

# 14

## Supplements and Performance



In this chapter you will learn about:

- ◆ Vitamin and mineral supplements.
- ◆ Nutritional ergogenic agents; hype versus reality.
- ◆ Risks associated with using performance enhancers.
- ◆ Ergolytic agents.

**Gaining** and maintaining physical fitness takes time and dedication. Often, to achieve these goals, people turn to various supplements based on their claims as performance enhancers. However, **no** supplement can replace the benefits of a well-planned exercise routine and a nutritionally-sound diet!

The definition of a nutritional supplement is “a nutrient taken in addition to your diet”. An **ergogenic agent** is a substance taken with the intent of improving physical performance. This chapter will address vitamin and mineral supplements, nutritional ergogenic agents (performance enhancers), and substances that can be harmful to your health and decrease physical performance.

## Vitamin and Mineral Supplements

Taking a vitamin or mineral supplement may be something you are considering, especially if you find it difficult to eat a variety of foods. Due to the various physiologic functions of vitamins and minerals, the supplement industry has tried to encourage supplement use by physically active people. However, multivitamin and mineral supplements do not appear to enhance performance in healthy, well-nourished individuals. A multivitamin and mineral supplement is useful if:

- ◆ You have an existing vitamin or mineral deficiency.

- ◆ You have poor dietary habits. In this case, increase the amount of nutrient dense foods and food variety in your diet!
- ◆ You are exposed to extreme environmental conditions, such as cold climates or high altitudes ([Chapter 12](#)).

## Buying Vitamin and Mineral Supplements

The more informed you are about the marketing and manufacturing of supplements the more likely you can save money and still buy a good supplement. Facts you should know before buying a supplement are:



- ◆ Amount of Nutrients - Follow RDA/DRI guidelines in [Chapter 2](#), taking too much of certain nutrients can be toxic. If you choose to supplement, take a multi-vitamin and mineral supplement that supplies nutrients in amounts close to the RDA/DRI. Excessive amounts of a single nutrient can upset your nutrient balance and cause a deficiency of other nutrients. Avoid “high potency” supplements.
- ◆ Natural Versus Synthetic Vitamins - Both forms are used by your body. If manufacturers add plant extracts or a bit of the natural vitamin, they label the supplement as “natural” and sell it at a higher price.
- ◆ Additives - Many supplements contain additives that may cause headaches or other side effects in some people.
- ◆ Store Brands Versus Name Brand - A store brand supplement from a national retailer is of similar quality to a name brand supplement.
- ◆ Disintegration Rate - Supplement disintegration in the gut should meet the U.S. Pharmacopoeia (USP) standards (found on the label) of 30 to 45 minutes. This does not apply to time-release or chewables.
- ◆ Check the expiration date of the supplements you buy.
- ◆ Stress tablets are a marketing ploy.
- ◆ Men should not take iron supplements, unless directed by their doctor.

# Nutritional Ergogenic Agents

Taking performance-enhancing supplements is a personal choice. [Table 14-1](#), which lists some popular ergogenic agents grouped by type (identified in bold), their claimed benefits, and research findings, is designed to educate you as a consumer. Many of the ergogenic agents listed in this table are classified as nutritional supplements. When marketed as a nutritional supplement, these substances are not regulated by the Federal Drug Administration (FDA). Often this means that the performance claims and the risks associated with using these substances have not been thoroughly tested.

