Scientific research also shows that aggression and other psychiatric side effects may result from abuse of anabolic steroids. Many users report feeling good about themselves while on anabolic steroids, but researchers report that extreme mood swings also can occur, including manic-like symptoms leading to violence. Depression often results when the drugs are stopped, and may contribute to dependence on anabolic steroids. Researchers also report that users may suffer from paranoid jealousy, extreme irritability, delusions, and impaired judgment stemming from feelings of invincibility (Pope & Katz, 1988).

Some users turn to other drugs to alleviate some of the negative effects of anabolic steroids. For example, a study of 227 men admitted in 1999 to a private treatment center for dependence on heroin or other opioids (opiates and synthetic narcotics) found that 9.3% had abused anabolic steroids before trying any other illicit drug. Of this 9.3%, 86% first used opioids to counteract insomnia and irritability resulting from the anabolic steroids.

The "Monitoring the Future" (MTF) study by the National Institute on Drug Abuse has assessed drug use among 8th-, 10th-, and 12th-graders nationwide annually since 1975. Because of growing professional and public concern over use of anabolic steroids by adolescents and young adults, questions regarding anabolic steroid use were added to the MTF in 1989, to give a better understanding of the extent of the problem. Between 1989 and 2000, the prevalence of anabolic steroid use among 12th-graders fluctuated between a 3% high in 1989 and a 1.9% low in 1996.

In 1991, the MTF study was expanded to include assessment of 8th- and 10th-graders nationwide, in addition to 12th-graders. Use of steroids remained unchanged among 8th- and 12th-graders from 1999 to 2000. Among 10th-graders, however, the use of steroids increased from 1.7% in 1999 to 2.2% in 2000. In addition, the 2000 MTF noted a decrease, among 12th-graders, in the perceived risk of harm from using steroids.

Most anabolic steroid users are male. Among male students, past-year use of these substances was reported by 2.2% of 8th-graders, 2.8% of 10th-graders, and 2.5% of 12th-graders.

The MTF also reports that use of anabolic-androgenic steroids remained stable from 2001 to 2002 in each grade and category (Table 9.1).

Table 9-1 Anabolic Steroid Use by Students Year 2000 Monitoring the Future Study

	8TH-GRADERS	10TH-GRADERS	12TH-GRADERS
Ever Used	3.0%	3.5%	2.5%
Used in Past Year	1.7	2.2	1.7
Used in Past Month	0.8	1.0	0.8

Growth Hormones

growth hormone *An ergogenic aid; a supplement of a substance produced naturally by the pituitary gland that works to increase conversion of amino acids into protein.*

Growth hormones are another ergogenic aid used by athletes to gain an edge. Growth hormone, which is produced by the pituitary gland, acts on most organs and tissues in the body. Growth hormone works by increasing conversion of amino acids into protein. It allows fat to be used as an energy source, sparing muscle glycogen. The adverse effects of growth hormone can include heart disease, impotence, osteoporosis, and death.

Androstenedione

androstenedione *A steroid produced naturally in both men and women that can change or enhance the growth and development of masculine or feminine traits.*

Androstenedione (andro) is a steroid hormone naturally produced in both men and women. Androstenedione produced in the body is converted either to testosterone or to estrogen. Elevated testosterone levels can have masculinizing effects on women; men with increased estrogen levels can experience feminizing effects such as the growth of breasts. Young people who have elevated levels of either hormone could develop early puberty and premature cessation of bone growth, leading to shorter-than-normal adult height. Androstenedione is also known to set off extreme aggression and mood changes. Other adverse effects of androstenedione include decreased levels of cardiac-protective HDLs and elevated levels of estrogen. This exposes the consumer to potential cardiovascular disease, breast cancer, and pancreatic cancer.

DID YOU KNOW . . .

More than 80% of andro users in grades 8–12 reportedly use creatine during the same period of time (National Institute on Drug Abuse, 2002).

Androstenedione is widely available as a nonprescription nutritional supplement. It is marketed primarily to athletes and bodybuilders who believe that taking it will increase strength, stamina, and muscle mass. Because it is a direct precursor of testosterone, it is thought to possibly encourage the buildup of muscle mass and recovery from injury. Andro is currently classified as a dietary supplement

under the Dietary Supplement Health and Education Act of 1994 and is sold over the counter (OTC).

It became notorious when baseball slugger Mark McGwire admitted taking it during his 1998 home run record-hitting season. Androstenedione is banned by the International Olympic Committee (IOC), the National Football League (NFL), and the National Collegiate Athletic Association (NCAA).

