



CARE FOR KIDS



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Performance-enhancing Sports Aids:

Concerns about this Exploding Market

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Performance-enhancing sports aids, also called ergogenic aids, are substances taken to improve athletic abilities. These include legal and illegal substances, as well as marketed nutritional supplements. Ergogenic aids may be taken orally, injected, or inhaled. They have been widely used by professional and elite athletes for several decades.

However, research indicates that an increasing number of younger athletes are experimenting with these drugs to improve both athletic ability and appearance. The widespread use and marketing of these products, in stores and on the Internet, are generating significant health concerns.

Common Ergogenic Aids

- anabolic-androgenic steroids
- steroid precursors (androstenedione and dehydroepiandrosterone)
- growth hormone
- creatine
- protein/amino acids
- ephedra alkaloids
- nitric oxide producers
- energy drinks (especially high caffeine products)

Historical Use of Ergogenics

Ergogenic use by athletes to improve athletic performance is not a new practice. As early as 776 BC, the Greek Olympians used substances, such as mushrooms, dried figs, and strychnine, to enhance performance. In 1889, Dr. Brown-Sequard hypothesized that testicles secreted substances that acted as

physiologic regulators. Attempting to confirm his assumption, he injected himself with the extract of dog and guinea pig testicles and perceived that he had reversed his 72-year-old body's ailments. This experiment helped lead to the discovery of hormones in 1905

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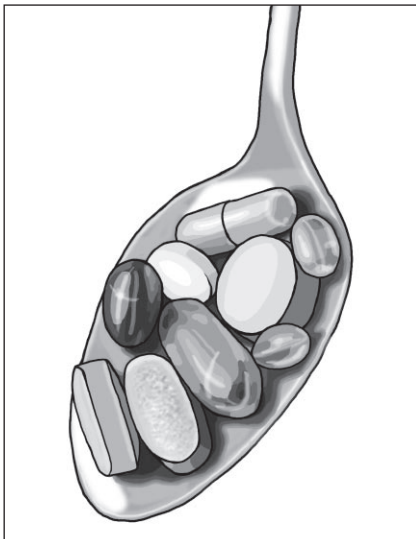


and the isolation of testosterone in 1935. The use of various hormones and steroid precursors has dramatically increased since the early 1960s, when commercial anabolic-androgenic steroids first became available.

The “Winning-At-Any-Cost” Mindset

In a 1987 survey of elite Olympic caliber athletes, 195 out of 198 athletes (98%) said they would use a banned substance if it were absolutely undetectable and it guaranteed victory. Additionally, >50% of the athletes stated they would use undetectable substances if it allowed them to be a top athlete for five years, but then resulted in death.

Today, athletes go to great lengths to increase athletic ability. Many young athletes admit that the competitive drive to win can be very intense. For a growing number of athletes, winning at all costs includes taking ergogenic aids. Some athletes appear to benefit from these products, but at what cost and risk? The short and long-term



benefits of taking these products have not been rigorously studied, nor have the potential side effects.

Statistics of Ergogenic Use

390,000 10- to 14-year-olds admitted to using sports supplements.

1 million 12- to 17-year-olds admitted to using potentially dangerous sports supplements.

Only **57%** of 12th graders perceived anabolic steroid use as harmful.

70% of young people & 50% of their parents could not identify any specific negative side effects from using sports supplements.

80% of young people have never discussed sports supplements with their parents.

No Food & Drug Administration (FDA) Oversight

The Food and Drug Administration (FDA) classifies sports supplements as dietary supplements, and does not require them to meet any standards or regulations. Supplement manufacturers are supposed to follow Good Manufacturing Practices (GMP), but these are essentially self-regulated and self-reported guidelines. There are no regulations that guarantee the safety or purity of products sold as a supplement. Additionally, the FDA is prohibited from removing a product from the market unless the product has caused proven medical harm. Most health risks from supplements are discovered only after the product is on the market. It is usually only after a supplement has been linked

to multiple serious health risks or death that the FDA can remove it from the market. Therefore, supplements are:

- Not guaranteed to meet product potency or purity
- Not required to meet the same safety requirements as prescription or over-the-counter drug or food requirements
- Not held to specific manufacturing standards
- Not required to meet safety or efficacy thresholds before going on the market
- Not required to be proven effective for any claimed health benefit

What Has Been Found in Supplements on the U.S. Market?

