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ERGOGENIC AIDS

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ABSTRACT:

Ergogenic aids are substances or phenomena that improve an athlete's performance. The list of possible ergogenic aids is long, but the number that actually possesses ergogenic properties is much shorter. Some of these ergogenic aids can actually cause more harm than good and can impair performance.

KEYWORDS: *Ergogenic aids , athlete's performance , ergogenic aids.*

Ergogenic aids can be considered in three classes:

1. Pharmacological agents
2. Hormonal agents
3. Physiological agents

1. PHARMACOLOGICAL AGENTS:

Numerous pharmacological agents or drugs are suggested as being having ergogenic qualities. Some of them are:

a) Alcohol can be classified as food or nutrient because it provides energy but it can also be considered as an anti-nutrient because it can interfere with the metabolism of other nutrients. It is also classified as a drug as it has depressant effects on the central nervous system.

Effects:

Studies have shown that most

psychomotor functions associated with sport performance are impaired by alcohol, not improved. Although athletes can feel more alert and self-confident, their reaction time, coordination, movement, and thinking are all impaired. Small amounts of alcohol impair psychomotor skills, yet athletes are unaware of these changes and often believe that their performance has improved. Research also suggests that alcohol ingestion has no ergogenic effects on strength, power, speed, local muscular endurance or cardio-respiratory endurance.

More than its lack of ergogenic qualities, it has many ergolytic qualities. It is a poor source of carbohydrates and an anti-nutrient. Its depressant effects on the CNS dull pain sensation, but pain indicates injury, and physical activity while injured always carries a great risk of

increasing the extent of injury. Although a reduction in muscle tremor and anxiety might occur, the accompanying impairment of psychomotor skills offsets any advantage one might gain.

Alcohol suppresses the release of anti-diuretic hormone, causing the body to excrete more water which can cause dehydration especially in hot environment; it also causes peripheral vasodilatation which can bigger hypothermia in cold environments.

b) Amphetamines and its derivatives are CNS stimulants. They have been used as appetite suppressants in medically supervised weight loss programs. They are thought to increase concentration and mental alertness and their stimulating effect reduces fatigue.

Effects:

As potent central nervous system stimulants, amphetamines do increase state of arousal, which

leads to a sense of increased energy, self-confidence, and faster decision making. Taking amphetamines leads to the following experience:

- Decreased state of fatigue
- Increased systolic and diastolic blood pressure
- Increased heart rate
- Redistribution of blood flow to skeletal muscle
- Elevation of blood glucose and free fatty acids and
- Increased muscle tension.

Amphetamines are inherently dangerous. Deaths have been caused because of excess usage, due to elevation of heart rate and blood pressure which places a great stress on cardiovascular system.

Since amphetamines delay the sensation of fatigue, the athletes push dangerously beyond normal limits to the points of circulatory failure.

They can be psychologically addictive since they give a feeling of euphoria and energized feelings. They can be physically addictive if taken regularly and with continued use, the dosage needs to be increased to get the same effect. This can result in extreme nervousness, aggressive behaviour and insomnia.

c) Beta blockers :

Beta Blockers are a class of drugs that block beta-adrenergic receptors which greatly reduces the effects of stimulation by the sympathetic nervous system. They are generally prescribed for the treatment of hypertension, angina pectoris and certain cardiac arrhythmias. They are also used to reduce symptoms of anxiety and stage fright. These are mostly used in sports where anxiety and tremor can impair performance.

Effects

Beta Blockers decrease the effects of sympathetic nervous activity, which reduces the heart rate. This has resulted in increased scores in events such as shooting. Beta Blockers are ergogenic in sports such as shooting, archery etc.

