 mg/day.</p> | <ul style="list-style-type: none">• Large doses will cause diarrhea. |

| Product | Claim | Fact | Reported Side Effect |
|---|---|--|--|
| <p>Vitamin E</p>  | <ul style="list-style-type: none"> • Prevents formation of exercise-induced free radicals. • Prevents destruction of red blood cells. • Increases oxygen delivery to the muscle. | <ul style="list-style-type: none"> • Fat soluble vitamin. • No ergogenic value reported with 400 IU/day at sea level. • May be useful when exercising at high altitude by minimizing markers of muscle damage. <p>Reported Dosage: Studies have tested up to 1,200 mg/day.</p> | <ul style="list-style-type: none"> • Toxicity not common with reasonable doses. • Individuals who are prone to prolonged bleeding should use with caution. |

| Product | Claim | Fact | Reported Side Effect |
|--|--|--|---|
| <p>Niacin</p>  | <ul style="list-style-type: none"> • Enhances thermo-regulation. • Increases energy production. • Increases endurance. • Lowers cholesterol/triglycerides. | <ul style="list-style-type: none"> • An essential B-vitamin and coenzyme involved in energy producing pathways. • Doses of 280 mg/day may <u>decrease</u> exercise capacity by blunting use of fat for energy thereby accelerating the depletion of muscle glycogen. • Intake of 100-500 mg/day have been shown to decrease lipid levels in patients with high cholesterol. • True deficiencies are rare. • No improvement of performance unless a deficiency exists. <p>Reported Dosage: Doses from 200-2,000 mg/day have been studied.</p> | <ul style="list-style-type: none"> • Large doses for long time period may damage liver. • Headaches, nausea, skin itching and flushing. |

| Product | Claim | Fact | Reported Side Effect |
|--|--|---|--|
| <p>Pantothenic acid</p>  | <ul style="list-style-type: none">• Increases aerobic endurance. | <ul style="list-style-type: none">• An essential B-vitamin and key factor in energy production.• Research does not support claim of improvement in aerobic performance. <p>Reported Dosage: Studies tested 1-2 g for two weeks.</p> | <ul style="list-style-type: none">• 10 g or more per day may cause diarrhea. |

Miscellaneous

The claims of agents that do not fall into any of the previous categories are listed here.

| Product | Claim | Fact | Reported Side Effect |
|--|--|--|--|
| Creatine  | <ul style="list-style-type: none"> • Maintains ATP levels during exercise. • Extends performance in repetitive bouts of short duration, high intensity exercise. | <ul style="list-style-type: none"> • An amino acid produced in the body by arginine, glycine, and methionine. • Increasing muscle reservoirs of phosphocreatine (PC). Helps to maintain levels of ATP, an immediate source of energy in muscle. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Gastrointestinal distress, nausea, diarrhea and muscle cramping. |

If you are taking any dietary supplements, be sure to tell your health care provider!

| Product | Claim | Fact | Reported Side Effect |
|------------------------------|-------|--|----------------------|
| Creatine continued | | <ul style="list-style-type: none">• Literature does indicate that creatine improves high intensity, repetitive exercise performance e.g., single sprints, repetitive sprints, one-rep weight-lifting max, vertical jump, and repetitive contraction of muscles.• Long-term studies of one year show safety. Weight gains of 2-10 lbs. likely but unclear whether weight is water or muscle mass.• Can actually compromise endurance activities because of weight gain. Continued on next page. | |

| Product | Claim | Fact | Reported Side Effect |
|---|---|---|--|
| Creatine continued | | Reported Dosage: A loading dose of 20 g/day split into 4 doses of 5 g each day for the first 5 days then 5 g/day maintenance thereafter. Some literature supports 3-5 g/day and skips the loading phase. | |
| Glucosamine  | <ul style="list-style-type: none"> • Reverses osteoarthritis. • Decreases inflammation. • Protects joints from injury. | <ul style="list-style-type: none"> • Taken to treat and/or prevent joint problems, such as in osteoarthritis and arthritis. • Clear benefit reported in terms of pain after 1-3 months taking 500 mg three times per day. • More rigorous studies need to be conducted. Reported Dosage: Customary dosage for 70kg (154 lbs) person is 500 mg glucosamine and 400 mg chondroitin three times per day. | <ul style="list-style-type: none"> • May elevate blood sugar levels. • Patients who are diabetic should consult their health care provider prior to consumption. • Gastrointestinal disturbances. |