**Table 14-1. Claims and Risks of Ergogenic Agents**

	<b>Name</b>	<b>Claims</b>	<b>Benefit / Risk / Side Effect</b>
<b>Energy Enhancers</b>	Inosine	Increases endurance and strength, facilitates post-exercise recovery, increases oxygen release to tissues.	No benefits demonstrated; may cause an increase in free radical production.
	Coenzyme Q10 (COQ10)	Raises heart enzyme levels to increase aerobic energy production.	No benefits in normal, healthy people.
	Desiccated Liver	Increase energy and performance by supplying extra vitamins and minerals.	No benefits demonstrated.
	Bee Pollen	Improves performance and post-exercise recovery because it is a natural food with numerous nutrients.	No benefits demonstrated; may cause allergic reactions.
<b>Fat Burners Lean Body Mass</b>	L-Carnitine	Delays fatigue by increasing the use of fats for energy.	No benefits demonstrated; diet meets needs; not depleted with exercise; may cause nausea, vomiting and cramps.
	Gamma Oryzanol, Ferulic Acid	Increases testosterone and lean body mass.	No benefits demonstrated; the plant sterols are not readily absorbed by the body.
	Hydroxy-Methyl-Butyrate (HMB)	Slows muscle breakdown during intense training, increases strength.	Research is inconclusive.
	Chromium Picolinate	Increases muscle mass, burns fat by enhancing the function of insulin.	Benefits are questionable; may cause stomach upset, anemia, or DNA damage.

**Table 14-1. Claims and Risks of Ergogenic Agents**

	<b>Name</b>	<b>Claims</b>	<b>Benefit / Risk / Side Effect</b>
<b>Growth Hormone (GH) Releasers</b>	Arginine, Lysine, Ornithine	Stimulate GH release.	Some benefits for Arginine and Lysine, but not Ornithine; may cause gastrointestinal (GI) upset, potential amino acid imbalances, and decreases in GH.
	Branched chain Amino Acids (Leucine, Isoleucine, Valine)	Stimulate GH, enhance muscle strength, endurance, and aerobic capacity by providing fuel to muscle and sparing muscle protein.	Some benefits demonstrated; may cause diarrhea and cramping.
	Free Amino Acids	More readily absorbed in gut.	Little benefit demonstrated.
	Dibenzozide, Cobamamide	Promotes growth.	No benefits demonstrated on performance.
<b>Glycogen Sparers</b>	40-30-30, high fat/protein diets	Increase endurance by promoting fat metabolism.	Some benefits; potential long-term risks are increased blood cholesterol and heart disease. Diet change 24-48 hr. before event leads to decrease in performance.
	Medium Chain Triglycerides	Increase energy and decrease body fat because they are easier to absorb and use as fuel than triglycerides.	No benefits demonstrated; may cause GI problems.
	Ginseng	Reduces fatigue, increases energy and work capacity.	No benefit demonstrated; may cause allergic reaction or excitability; may contain alcohol.
	Lactate	Delays fatigue by maintaining blood glucose levels.	Some benefits demonstrated.
	Caffeine	Delays fatigue, burns fat, increases performance by elevating fatty acid levels in blood.	Some benefits; may cause irritability, GI pain, tremors, loss of concentration, and interfere with iron absorption. No increase in anaerobic or maximal aerobic capacity. Fewer benefits seen in habitual users.
	Choline	Delays fatigue, reduces fat, improves physical and mental performance.	Benefits questionable; may cause nausea, diarrhea, and "fishy" body odor.

**Table 14-1. Claims and Risks of Ergogenic Agents**

	<b>Name</b>	<b>Claims</b>	<b>Benefit / Risk / Side Effect</b>
<b>Intercellular Buffers</b>	Phosphate Salts	Delay fatigue and increase oxygen transport to muscle.	Results questionable; may cause GI upset.
	Aspartate Salts (Magnesium/ Potassium)	Increase aerobic capacity, delay fatigue by neutralizing ammonia produced during exercise.	Results are inconclusive.
	Citrate	Increases endurance and delays onset of fatigue by buffering hydrogen ions produced during metabolism.	Some benefits demonstrated; may cause GI upset, diarrhea, nausea. Avoid large doses.
	Sodium Bicarbonate	Delays fatigue during short, high intensity exercise by buffering lactic acid.	Some benefits demonstrated; may cause cramps or diarrhea.
<b>Testosterone Enhancers</b>	Glandulars (grounded organs)	Ingesting animal organs high in testosterone leads to greater lean muscle mass.	No benefits demonstrated; may cause your own production of testosterone to decline.
	Sapogenins (Smilax, Dioscorea, Trillium, Yucca, Sarsaparilla)	Ingesting testosterone precursors leads to greater testosterone concentrations and muscle mass.	No benefits demonstrated; may cause light-headedness or aggression.
	Yohimbine	Aphrodisiac and purported to cure male impotence. Increases muscle mass and decreases body fat.	No demonstrated increase in testosterone levels; conflicting results with regard to impotence; may cause dizziness, nausea, headaches, or depression.
	Boron	Increases production of testosterone.	No benefits demonstrated; may cause rashes, nausea, vomiting, diarrhea, lethargy.
	Androstenedione, Androstenediol, Norandrostenediol Andro	Increases energy, strength, muscle mass, and possibly greater sexual arousal and sense of well-being. Termed "prohormones."	Considered a steroid; banned by many organizations; long-term risks are not well known. Risk of failing drug tests. "Natural" does not mean "safe"!
	DHEA	Slows aging, builds muscle, burns fat, boosts libido by increasing testosterone in body.	Little or no benefits demonstrated with respect to performance; side effects include acne, nausea, virilization. May increase risk of some cancers.