An International Olympic Committee study, conducted from 2000 to 2002, showed that 18.8% of the 240 supplements purchased in the USA surreptitiously contained steroids.

A study overseen by Informed Choice, a non-profit coalition of dietary supplements, found that 13 of the 52 supplements (25%) purchased at various U.S. retailers surreptitiously contained steroids and that six (11.5%) contained banned stimulants.

Numerous studies have found that ~25% of dietary supplements are contaminated with heavy metals, steroids, and/or medications not listed on the labels.

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It is important to check supplement labels for a seal of approval from a legitimate, independent (third-party) company. These independent companies contract with supplement manufacturers to assess and verify the purity and content of their products. If supplements do not have a seal of approval, then they either have not been analyzed by an independent company or they have not met an independent company's standards. Many supplements have labels that falsely appear to contain seals of approval, e.g., "GNC Approved." However, in many cases, these seals are not from independent testing companies. Below are three seals of approval from legitimate, independent companies.



Energy Drinks

Energy drinks are increasing in popularity among athletes of all ages. Caffeine is the main "energy" ingredient in energy drinks, but they also frequently contain other ingredients, such as, vitamins, glucuronolactone, ginseng, guarana, and taurine. Familiar brand names include Jolt, Red Bull, Rock Star, and even some VitaWater products. It is claimed that these products improve alertness, stamina and reaction time. Caffeine has been used for its stimulant effects by endurance athletes as a way to stay alert and improve endurance. Its ability to enhance performance, under certain conditions, has been well documented. However, consuming too much caffeine often has negative effects

on overall performance, and has even led to the deaths of athletes. In the United States, manufacturers are not required to list the ingredients of energy drinks. Therefore, it is difficult for consumers to appreciate how much caffeine they ingest with an energy drink. In addition to acting as a stimulant, caffeine is also a diuretic. Thus, it can contribute to dehydration in athletes. Ginseng and guarana also have stimulant effects in the body and add to the danger of these products. Considerable concern remains regarding the negative effects of energy drinks. Emergency room visits arising from energy drink consumption are becoming commonplace. Current trends among students include mixing energy drinks with alcohol at parties and bars. Side effects of energy drinks include dehydration, nausea, nosebleeds, heart arrhythmias, and death.

Creatine

Creatine is a natural substance that the body uses to produce energy. The daily requirement of creatine is 2g per day. Humans produce half the daily requirement, while the other half comes from a balanced diet. Creatine supplements are commonly used by athletes in the hope that they will provide quick bursts of energy. Creatine supplementation can have some athletic benefits, as it increases strength and improves outcomes in short-duration, anaerobic events (such as weightlifting or short sprints). It does not improve endurance, since prolonged muscle activity depends on aerobic glycolysis. Despite the wide-spread use of creatine by young athletes, little information exists regarding its safety or effica-

cy in children and teens. Creatine side effects include dehydration, muscle cramps, diarrhea, and renal function compromise. Additionally, there is no data to judge the effects of creatine supplementation on the other tissues that store creatine (such as the heart and brain), and the effects of chronic use are unknown.

Protein/Amino Acids

Proteins provide critical amino acids that serve as building blocks for new muscle. The amount of protein that should be ingested per day is listed below:

0.8g/kg per day for *normal* activity levels

1.0-1.2g/kg per day for *light-moderate* athletic training

1.4-1.7g/kg per day for *moderate-heavy* athletic training

(Limited data suggests up to) **2g/kg** per day may be used for *heavy* athletic training

Fortunately, the higher intakes recommended for athletes are easily achieved in a well-balanced diet without the use of supplements. Common sources of dietary protein include meat (5-7g protein/ounce) and milk (8g protein/cup). Milk consists primarily of two proteins: 80% casein and 20% whey. Both of these proteins are excellent sources of all essential amino acids, but they differ in one important aspect. Whey is a quickly-digested protein that provides an immediate increase in the blood's amino acid content. However, its effects are short-lived.

