

# Ergogenic Aids: Counseling the Athlete

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Numerous ergogenic aids that claim to enhance sports performance are used by amateur and professional athletes. Approximately 50 percent of the general population have reported taking some form of dietary supplements, while 76 to 100 percent of athletes in some sports are reported to use them. Physicians can evaluate these products by examining four factors (method of action, available research, adverse effects, legality) that will help them counsel patients. Common ergogenic aids include anabolic steroids, which increase muscle mass. These illegal supplements are associated with a number of serious adverse effects, some irreversible. Creatine modestly improves athletic performance and appears to be relatively safe. Dehydroepiandrosterone and androstenedione do not improve athletic performance but apparently have similar adverse effects as testosterone and are also banned by some sports organizations. Caffeine has mild benefits and side effects and is banned above certain levels. Products that combine caffeine with other stimulants (e.g., ephedrine) have been linked to fatal events. Protein and carbohydrate supplementation provides modest benefits with no major adverse effects. (*Am Fam Physician* 2001;63:913-22.)

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**E**rgogenic aids are substances or devices that enhance energy production, use or recovery and provide athletes with a competitive advantage.

Numerous products claim to bolster strength or endurance in sports. In 1996, approximately 50 percent of the general population reported some supplement use.<sup>1</sup> Other surveys have shown that 76 percent of college athletes, and 100 percent of body builders take supplements.<sup>2</sup> Americans spent \$11.8 billion on supplements in 1997, with a predicted growth rate of 10 to 14 percent in 2000 (*Table 1*).<sup>3</sup>

New products with ergogenic claims appear on the market almost daily. Most are classified as supplements, which means the contents of the product and the claims on the label have not been evaluated by the U.S. Food and Drug Administration and may not have any scientific basis. The following questions will help the physician and patient determine whether a product is worth taking:

1. What is the physiologic basis or theory for this product's action?
2. Are there any scientific studies published in peer-reviewed journals that support or refute the claims that the product makes?

TABLE 1  
Supplement Costs\*

Product	Cost*
Creatine powder	\$ 26
Creatine mixture†	60
DHEA	14
Androstenediol	30
Androstenedione	30
HMB	100
Protein powder (50 g daily)	85
Antioxidant formulations	30
Energizing/diet capsules	35
Multivitamins	5 to 20

DHEA = dehydroepiandrosterone; HMB = calcium beta-hydroxy beta-methylbutyrate.

\*—Based on a sampling of popular nutrition stores in January 2000 for one month's therapy at lowest usual dose.

†—Phosphagen HP (Experimental and Applied Sciences, Inc., Golden, Colo.).

Anabolic steroids have many adverse effects, some serious and irreversible.

3. Are there any side effects, especially any potentially serious adverse effects?

4. Is the product legal?<sup>4</sup>

This article reviews some of the more popular supplements and provides some basic information on others.

### Anabolic Steroids

**Action.** Anabolic steroids are testosterone derivatives with three mechanisms of action. First, anticatabolic effects reverse the actions of glucocorticoids and help metabolize ingested proteins, converting a negative nitrogen balance into a positive one. Second, anabolic effects directly induce skeletal muscle synthesis. Third, there is a “steroid rush”—a state of euphoria and decreased fatigue that allows the athlete to train harder and longer.<sup>5</sup>

**Research.** Many early studies used physiologic doses, or doses only two to three times these amounts, and provided mixed results. More recent reviews,<sup>5</sup> controlling for various measurement methods, have concluded that

anabolic steroids do indeed cause increased strength and muscle mass. A randomized, double-blind, 10-week study<sup>6</sup> of 40 men examined the effect of supraphysiologic testosterone doses. The participants were divided into four groups: those given a placebo with or without weight training, and those given 600-mg testosterone enanthate with or without weight training. Diet and training times were controlled. Fat-free mass, muscle size and strength increased more than placebo in both groups taking testosterone than in the groups taking placebo. The subjects in the exercise plus testosterone group had a 9 percent increase in mass and 23 percent increase in bench-press strength, compared with 3 percent and 9 percent, respectively, in the subjects in the exercise plus placebo group.<sup>6</sup> These doses were comparable with the doses that many athletes who use steroids take.

**Adverse Effects.** Anabolic steroids have many adverse effects, most related to the unwanted androgenic effects. Some of the adverse effects are potentially serious and irreversible (*Table 2*).