**Table 14-1. Claims and Risks of Ergogenic Agents**

	<b>Name</b>	<b>Claims</b>	<b>Benefit / Risk / Side Effect</b>
<b>Miscellaneous</b>	Octacosanol (Wheat Germ Oil)	Improves aerobic capacity by enhancing central nervous system function.	Some benefits demonstrated in reaction times but not aerobic capacity; may cause allergic reactions.
	Glycerol	Improves endurance by increasing blood volumes and decreasing core temperatures.	No benefits demonstrated; may cause cellular dehydration, nausea, vomiting, diarrhea.
	Omega-3 Fatty Acids	Improve aerobic capacity.	No ergogenic effects have been demonstrated.
	Creatine	Increases stores of Creatine phosphate in muscle used for ATP-PC anaerobic energy system.	Some benefits demonstrated during short-term, high intensity exercise, but negated if ingested with caffeine.
	Tyrosine	Maintains cognitive performance during cold, stressful, or distracting conditions.	Benefits demonstrated.
	Glutamine	Promotes muscle growth, prevents fatigue, overtraining, and immune deficiency.	No performance benefits demonstrated.
	Glucosamine Sulfate with Chondroitin Sulphate	Component of connective tissue; has anti-inflammatory properties which increase recovery from musculoskeletal or overuse injuries.	Has potential for preventing and treating injuries, however, is not yet endorsed by doctors because of the lack of research.
	Melatonin	Increases mental and physical performance by enhancing quality of sleep.	Benefits demonstrated; may cause sleepiness and fatigue at time of administration, but not upon awakening.
	Steroids and Steroid Alternatives	Increase muscle mass.	Risks include aggressiveness, acne, changes in behavior/ emotions, injury to connective tissue, impaired immune function, tumors, shrinking of testicles, decrease sperm and testosterone production, and masculinization in women. Use banned by the military.

Other sources of information include the **Ergogenics Pamphlet** (<http://www.usuhs.mil/mim/ergopam.pdf>); the Alcohol Tobacco and Firearms web site at <http://www.ATF.treas.gov>; the Federal Drug Agency at <http://www.fda.gov> (select the “Food” icon); and the Federal Trade Commission at <http://www.ftc.gov> (search “consumer publications”). Be aware of substances that are banned by the military and various athletic associations.

## Ergolytic Agents

Ergolytic agents are those substances which impair physical and/or mental performance. When using these substances, you are undoing the benefits gained through training. Hopefully, by avoiding these substances, you can maximally improve your physical fitness and performance.



**Table 14-2. Ergolytic Agents and Performance**

Name	Common Beliefs	Side Effects / Risks
Alcohol	Relaxes, increases self-confidence, alters perception of fatigue.	Heavy drinking can cause severe dehydration and decrease performance.
Stimulants: amphetamines, ephedrine	Improve performance by increasing central nervous system arousal.	Banned by the military; increases heart rate, increases blood pressure; may cause dizziness, stomach upset, irritability, insomnia, and death.
Cigarettes or Smokeless Tobacco (Nicotine)	Buzz leads to improved performance and reaction time.	Increases heart rate and blood pressure, leading to decreased performance.