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Casein is a slowly-digested protein that provides a slower increase of blood amino acids, and its effects last much longer (7 hours). Drinking 16 to 32 ounces of chocolate milk within 20 to 30 minutes after weightlifting or other strenuous exercise is the safest way to efficiently build muscles. Chocolate milk specifically is most helpful because chocolate reduces lactic acid that builds up during strenuous exercise, while milk provides an immediate source of both protein and carbohydrates.

Protein supplements available on the market consist primarily of casein, whey, or both proteins. If an athlete is set on using a protein supplement, it is best to use a product that has both whey and casein to maximize the benefit. Side effects of protein supplements include constipation, gas, diarrhea, dehydration (especially intravascular), and high prolactin levels (if tainted with steroids). Rare side effects have included liver, renal and heart disease.

Nitric Oxide Producers

Considerable interest has been shown by athletes in nitric oxide and associated vasodilators to enhance athletic performance. Nitric oxide is a gas that is produced when an enzyme, Nitric Oxide Synthase (NOS), breaks down L-arginine into L-citrulline. The most common way to increase nitric oxide in the body is through exercise. As the heart pumps with more pressure to supply the muscles with blood, arterial walls release nitric oxide into blood. Nitric oxide dilates vessel walls, allowing greater blood

flow. Athletes and youth have the most optimal nitric oxide systems, reflecting their energy and resilience. The supplement market is now flooded with products that contain L-arginine for athletes. The theory is that the athlete taking these products right before working out will provide maximal blood flow to the muscles. In reality, this shunts blood away from other vital organs, such as the brain, heart, and kidneys. Athletes also theorize that by consuming these products in combination with creatine or protein supplements, these supplements are delivered more effectively to the muscles since the vessels are dilated. Common side effects of these products include hypotension, fainting, dizziness, nausea, diarrhea, changes in electrolytes, and increased bleeding. The long-term consequences of using these products are unknown and may be serious, particularly if they lead to cardiac hypertrophy and heart failure.

Ephedra Alkaloids

Similar to amphetamine, ephedra is a stimulant. Athletes use ephedra to improve mental alertness, limit fatigue, and reduce weight. In 2004, the FDA banned the sale of ephedra after it was linked to the sudden deaths of three college and pro athletes. However, some sports drinks and energy foods still contain ephedra or ephedra-like substances. It can also be found in cold products, such as pseudoephedrine (i.e., Sudafed). Athletes are increasingly using these products for their stimulant effects to enhance performance. Side effects include insomnia, tachycardia, hypertension, heart attacks, seizures, and death.

Growth Hormone

Growth hormone is a polypeptide secreted by the anterior pituitary. The liver converts growth hormone to insulin-like growth factor 1, which has several effects throughout the body. Its main role is to increase protein synthesis, lipid catabolism, and bone growth. Although growth hormone has many benefits for those who are congenitally deficient, it does not hold similar promise for healthy young athletes. There is no conclusive evidence that growth hormone enhances athletic performance. Use of exogenous growth hormone requires a prescription, but athletes are easily able to obtain it over the Internet. Growth hormone is banned by all major sporting leagues. However, no reliable test to detect use by athletes has been developed. Nearly 5% of 10th graders have used growth hormone for enhanced athletic performance purposes. It is typically injected several times per month, and the cost of a 1-month supply can approach \$5000. Athletes who take growth hormone often combine it with anabolic steroids. Side effects of exogenous growth hormone include acromegaly, myopathy, hypertension, papilledema with intracranial hypertension, and premature closure of growth plates.

Anabolic Steroids and Steroid Precursors

Most anabolic steroids are synthetic versions of testosterone or testosterone precursors. This male sex hormone is responsible for sex characteristics and the growth of skeletal muscle. More than 100 anabolic

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Evidence to Practice:

Improving Care for Children with Hearing Loss

by Shannon Sullivan, MD, University of Iowa Children's Hospital

Newborn hearing screening has become successful over the last decade. Currently, more than 95% of newborns are screened for hearing loss. However, diagnosis and intervention rates are lower: fewer than 60% of newborns who do not pass their screening have a documented diagnosis and only 77% of those diagnosed with hearing loss receive intervention services by 6 months of age.