On the negative side, BB can cause cardiac failure in people having cardiac problems. These drugs through their various effects can cause pronounced fatigue, which can inhibit performance and decrease motivation.

d) Caffeine

Caffeine is one of the most widely used drugs in the world and is found in coffee, tea, cocoa, soft drinks and various other foods. Caffeine is a CNS stimulant and its effects are similar to those of amphetamines, although weaker

Effects

- Because of its effects on the CNS, caffeine
- Increases mental alertness
- Increases concentration
- Elevates mood
- Decreases fatigue and delays its onset
- Decreases reaction time
- Enhances catecholamine release
- Increases free fatty acid metabolism and
- Increases use of muscle triglycerides

Through experiments it is now concluded that caffeine does improve endurance performance, possibly through increased mobilization of free fatty acids which leads to sparing of muscle glycogen for later use. Caffeine might also improve performance in sprint and strength types of activities.

In persons who are highly sensitive to caffeine, it can produce nervousness, restlessness, insomnia and tremors. It also acts as a diuretic, increasing an athlete's risk for dehydration. Abrupt discontinuation can result in headache, fatigue, irritability and gastrointestinal distress.

e) Cocaine

Cocaine is a recreational drug and acts as a CNS stimulant. Its actions are very similar to amphetamines.

Effects

Though cocaine is a recreational drug, many athletes believe that it is an ergogenic aid. The drug creates an intense euphoria that is thought to increase self-confidence and motivation. Like amphetamines, cocaine masks both fatigue and pain, increases alertness, and makes the athlete feel energetic.

f) Diuretics

Diuretics affect the kidneys, increasing urine formation. Used properly, they rid the body of excess fluid and are frequently prescribed to control hypertension and reduce edema.

Diuretics are generally used as ergogenic for weight control. Many athletes take diuretics in the hope that the excess fluids in the urine will dilute the concentration of banned drugs, thus decreasing their chances of being detected. Though diuretics lead to significant weight loss and are mainly used by wrestlers, gymnasts the resulting fluid loss proves to be detrimental for athletes who are moderately to highly dependent on endurance.

g. Marijuana

Marijuana is another recreational drug which like alcohol, can elicit both stimulant and depressant effects. Its actions are primarily on the CNS.

Effects

Many who use marijuana seek the sense of euphoria and relaxation it produces. Like alcohol, it is often a means of escape or a way to reduce tension. But marijuana impairs performance of skills requiring, hand-eye coordination, fast reaction time, motor coordination, tracking ability, and perceptual accuracy.

h. Nicotine

Nicotine is found in cigarettes, chewing tobacco, snuff and compressed tobacco.

Effects

Nicotine is a stimulant and some athletes believe it can make them more alert and better able to concentrate. Since it also has a soothing effect, many athletes also use it to soothe their jittery nerves.

Generally nicotine has been found to be detrimental to athletic performance. Lower levels of VO₂ max have been found in smokers when compared to non smokers. Similarly other changes include vasoconstriction, decreased peripheral circulation, increased secretion of antidiuretic hormone and catecholamines and increased blood lipid levels, plasma glucose, glucagon, insulin and Cortisol.

2. HORMONAL AGENTS

a. Anabolic Steroids

Anabolic steroids are identical to the male sex hormones. The anabolic properties of these steroid hormones accelerate growth by increasing the rate of bone maturation and increase the development of muscle mass.

Effects

Steroids in the presence of an adequate diet can increase total body mass and often increase fat-free mass. Furthermore, normal gains in muscle strength associated with high-intensity exercise and proper diet can be increased by anabolic steroid use in some individuals. Anabolic steroids have been proposed to increase muscle mass, strength and endurance capacity, and to facilitate recovery from exhaustive training.

Considerable risks are associated with the use of anabolic steroids, including personality changes, testicular atrophy reduced sperm count, breast enlargement in men and breast regression in women, prostate gland enlargement in men, masculinization in women, liver damage and cardiovascular damage.

b. Human Growth Hormone

Human growth hormone (hGH) is a hormone secreted by the anterior pituitary gland.

Effects

hGH stimulates synthesis of protein and nucleic acid in skeletal muscle, stimulates bone growth, increases lipolysis (thus decreasing body fat), increases blood glucose levels, and enhances healing of musculoskeletal injuries.

Risks associated with hGH include acromegaly, hypertrophy of internal organs, muscle joint weakness, diabetes, hypertension and heart disease.