Caffeine

Many people like **caffeine** because it makes them feel more alert, gives them more energy, improves their mood, and makes them more productive. Some studies indicate that some endurance athletes may benefit from ingesting caffeine prior to exercise, but others show that caffeine has no effect at all on endurance performance.

caffeine *An alkaloid present in coffee, many soft drinks, and chocolate that acts as a stimulant and is believed to enhance endurance and improve reaction times.*

High levels of caffeine can cause sleeplessness, anxiety, headache, upset stomach, and nervousness, as well as dehydration. Caffeine-induced dehydration may actually decrease athletic performance by decreasing the efficiency of the muscles, which are forced to work while being deprived of fluids. These side effects may very well offset any possible benefits.

The IOC has banned caffeine over a certain limit. Coffee, tea, chocolate, and colas, as well as NoDoz and some nonprescription painkillers, contain caffeine. Because caffeine is a common ingredient in foods and drinks, the IOC allows an upper limit. Table 9-2 shows common foods and OTC items that contain caffeine.

DID YOU KNOW . . .

The NCAA ban on caffeine applies when the concentration in urine exceeds 15 micrograms per milliliter. This is equal to eight cups of coffee at one sitting, with testing within two to three hours thereafter.

Creatine Monohydrate

One of the most popular performance enhancers currently used today is **creatine monohydrate**. Creatine is an amino acid (amino acids are the building blocks of protein), is made in the body by the liver and kidneys, and is derived from a diet of meat and animal products. Creatine is found naturally in skeletal muscle.

creatine monohydrate *An amino acid, found naturally in skeletal muscle, that is stored for quick energy and is used as a supplement to increase skeletal muscle.*

In the body, creatine is changed into a molecule called phosphocreatine, which serves as a storage reservoir for quick energy. Phosphocreatine is especially important in tissues such as the voluntary muscles and the nervous system, which periodically require large amounts of energy.

Athletic use of creatine increased dramatically after a 1992 study showed that high doses of creatine could increase skeletal muscle by 20%. It has become increasingly popular among athletes involved in power sports. Creatine theoretically works by increasing energy production during exercise. It enables athletes to sustain strenuous exercise for a longer period of time.

Table 9-2 Caffeine Content of Foods and Drugs

PRODUCT	SERVING SIZE	CAFFEINE (mg)
OTC Drugs		
NoDoz, maximum strength; Vivarin	1 tablet	200
Excedrin	2 tablets	130
NoDoz, regular strength	1 tablet	100
Anacin	2 tablets	64
Coffees		
Coffee, brewed	8 ounces	135
Coffee, instant	8 ounces	95
Coffee, decaffeinated	8 ounces	5
Teas		
Tea, leaf or bag	8 ounces	50
Soft Drinks		
Mountain Dew	12 ounces	55.5
Surge	12 ounces	52.5
Diet Coke	12 ounces	46.5
Coca-Cola classic	12 ounces	34.5
Dr. Pepper, regular or diet	12 ounces	42
Sunkist orange soda	12 ounces	42
Pepsi-Cola	12 ounces	37.5
Barqs Root Beer	12 ounces	22.5
7-Up or Diet 7-Up	12 ounces	0
Barqs Diet Root Beer	12 ounces	0
Caffeine-free Coca-Cola or Diet Coke	12 ounces	0
Caffeine-free Pepsi or Diet Pepsi	12 ounces	0
Minute Maid Orange Soda	12 ounces	0
Mug Root Beer	12 ounces	0
Sprite or Diet Sprite	12 ounces	0
Caffeinated Waters		
Java Water	1/2 liter (16.9 ounces)	125
Krank 20	1/2 liter (16.9 ounces)	100
Aqua Blast	1/2 liter (16.9 ounces)	90
Juices		
Juiced	10 ounces	60
Frozen Desserts		
Ben & Jerry's No Fat Coffee Fudge frozen yogurt	1 cup	85
Starbucks coffee ice cream, assorted types	1 cup	40–60
Häagen-Dazs coffee ice cream	1 cup	58
Yogurts, one container		
Dannon coffee yogurt	8 ounces	45
Chocolates or Candies		
Hershey's Special Dark chocolate bar	1 bar (1.5 ounces)	31
Hershey Bar (milk chocolate)	1 bar (1.5 ounces)	10
Cocoa or hot chocolate	8 ounces	5

Serving sizes are based on commonly eaten portions, pharmaceutical instructions, or the amount of the leading-selling container size. For example, beverages sold in 16-ounce or half-liter bottles were counted as one serving.

Sources: National Coffee Association; National Soft Drink Association; Tea Council of the USA; information provided by food, beverage, and pharmaceutical companies; Barone & Roberts, 1996.