In 2001, the American Academy of Pediatrics (AAP) implemented a program, Improving the Effectiveness of Newborn Hearing Screening, Diagnosis, and Intervention (EDHI) through the Medical Home, focused on increasing the involvement of primary care pediatricians and other child health care providers by linking follow-up services more closely to the newborn's medical home.

The Iowa EHDI program works with primary care providers to ensure Iowa children are screened, re-screened, and receive an audiological assessment. In addition, the EHDI program follows up with primary care providers and parents of the 10% of infants identified with risk factors associated with late onset or progressive hearing loss to ensure children receive a follow-up hearing screen or assessment as recommended by the Joint Committee on Infant Hearing Screening.

Iowa's EHDI program is successfully screening 99% of newborns for early hearing loss. Of those screened,

91.6% in 2009 and 93.7% in 2010 passed. Additionally, of the newborns that missed or did not pass their initial birth screen, 70% went on to pass their outpatient screen in 2009. In 2009, 661 children were lost to follow-up or documentation. Sixty-five children were diagnosed with a permanent hearing loss. Another 291 children were shown to have a conductive hearing loss; however, identifying the number of children who had a permanent conductive loss or normal hearing is impossible because there is no evidence of the child being rescreened following medical intervention. To rule out the possibility of a permanent loss, it is imperative that children return to a pediatric audiologist for a hearing screen and/or diagnostic evaluation if they do not pass their birth screen, and require medical intervention to treat fluid or ear infections.

In 2008, experts reviewed and prioritized existing newborn hearing screening and diagnosis and intervention recommendations, to identify the most effective of these recommendations, and to create a plan for incorporating evidence-based recommendations into practice.

Conclusions and recommendations from the workshop, Accelerating Evidence into Practice for the Benefit of Children With Early Hearing Loss, are summarized in an article of the same name in the supplement, "Improving the System of Care for Infants and Children with

Early Hearing Loss" (*Pediatrics*. 2010; 126:S1-S69).

Workshop participants used a modified Delphi process to identify the top five existing recommendations for each of the following key areas:

- Diagnosis
- Treatment
- Parental awareness
- Public awareness
- Continuous quality improvement.

For example, participants indicated that using outreach to ensure at-risk families seek follow-up was the top priority in the diagnosis category. In addition, ensuring infants have hearing aids within one month of diagnosis was the top priority in the treatment and intervention category; providing special resources to minority and non-English speaking parents was the top priority in the parental and public awareness category; and expanding state data management and tracking systems was the most important recommendation for continuous quality improvement.

Participants also made choices for organizing a stewardship group, with public/private oversight funded and organized by the federal government, as the top priority.

"More infants are being screened early for hearing loss, but the extent of essential diagnostic follow-up and treatment is variable, and there is concern that not all children

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Performance-enhancing Sports Aids:

Myths and Reality

Taken to improve athletic abilities, these legal and illegal substances, also marketed as nutritional substances, may be taken orally, injected, or inhaled. Their use by athletes, with the intention of improving ability and appearance, generates significant health concerns. There is no FDA oversight guaranteeing safety or purity of these sports or dietary supplements, and without FDA oversight, they are not required to be proven effective for any claimed health benefit. Some of these substances are available in stores, while others can be obtained over the Internet, without a prescription.

Following are some commonly used supplements and their health concerns.

Substance: Energy Drinks

Health concerns: Dehydration, nausea, nosebleeds, heart rhythm problems, death

Substance: Creatine

Health concerns: Dehydration, muscle cramps, diarrhea, kidney function compromise. Effects of chronic use unknown.

Substance: Protein/Amino Acids

Health concerns: Constipation, gas, diarrhea, dehydration, high prolactin hormone levels. Rare side effects include liver, kidney, and heart disease.

Substance: Nitric Oxide Producers

Health concerns: Low blood pressure, fainting, dizziness, nausea, diarrhea, changes in blood electrolytes, increased bleeding.

Substance: Ephedra Alkaloids

Health concerns: Trouble sleeping, fast heart rate, high blood pressure, heart attacks, seizures, death

Substance: Growth Hormone

Health concerns: Excess growth, heart muscle weakness, high blood pressure, increased pressure within the skull, premature closing of growth plates.