| Product | Claim | Fact | Reported Side Effect |
|---|---|--|--|
| <p>Water</p>  | <ul style="list-style-type: none"> • Prevents dehydration, allowing optimal performance. • Improve aerobic and work capacity. • Thermo-regulation. | <ul style="list-style-type: none"> • An essential nutrient with proven benefits. • Dehydration causes performance decrements, which can occur with minimal water loss (only 2%). Significant impairments in performance occur as water loss continues past 4%. • Preventing dehydration is paramount, measure body weight before exercise. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Plain water consumption for long periods of time (ultramarathons or sustained military operations in the heat) can produce water intoxication also known as hyponatremia (low blood sodium). |

| Product | Claim | Fact | Reported Side Effect |
|------------------------|-------|--|---|
| Water continued | | <ul style="list-style-type: none"> • For each 1% decrease in body weight attributable to dehydration, heart rate increases 4 beats/min, core temperature increases by 0.15 degree Celsius and mean sweat rate decreases by 29 g/hour. • Exercise 30 minutes in competition climate with no fluid intake. Measure post exercise weight. Subtract post-weight from pre-weight, multiply X 2 to determine fluid loss per hour. Ingest 1 liter per 2.2 lbs. lost. Example: Pre-weight 180.0 lbs. – Post-weight 178.0 lbs. = 2 x 2 = 4 lbs. water loss per hour/2.2 = 1.8 liters per hour that must be consumed. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • A glucose electrolyte solution (GES) or food should be consumed additionally to maintain adequate sodium and electrolyte levels during competition. |

| Product | Claim | Fact | Reported Side Effect |
|-----------------|-------|--|----------------------|
| Water continued | | <p>Reported Dosage:</p> <ul style="list-style-type: none"> • Two hours before exercise: 1-2 cups (8-16 oz). • Immediately before exercise/ competition: .5-1 cup (4-8 oz. if very hot or very cold) 1.5-2.5 cups (12-20 oz) 10-20 minutes prior to exercise. • During exercise: .5-1 cup (4-8 oz) every 15-20 minutes. • After exercise: 2 cups (16 oz) for every pound of body weight you lost during event. | |

| Product | Claim | Fact | Reported Side Effect |
|--|---|---|---|
| <p>Glycerol</p>  | <ul style="list-style-type: none"> • Increases blood volume. • Regulates core body temperature. • Improves exercise performance in heat by “hyperhydrating” the body to prevent dehydration. | <ul style="list-style-type: none"> • The “backbone of fats”. • Has been used to expand plasma volume in hopes of preventing dehydration. • Has not proven to be effective. <p>Reported Dosage: 1.0-1.5 g glycerol/kg lean body mass with 1.8-2.0 L of water (25 mL water/kg lean body mass) taken 60-120 min prior to exercise.</p> | <ul style="list-style-type: none"> • Nausea and severe headaches. • Should not be used by diabetics, pregnant women and individuals with kidney disease or high blood pressure. |

| Product | Claim | Fact | Reported Side Effect |
|---|---|---|--|
| <p>Glutamine</p>  | <ul style="list-style-type: none"> • Enhances immune function. • Decreases risk of infection. • Enhances recovery after long endurance events. | <ul style="list-style-type: none"> • The most abundant free amino acid in the body. • Evidence supporting its use in athletes is not well substantiated. • Beneficial effects of glutamine are well documented in aiding recovery in hospitalized patients. • Use of glutamine to prevent upper respiratory tract infections after strenuous exercise has not been demonstrated. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Greater consumption can cause diarrhea and imbalance of amino acids. |

| Product | Claim | Fact | Reported Side Effect |
|-------------------------------|-------|---|----------------------|
| Glutamine continued | | Reported Dosage: 4 to 12 g/day have been shown to elevate blood levels but no long term testing of effectiveness has been done. Doses of 20 g divided evenly over 2-4 servings per day have been well tolerated. Dividing doses increase absorption without causing absorption issues. | |