**Legality.** Anabolic steroids such as testosterone and its derivatives are prescription medications with clearly defined indications. Procuring and using them without a prescription is illegal. Most sports organizations have rules that ban the use of anabolic steroids for any reason.

### Creatine

**Action.** During brief, high intensity exercise, adenosine diphosphate is rephosphorylated to adenosine triphosphate (ATP) by muscle phosphocreatine stores. As muscle phosphocreatine stores become depleted, performance decreases. Oral creatine supplementation can increase muscle phosphocreatine stores by 6 to 8 percent. Increasing the available muscle stores of phosphocreatine causes faster regeneration of ATP, allowing decreased rest time between activities and increased energy for repeated bouts of exercise. Increased muscle creatine also buffers the lactic acid produced during exercise,

TABLE 2  
Reported Side Effects of Anabolic Steroids

#### Reversible side effects

Sexual effects  
Increased or decreased libido  
Decreased sperm production  
Scrotal pain  
Gynecomastia  
Cutaneous effects  
Acne  
Hirsutism  
Edema  
Psychiatric effects  
Euphoria  
Nervousness  
Aggression  
Personality disorders  
Other  
Increased transaminases  
Nausea  
Increased urination

#### Serious and irreversible side effects

Hypertension from mineralocorticoid effects  
Dysplastic changes in collagen fibrils, resulting in severe tendon ruptures  
Liver tumors (hepatocellular carcinoma, hepatic adenoma, hepatic cholangiocarcinoma)  
Psychosis (i.e., “steroid rage”)  
Irreversible hirsutism, clitoral hypertrophy and deepening of voice in women  
Premature closure of growth plates, causing shorter stature in adolescents

delaying muscle fatigue and soreness. As with any ergogenic aid, increased motivation can spring from expected or perceived benefits, causing increased effort (placebo effect).

**Research.** Creatine research shows generally positive results. A short-term, double-blind, placebo-controlled study<sup>7</sup> examined the effects of 28 days of creatine supplementation on 25 football players. Diet and exercise were tightly controlled, and strength and body composition were measured. Body weight, dual-energy radiograph absorptiometry-scanned body mass, fat-free and bone-free mass, and bench-press strength all increased in the athletes taking creatine. Overall lifting volume (sum of all lifts) was increased by 41 percent in this group. A five-week study<sup>8</sup> of 42 football players also showed gains in strength and mass. Another report<sup>9</sup> of 19 women who took supplements for 10 weeks also described increases in strength and mass. Some researchers<sup>10,11</sup> have seen strength gains with as little as five to seven days of supplementation.<sup>10,11</sup> Studies<sup>12</sup> examining the effects of creatine in older individuals (60 to 82 years of age) have found no effect on body composition or strength. Investigations<sup>7,13</sup> of the benefits on short-term sprint performance have shown increases in endurance time. A summary of 31 studies<sup>14</sup> on sprint performance showed that supplemental creatine is associated with some improvement in athletic performance in laboratory settings, but most findings indicated no benefit on the field.

A typical regimen for creatine supplementation uses a loading dosage of 20 g daily, divided in four doses, for five to seven days, followed by a maintenance dosage of 5 g daily. Creatine monohydrate is not dehydrating, and may be safer.

**Adverse Effects.** Weight gain is the most consistent adverse effect reported. In studies that investigated side effects, no other adverse effects were found, including no changes in electrolyte concentrations, muscle cramps or strains.<sup>7</sup> Researchers<sup>15</sup> examined the renal function of patients who had been using crea-

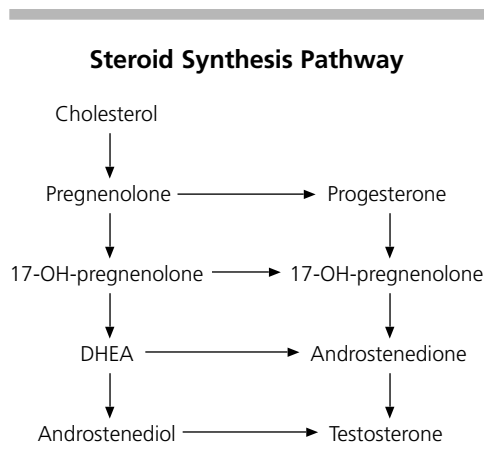
tine for as long as five years and found no detrimental effects.<sup>15</sup> Some studies have shown improved cholesterol profiles in persons taking creatine.<sup>7</sup> It must be noted, however, that most research to date has examined creatine use of three months or less, leaving questions about long-term use unanswered.

