Ergogenic Aids

TABLE 10-10 An Evaluation of Popular Ergogenic Aids

Substance/Practice	Rationale	Reality
Useful in Some Circumstances		
Creatine	Increase phosphocreatine (PCr) in muscles to keep ATP concentration high	Use of 20 grams per day for 5 to 6 days and then a maintenance dose of 2 grams per day may improve performance in those who undertake repeated bursts of activity, such as in sprinting and weight lifting. Vegetarian athletes benefit the most because their diets are low in or devoid of creatine. Some of the muscle weight gain noted with use results from water contained in muscles. Endurance athletes do not benefit from use. Little is known about the safety of long-term creatine use. Continual use of high doses has led to kidney damage in a few cases. Cost: $25 to $65 per month.
Sodium Bicarbonate (baking soda)	Counter lactic acid buildup	Partially effective in some circumstances (when lactic acid is rapidly produced), such as wrestling, but induces nausea and diarrhea. The dose used is 300 milligrams/kilogram, given 1 to 3 hours before exercise. Cost: nil.
Caffeine	Increase use of fatty acids to fuel muscles, promote mental alertness	Drinking two to three 5-ounce cups of coffee (equivalent to 3 to 9 milligrams of caffeine per kilogram of body weight) about 1 hour before events lasting about 5 minutes or longer is useful for some athletes; benefits are less apparent in those who have ample stores of glycogen, are highly trained, or habitually consume caffeine; intake of more than about 600 milligrams (six to eight cups of coffee) elicits a urine concentration illegal under NCAA rules (greater than 15 micrograms per milliliter). Possible side effects include shakiness, nervousness, nausea, anxiety, and insomnia. Cost: $0.08 per 300 milligrams.
Possibly Useful, Still Under Study		
Beta-hydroxy-beta methylbutyric acid (HMB)	Decrease protein catabolism, causing a net growth-promoting effect	Some research suggests that supplementation with this substance may increase muscle mass by 0.5 to 1 kilogram beyond unsupplemented diets when taken during initial phases of weight training. Still, safety and effectiveness of-long term HMB use in humans is unknown. Cost: $100 per month.
Glutamine (an amino acid)	Enhance immune function, preserve lean body mass	Some preliminary studies show decreased occurrence of upper respiratory tract infections in athletes with use. It also may promote muscle growth, but long-term studies are lacking. Protein foods are a rich source of glutamine. Cost: $10 to $20 per month for 1 to 2 grams per day.
Branched-chain amino acids (BCAA) (leucine, isoleucine, valine)	Increase gains in muscle mass during resistance training Important energy source, especially when carbohydrate stores are depleted	Several studies point to positive effects of BCAA on increases in muscle mass when taken before or after resistance training. This effect is most dramatic among untrained athletes who are just beginning a resistance-training program. Protein-rich foods (especially dairy proteins) are also rich in BCAA. Cost: $20 per month. For endurance athletes, supplementation of BCAA (10 to 30 grams per day) during exercise can increase BCAA in the blood when it has been depleted due to exercise, although there is no consistent evidence of improved endurance performance. Carbohydrate feeding, by delaying use of BCAA as fuel, may negate the need for BCAA supplementation in endurance activities.
Dangerous or Illegal Substances/Practices		
Anabolic steroids (and related substances, such as androstenedione and tetrahydrogestrinone)	Increase muscle mass and strength	Although effective for increasing protein synthesis, anabolic steroids are illegal in the United States unless prescribed by a physician. They have numerous potential side effects, such as premature closure of growth plates in bones (thus possibly limiting the adult height of a teenage athlete), bloody cysts in the liver, increased risk of cardiovascular disease, increased blood pressure, and reproductive dysfunction. Possible psychological consequences include increased aggressiveness, drug dependence (addiction), withdrawal symptoms (such as depression), sleep disturbances, and mood swings (known as "roid rage"). Use of needles for injectable forms adds further health risk. Banned by the International Olympic Committee.