| Product | Claim | Fact | Reported Side Effect |
|---|--|---|---|
| <p>Omega-3 Fatty Acids</p>  | <ul style="list-style-type: none"> • Increases growth hormone. • Reduces blood clotting. • Reduces blood pressure. • Suppresses inflammation. • Protects the heart. | <ul style="list-style-type: none"> • Omega-3-fatty acids, which are found in fish and certain plant sources, appear to protect the heart by changing characteristics of blood clotting. • Thought to increase blood circulation and enhance oxygen delivery to the muscles in addition to improve strength by increased growth hormone. • Regular consumption of fish has been linked with a reduction of heart attacks. • No data to support ergogenic benefit with regard to aerobic or anaerobic power. <p>Continued on next page.</p> | <ul style="list-style-type: none"> • Increased blood cholesterol, bleeding and/or hemorrhages with high doses. |

| Product | Claim | Fact | Reported Side Effect |
|--|---|---|--|
| Omega-3 Fatty Acids continued | | Reported Dosage: 4 g/day for 8-10 weeks or dose equivalent to 12 capsules of fish oil supplement. | |
| Coleus forskolin  | <ul style="list-style-type: none"> • Promotes fat loss • Increases muscle mass • Lowers blood pressure | <ul style="list-style-type: none"> • Part of the mint family of plants linked with medicinal treatment of heart ailments. • No credible evidence to support usefulness as a weight loss aid or muscle enhancer. <p>Reported Dosage: Doses typically range from 100-300 mg/day (10-20% forskolin) taken in 2-3 divided doses.</p> | <ul style="list-style-type: none"> • May decrease effectiveness of anticoagulant medications. • May interact with blood pressure medications. • Should not be used by children or pregnant women. |

| Product | Claim | Fact | Reported Side Effect |
|---|---|---|---|
| <p>Octacosanol</p>  | <ul style="list-style-type: none"> • Improves reaction time. • Enhances oxygen utilization. • Improves energy level and endurance. | <ul style="list-style-type: none"> • A long chain alcohol that is extracted from foods such as wheat germ oil, spinach and sugar cane. • May be beneficial for controlling cholesterol or preventing platelet aggregation (clumping) in the arteries. • Studies do not support benefit for endurance exercise. <p>Reported Dosage: Doses have ranged from 100-6,000 mg/day.</p> | <ul style="list-style-type: none"> • No significant side effects have been reported. |

| Product | Claim | Fact | Reported Side Effect |
|--|---|---|---|
| <p>Gamma-hydroxybutyric Acid (GHB)</p> <p>Various known forms:</p> <ul style="list-style-type: none"> • Gamma-butyrolactone (GBL) • Butadione (BD)  | <ul style="list-style-type: none"> • Increases growth hormone levels. • Induces muscle relaxation. • Promotes muscle recovery. | <ul style="list-style-type: none"> • A related compound to a hormone that promotes the secretion of growth hormone. • No studies have ever shown GHB to positively change body fat levels, muscle mass or strength. • The FDA banned GHB in 1990 yet various forms are still being sold on the internet. <p>Reported Dosage:</p> <p>SHOULD NOT BE TAKEN!</p> | <ul style="list-style-type: none"> • Associated with more than 55 adverse reactions (coma, seizures, vomiting, slowing of respiratory rate and heart rate) • Death. |

*The will to win means nothing
if you haven't the will to prepare.”*

Juma Ikangaa
1989 NYC Marathon winner

Have you noticed that the materials in this guide may be different from what you've read in a muscle magazine? This is very possible. Often the information in the magazine is written in favor of the product. The information in this guide is written based on sound science.

Web site Resources: Check out the truth about dietary supplements.

Army Center for Health Promotion and Preventive Medicine

<http://chppm-www.apgea.army.mil/dhpw>

Navy Environmental Health Center Homepage

<http://www-nehc.med.navy.mil/hp/>

Tufts Nutrition Navigator (Critical review of supplement websites)

<http://www.navigator.tufts.edu/>

Is there someone you can talk to about dietary supplements?

Yes!! Contact a Registered Dietitian, Family Medicine doctor, pharmacist, or a health care provider at your local military installation. If a Registered Dietitian is not at your location, you may send your questions through U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) at <http://chppm-www.apgea.army.mil/contactus/REQUESTFORSERVICE.asp>. Your question(s) will then be forwarded to a Registered Dietitian. You may also contact the Navy Environmental Health Center (NEHC) Health Promotions at 1-757-953-0976.

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