**Legality.** Creatine is legal for use in amateur and professional sports.

### Dehydroepiandrosterone and Androstenedione

**Action.** Both of these supplements are precursors in the gonadal steroid pathway (*Figure 1*). Increasing supplies of precursors theoretically cause a physiologic increase in testosterone synthesis.

**Research.** Dehydroepiandrosterone (DHEA) has been studied for its replacement role in older men and women. These studies<sup>16,17</sup> found testosterone levels increased in women, but were unchanged in men, with no changes in body composition noted. No published studies of its ergogenic benefit in younger athletes exist. One eight-week study<sup>18</sup> evaluated androstenedione supplementation in 30 men, aged 19 to 29 years, during resistance training. No differences in muscle size, strength or overall body composition were noted. One



**FIGURE 1.** Pathway for testosterone synthesis. (DHEA = dehydroepiandrosterone)

At least 17 deaths have been linked to products that combine caffeine and ephedrine.

study<sup>19</sup> has shown transient increases in serum testosterone levels but no ergogenic benefit has been demonstrated.

*Adverse Effects.* No long-term studies of adverse effects are available. If these precursors could successfully increase testosterone production, they would likely cause the many adverse effects associated with anabolic steroids.

*Legality.* DHEA is banned by the International Olympic Committee (IOC). Androstenedione is banned by the IOC, the National Collegiate Athletic Association (NCAA) and the National Football League.

### Caffeine

*Action.* Caffeine enhances the contractility of skeletal and cardiac muscle, and helps metabolize fat, thereby sparing muscle glycogen stores. It is also a central nervous system stimulant, which can aid in activities that require concentration.

*Research.* Many small studies<sup>20,21</sup> using randomized, double-blind design have associated caffeine use with increased endurance times. The smallest dose linked to positive results was 250 mg (approximately 3.0 to 3.5 mg per kg).<sup>22</sup> Other studies have used doses of 6 to 9 mg per kg.

*Adverse Effects.* Ergogenic doses of caffeine may cause restlessness, nervousness, insomnia, tremors, hyperesthesia and diuresis. Caf-

feine use has no adverse effects on body temperature or sweating.<sup>23</sup>

*Legality.* Caffeine is part of a regular diet for most people and is legal to a certain level. The legal urine level for athletes is 12 µg per mL (IOC standards) or 15 µg per mL (NCAA standards). The ergogenic dose is approximately one half of this—250 to 500 mg (three cups of coffee or six to eight sodas). Many athletes take caffeine in pill form.

### Caffeine and Ephedrine Combination

*Action.* Sympathomimetics such as ephedrine, pseudoephedrine, phenylpropanolamine and herbal ephedrine (ma huang) are used for their stimulant properties. This combination is found in many “energizing” and diet supplements and is used to increase subjective energy, decrease appetite and increase metabolism without exercise.<sup>24</sup>

*Research.* A double-blind study<sup>24</sup> of eight patients showed prolonged time to exhaustion and decreased perception of exertion with a caffeine and ephedrine combination. Studies<sup>24,25</sup> of sympathomimetics alone have not shown benefit.

*Adverse Effects.* The combined adverse effects of these stimulants include restlessness, nervousness, tachycardia, arrhythmias and hypertension. As of August 1998, at least 17 deaths have been linked to use of these products in combination.<sup>26</sup>

*Legality.* Use of ephedrine products and elevated levels of urinary caffeine, as noted above, are banned by the IOC.

### Protein

*Action.* Protein and its constituent, amino acids, are the building blocks of muscle. Protein supplements are used by some athletes to enhance muscle repair and growth. Inadequate protein intake does cause a negative nitrogen balance, which slows muscle growth and causes fatigue.

*Research.* Athletes in training have increased protein needs. A study<sup>27</sup> examining the protein requirements of experienced resistance-train-

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ing athletes found that those consuming the recommended daily allowance for protein (0.8 g per kg daily) had a negative nitrogen balance. The protein intake required for a zero balance was 1.4 g per kg daily, with a recommended intake of 1.8 g per kg daily. Another study<sup>28</sup> using novice resistance-training athletes found their requirements to be 1.6 to 1.7 g per kg daily. Both studies found that protein intakes in excess of these recommendations did not provide additional gains in strength or mass.

**Adverse Effects.** In an athlete with normal renal function, there are no notable adverse effects to increased protein consumption. It may be more healthy, however, to avoid acquiring protein from foods that also contain increased amounts of fat and cholesterol.