Substance: Anabolic Steroids

Health concerns: Stopping bone growth, high cholesterol, decrease in testicular size, diabetes, mood swings, aggressive behavior, fluid retention, depression, acne, and heart, kidney and liver damage

Many of these substances have serious long-term side effects, as well.

The best sports performance enhancers are adequate water, carbohydrates, and electrolytes. For vigorous and long-lasting exercise, sports drinks with electrolytes and snacks with sufficient carbohydrates are best. A well-balanced diet, including milk and meat as sources of protein for building new muscle, is important. **Drinking 16 to 32 ounces of chocolate milk within 20 to 30 minutes after weightlifting or other strenuous exercise is the safest way to efficiently build muscles.** Chocolate reduces lactic acid that builds up during strenuous exercise, while milk provides an immediate source of both protein and carbohydrates.

Use extreme caution when researching supplement information online—many websites provide biased, unscientific information to improve product sales. They may include labels that contain false seals of approval, such as “GNC approved.” Below are seals from legitimate, independent companies.



Check with your child’s coach about education and rules in place to reduce the use of supplements and aids.

For more information, visit Blue Cross Blue Shield Foundation at www.healthycompetition.org, the National Center for Drug Free Sports at www.drugfreesport.com, and www.ncaa.org.

steroids or steroid precursors are on the market. Trade names for these steroids include Anadrol, Anavar, Winstrol, and Oxadrin. Examples of steroid precursors are androstenedione and DHEA. Slang terms commonly used for these products are roids, hype, andro, pump, and juice. These products are available legally, by prescription only, to treat certain medical conditions, such as delayed puberty, muscle wasting, and some breast cancers. Unfortunately, these products are easily available over the Internet without legitimate, legal prescriptions.

Athletes engaged in endurance and strength-focused sports are the most likely to use steroids. Steroids are used to increase muscle mass, to train faster and longer, and to reduce recovery time. Anabolic steroids have very dangerous side effects that include bone growth arrest; heart, kidney, and liver damage; high cholesterol; testicular atrophy; diabetes, mood swings; aggressive behavior; depression; fluid retention and acne. The use of anabolic steroids and the steroid precursor, androstenedione, are banned by all athletic associations. DHEA remains an over-the-counter nutritional supplement. Although DHEA is a legal supplement, impurities during production can place athletes at risk for testing positive for a banned substance.

Advice to Parents and Athletes

Health care professionals play an important role in reducing the use of ergogenic aids in athletes. The best sports performance enhancers are adequate water, carbohydrates, and electrolytes. For kids, adequate water intake is the most important exercise supplement. For vigorous or long-lasting exercise, sports drinks with electrolytes and snacks with sufficient carbohydrates should be used. Encourage parents of athletes to educate themselves about the risks of products that children are buying in stores or over the Internet. Teach parents and athletes to be extremely cautious of supplement information on the Internet. Most websites are trying to sell a product and provide very biased, unscientific information. Discuss the health risks associated with products and encourage parents to do the same. Advise parents to ask their child's coach what rules are in place to reduce the use of these products and what the school is doing to help educate athletes about ergogenic use. Good sources of information for parents and athletes include the Blue Cross Blue Shield Foundation at www.healthycompetition.org; the National Center for Drug Free Sports at www.drugfreesport.com; and www.ncaa.org

are receiving the best available, evidence-based care. The outcomes of infants identified with early hearing loss and their families can be improved by efforts to accelerate evidence into practice and to continuously monitor access, quality, and outcomes of services," concluded the authors at the end of the supplement article. To access the supplement in its entirety on the Pediatrics Web site, visit: http://pediatrics.aappublications.org/content/vol126/Supplement_1/.

With continued support from Iowa's primary care providers, it's possible to reduce the number of children who become lost, and increase the number of children identified with a hearing loss and enrolled in appropriate early intervention services in a timely manner.

For additional information about follow-up efforts specific to Iowa, please contact:

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Also, visit http://medicalhomeinfo.org/how/clinical_care/hearing_screening, or Iowa's EHDI website at www.idph.state.ia.us/iaehdi/default.asp, to access resources related to newborn hearing screening and follow-up.



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