3. PHYSIOLOGICAL AGENTS

The goal behind taking physiological agents is to improve the body's physiological response during exercise. The reasoning is that natural levels of a substance are beneficial to performance, higher levels should be even better.

a. Blood doping

Blood doping refers to any means by which a person's total volume of red blood cells is increased. This is often accomplished by transfusion of red blood cells, either previously donated by the individual or from someone else with the same blood type.

Effects

Oxygen is carried through the body bound to hemoglobin, which are found in the red blood cells. Blood doping increases the number of red blood cells, thereby increasing the number of oxygen carriers and thus increasing the oxygen carrying capacity. This results in more oxygen being delivered to the active tissues. This results in increase in VO₂ max and therefore an increase in your aerobic capacity and performance could be substantially increased.

But there are risks associated with blood doping. If the blood is overloaded, the blood can become too viscous, which could lead to clotting and heart failure. Several other diseases or reactions could be triggered when taking blood from another person, if the blood is mismatched or the donor has AIDS etc.

b. Erythropoietin

Erythropoietin is a naturally occurring hormone produced in the kidneys, which stimulates red blood cell production. This hormone can be produced through genetic engineering and so it is widely available.

Effects

The goal of human Erythropoietin administration is to increase the red blood cell volume, thus increasing the blood's oxygen carrying capacity.

Research in lab has proved that the following effects take place when subcutaneous injections of low doses of human Erythropoietin was done. After six weeks it was found that,

Both hemoglobin concentration and hematocrit increased by 10%

VO₂ max increased 6% to 8%

Time to exhaustion on the treadmill increased 13% to 17%

c. Oxygen supplementation

The purpose of oxygen supplementation obviously, is to increase the oxygen content of the blood. By increasing oxygen, athletes hope to fend off fatigue for longer periods.

Effects

Oxygen breathing before exercise has limited effect on performance. . No improvement occurs unless the exercise follows within seconds of breathing oxygen.

When administered during exercise, the total amount of work performed and the rate of work performed increases substantially. But it is too cumbersome to be practical.

d. Aspartic acid

Increased levels of blood ammonia as a result increased intensity and duration of exercise, leads to increased fatigue. To decrease the toxic effects of ammonia, the excess ammonia is converted by the liver into a less harmful substance - urea. Aspartic acid is an amino acid involved in this conversion process in the liver.

Effects

Though research on this topic is not conclusive, it is hypothesized that administering aspartates (aspartic acid salts) might facilitate the clearing of ammonia from the blood, thereby delaying fatigue.

e. Bicarbonate loading

Bicarbonates are an important part of buffering system necessary to maintain the acid-base balance of body fluids. The idea of Bicarbonate loading was born out of this idea, to investigate whether taking of bicarbonate ions would result in improved performance, in events where large quantities of lactic acid is formed, by improving the body's buffering capacity.

Effects

Oral intake of sodium bicarbonate elevates the plasma bicarbonate concentrations. Since this has little effect on intracellular concentrations of bicarbonate ions, it was thought that buffering capacity would be increased only in events lasting more than 2 minutes, since the hydrogen ions from lactic acid would diffuse out of the muscle fibers into the extra cellular fluid only after 2 min, where they could be buffered. In another research, it was showed that the effect of bicarbonate loading would only be felt in events lasting more than 1 min. and less than 7 min. and only if taken in appropriate dosage of 300mg/kg of body mass.

But bicarbonate loading can also cause severe gastrointestinal discomfort, including diarrhea, cramps and bloating when high doses are used.

f. Phosphate loading

Phosphate loading involves ingestion of sodium phosphate as a dietary supplement.

Effects

It has been proposed to have numerous potential benefits which include, increasing the level of extra cellular and intracellular phosphate level, which would increase the availability of phosphate for oxidative phosphorylation and phosphocreatine synthesis thus improving the body's energy producing capacity. It also facilitates the release of oxygen from the red blood cells. It is also proposed to improve

the cardiovascular response to exercise, improve the body's buffering capacity and consequently improve endurance capacity and performance. But more research is needed to confirm this.

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