**Legality.** Protein supplements are legal.

## Carbohydrates

**Action.** While fat stores constitute the largest reservoir of stored energy, carbohydrates are the body's main source of rapidly available energy. It has been suggested that taking proper quantities of carbohydrates at the right time could improve athletic performance by ensuring adequate energy stores are available when necessary.

**Research.** Loading, or increasing the carbohydrate content of the diet for several days before an event, has been promoted as a means to prolong exercise endurance. One study<sup>29</sup> evaluated its impact on continuous, short-term events of less than one hour and found no benefit, because muscle glycogen content was not depleted at the end of the exercise.

A meal prior to exercise will ensure that muscle and liver glycogen stores are maximized. Studies<sup>30,31</sup> investigating a meal two to four hours prior to exercise have shown positive effect, regardless of the "glycemic index" of the foods ingested. Evaluation of six endurance athletes ingesting carbohydrates only 45 minutes prior to a two-hour exercise test revealed no benefit.<sup>32</sup>

Replenishment with carbohydrate-containing fluids during an endurance event may help

*Many studies have demonstrated that carbohydrate supplementation increases endurance.*

to delay fatigue. Thirty marathon runners in a double-blind study<sup>33</sup> described decreased subjective exertion when ingesting 60 g per hour of a liquid carbohydrate solution during a two and one-half hour run. Another study<sup>34</sup> found that ingesting a carbohydrate-electrolyte drink during one hour of high-intensity exercise improved performance in 19 bicyclists. Many studies have demonstrated similar results. One study<sup>35</sup> that evaluated solid versus liquid carbohydrate replenishment showed no difference, as long as adequate water intake was maintained. Eating a mixture of carbohydrates and protein within two hours after an activity has also been associated with benefits, including replenishment of depleted muscle and liver glycogen stores and decreased muscle catabolism. A study<sup>36</sup> of nine weight lifters showed increased levels of plasma growth hormone and insulin when athletes ingested protein and carbohydrate immediately and two hours after exercise, which would theoretically provide a physiologic environment favorable for muscle growth. Another placebo-controlled study<sup>37</sup> of endurance athletes ingesting a carbohydrate-containing solution after exercise reported increased glycogen resynthesis.

**Adverse Effects.** Theoretic disadvantages have been reported with carbohydrate supplementation. Increased insulin levels after carbohydrate consumption were shown to significantly decrease blood glucose levels in some athletes, though not all athletes seem to be subjectively sensitive to these decreased levels.<sup>38</sup> Fructose-containing solutions have been associated with adverse gastrointestinal effects in some studies.<sup>39</sup>

**Legality.** Carbohydrate supplements are legal.

Many other dietary supplements have been advertised for their purported ergogenic properties, and the list grows each year. *Table 3* pro-

**TABLE 3**  
**Ergogenic Aids: A Summary of An Assessment of the Current Literature**

<i>Ergogenic aid</i>	<i>Action</i>	<i>Research on ergogenic effects</i>	<i>Side effects</i>	<i>Legality</i>
Alcohol	Decreases anxiety	No benefits	Significant	Banned for shooting events
Amphetamines	Improve concentration, decrease fatigue and appetite	Mixed, some positive	Significant, dangerous	Illegal
Anabolic steroids	Increase strength, lean muscle mass and motivation	Positive	Significant, dangerous	Illegal
Androstenediol	Same as steroids	Limited, refutes	Unknown	Banned by IOC
Androstenedione	Same as steroids	Refutes, no benefits	Significant	Banned by IOC, NCAA
Antioxidants	Decrease muscle breakdown	Mixed, no clear benefits	Mild at high doses	Legal
Arginine, ornithine, lysine	Stimulate growth hormone release	No benefit	None at doses used	Legal
Aspartates	Increase free fatty acid use, sparing muscle glycogen	Mixed, some positive benefits	Mild at high doses	Legal
Aspirin	Decreases pain with muscle fatigue and muscle breakdown	No benefit	Mild	Legal
Avena sativa	Increases steroid production	Limited, refutes	None	Legal
Bee pollen	Increases strength and endurance	Refutes, no benefits	Allergic reaction	Legal
Beta blockers	Decrease anxiety	Positive effect on fine motor control, negative effect on aerobic capacity	Significant	Banned by IOC
Beta <sub>2</sub> agonists	Increase lean muscle mass	Mixed, no benefit from inhaled formulations	Mild	Banned by IOC, legal when prescribed
Blood doping	Increases aerobic capacity	Supports	Significant, dangerous	Illegal
Boron	Increases endogenous steroid production	Refutes, no benefit	Mild at high doses	Legal
Branched chain amino acids	Decrease mental fatigue	Mixed, negative	Mild at high doses	Legal
Caffeine	Increases muscle contractility and aerobic endurance, enhances fat metabolism	Supports	Mild	Legal to urine level of 12 to 15 µg per mL
Calcium	Increases muscle contractility, enhances glycogen metabolism	Refutes, no benefit	Mild at high doses	Legal
Carbohydrates	Increase endurance, decrease fatigue	Supports	Mild at high doses	Legal
Carnitine	Increases fat metabolism	Refutes	None	Legal
Choline	Increases endurance	Mixed, inconclusive	None	Legal
Chromium	Increases lean mass	Refutes, no benefit unless prior deficiency	Safe to 400 µg daily, potentially dangerous above this level	Legal
Chrysin	Inhibits aromatase, increases endogenous steroids	Limited, refutes	None	Legal
Cocaine	Stimulates CNS, delays fatigue	Mixed	Significant, dangerous	Illegal
Coenzyme Q <sub>10</sub> (ubiquinone)	Delays fatigue, acts as antioxidant	Refutes, no benefit	None	Legal
Coenzyme Q <sub>12</sub>	Increases aerobic capacity, speeds muscle repair	Refutes, no benefit	None	Legal

*Table continues*

TABLE 3 (CONTINUED)

<i>Ergogenic aid</i>	<i>Action</i>	<i>Research on ergogenic effects</i>	<i>Side effects</i>	<i>Legality</i>
Creatine	Increases muscle energy, endurance, strength and lean muscle mass	Supports, insufficient data on long-term use	Mild	Legal
DHEA	Increases endogenous steroid production	No benefit in healthy athletes	Potentially dangerous	Banned by IOC, some other organizations
Diuretics	Decrease body mass	Limited benefit	Potentially dangerous	Banned by IOC
Ephedrine, other sympathomimetics	Stimulate CNS, increase energy, delay fatigue, stimulate weight loss	No benefit	Potentially dangerous	Banned by IOC, some other organizations
Ephedrine plus caffeine	Increases energy, stimulates weight loss	Supports	Potentially dangerous, fatal at high doses	Banned by IOC, some other organizations
Erythropoietin	Increases aerobic capacity	Supports	Significant, dangerous	Illegal
Fat supplements	Increase endurance	Refutes	Mild	Legal
Fluids	Increase endurance	Supports	Mild	Legal
Folic acid	Increases aerobic capacity	Refutes	None	Legal
GHB	Stimulates growth hormone release and muscle growth	Limited, refutes	Significant, dose-related; abuse potential	Illegal
Ginseng	Increases endurance, enhances muscle recovery	Limited, refutes, no benefit	Mild, abuse syndrome reported	Legal
Glucosamine	Serves as NSAID alternative, enhances recovery	Limited, may have limited NSAID abilities	None	Legal
Glutamine	Boosts immunity and growth hormone levels	May boost immunity, no other benefits	None	Legal
Glycerol	Improves hydration and endurance	Limited, supports	Mild	Legal (oral)
Guarana (herbal caffeine)	Same as caffeine			
HMB	Decreases muscle breakdown, enhances recovery	Limited, some strength benefits	None	Legal
Human growth hormone	Anabolic effect on muscle growth, increases fat metabolism	Refutes, limited ergogenic benefits	Significant, dangerous	Illegal
Inosine	Enhances energy production, improves aerobic capacity	Refutes, no benefit	Mild	Legal
Iron	Increases aerobic capacity	No benefit unless preexisting deficiency	Mild, toxic at high doses	Legal
Leucine	Decreases muscle breakdown and spare muscle glycogen stores	Limited, no ergogenic effect	None	Legal
Ma huang (herbal ephedrine)	Same as ephedrine			
Magnesium	Enhances muscle growth	No benefit unless preexisting deficiency	Mild at high doses	Legal
Marijuana	Decreases anxiety	Refutes, negative effect	Significant, dangerous	Illegal
Multivitamins	Increases energy, endurance and aerobic capacity, enhances recovery	No benefit unless preexisting deficiency	None at RDA, some toxicities at high doses	Legal
Narcotics	Increase endurance by suppressing pain, decrease anxiety	Mixed, negative	Significant, dangerous	Illegal
Niacin	Increases energy and endurance	No benefit unless a preexisting deficiency	Mild at high doses	Legal

Table continues

TABLE 3 (CONTINUED)

**Ergogenic Aids: A Summary of An Assessment of the Current Literature**

<i>Ergogenic aid</i>	<i>Action</i>	<i>Research on ergogenic effects</i>	<i>Side effects</i>	<i>Legality</i>
Oxygen	Increases aerobic capacity, enhances recovery	No benefit if given before or after activity	Mild	Legal
Phosphates	Increase ATP production, energy and muscle endurance	Mixed, negative	Mild at high doses	Legal
Phytosterols	Stimulates release of endogenous steroids and growth hormone	Refutes, no benefit	Little data, allergic reaction possible	Legal
Protein	Optimizes muscular growth and repair	Supports, increased need for protein with activity	None unless underlying medical condition	Legal
Pycnogenol	Boosts antioxidant levels, enhances recovery	Supports, dietary sources offer same benefit	None	Legal
Pyruvate	Increases lean body mass	Limited research, benefit only in specific cases	None	Legal
D-Ribose	Increases cellular ATP and muscle power	No human research	None known	Legal
Selenium	Enhances antioxidant functions	Limited, no benefit	Mild at high doses	Legal
Sodium bicarbonate	Buffers lactic acid production, delays fatigue	Supports	Mild, dangerous at high doses	Legal
Strychnine	Unknown	No research on ergogenic benefits	Significant, dangerous	Legal
Tribulus terrestris	Increases endogenous steroid production	Refutes	Potentially dangerous at high doses	Legal
Tryptophan	Decreases pain perception, increases endurance	Mixed, no benefit in trained athletes	Mild, potentially dangerous	Legal
Vanadyl sulfate	Increases glycogen synthesis, enhances muscle recovery	Refutes, no benefit in healthy individuals	Mild	Legal
Vitamin B <sub>1</sub> (thiamin)	Enhances energy production, increases aerobic capacity, improves concentration	No benefit unless preexisting deficiency	None	Legal
Vitamin B <sub>2</sub> (riboflavin)	Increases aerobic endurance	No benefit unless preexisting deficiency	None	Legal
Vitamin B <sub>6</sub> (pyridoxine)	Enhances muscle growth, decreases anxiety	No benefit unless preexisting deficiency	Mild at high doses	Legal
Vitamin B <sub>12</sub> (cyanocobalamin)	Enhances muscle growth	No benefit unless preexisting deficiency	None	Legal
Vitamin B <sub>15</sub> (dimethylglycine)	Increases muscle energy production	Mixed, negative	None proven, but concerns raised	Legal
Vitamin C	Acts as antioxidant, increases aerobic capacity and energy production	No benefit unless preexisting deficiency	Mild at high doses	Legal
Vitamin E	Acts as antioxidant, improves aerobic capacity	Mixed, some positive	Mild	Legal
Yohimbine	Increases endogenous steroid production	Refutes, no benefit	Mild	Legal
Zinc	Enhances muscle growth, increases aerobic capacity	Limited, negative	Mild	Legal

*IOC = International Olympic Committee; NCAA = National Collegiate Athletic Association; CNS = central nervous system; DHEA = dehydro-epiandrosterone; GHB = gamma-hydroxybutyrate; NSAID = nonsteroidal anti-inflammatory drug; HMB = calcium beta-hydroxy beta-methylbutyrate; RDA = recommended daily allowance; ATP = adenosine triphosphate.*

\*—References are available from the author.



vides a brief summary of the most common agents that physicians may hear about from their patients who are athletes. When counseling patients about ergogenic aids, it is important that the physician be knowledgeable about the topic. The intervention that carries the most impact is ensuring optimal dietary habits. Supplying adequate energy intake, carbohydrates and protein in the diet, and timing these to be efficiently used by the body, will provide the most effective and safe results.<sup>36,40</sup>

If a patient asks about a specific ergogenic aid, he or she should be told what is known and unknown about the product based on current research, including the side effect profile. The danger is that once athletes start using a commercial supplement, they will continue to use more, eventually trying something that may not be safe. Many athletes feel pressured to use supplements to maintain a competitive advantage over their supplement-using peers. If physicians can guide athletes away from disproven and dangerous supplements, while maintaining open and honest lines of communication, then more serious health risks may be prevented.

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*The opinions expressed in this article reflect the views of the author and do not reflect the opinion of the Department of Defense or the United States Government.*

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