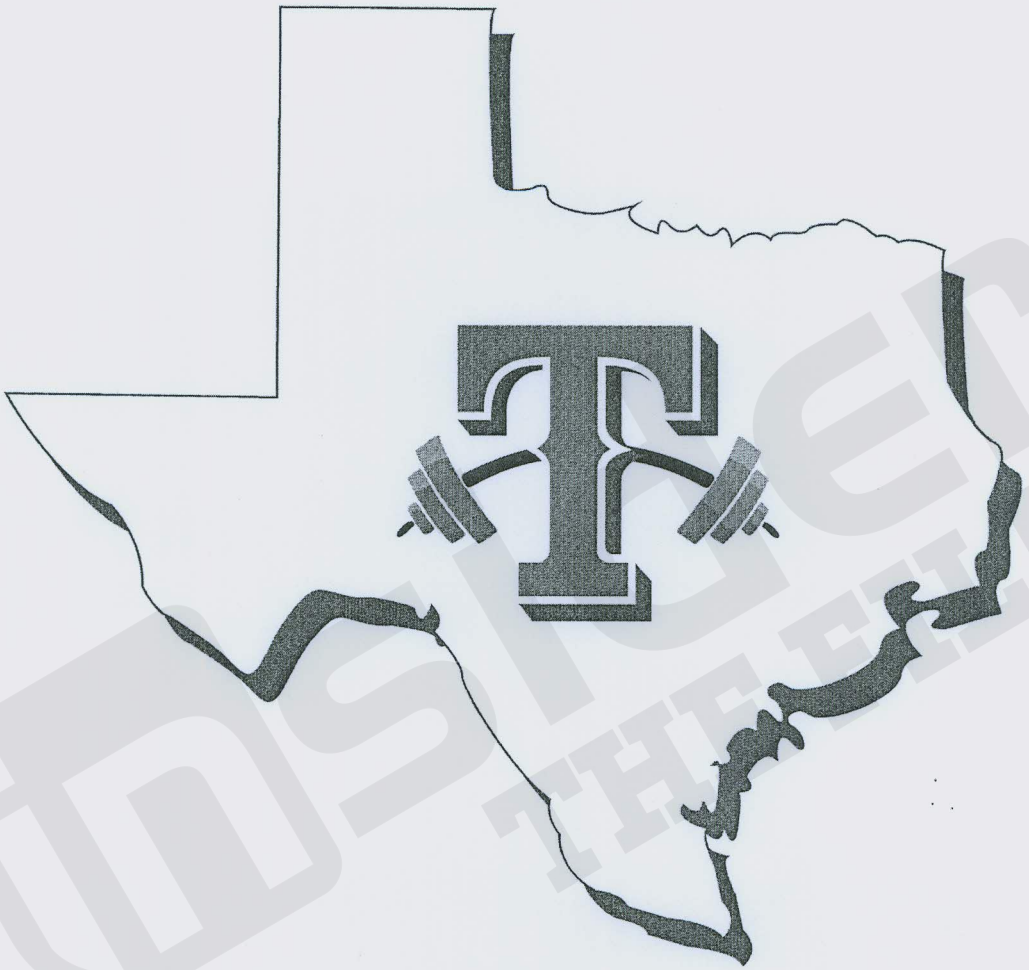

Texas Rangers

Harmful Substances

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HARMFUL SUBSTANCES

Elite athletes are always looking for ways to improve their physical performance and gain a competitive edge to enhance their success and careers. Often, there is a temptation to seek other ways of increasing your capabilities, including trying various ergogenic agents or chemical substances, either natural or man-made, that promise to give an edge. This section will be a review of these harmful chemicals that may give you a temporary edge, but minor improvements you might see in the short term can be harmful in the long-term. The goal of this section is to inform you of the detrimental effects and the legal consequences of using chemicals as performance enhancers. This section is not intended to support or promote the use of these chemicals for improving your performance.

Anabolic / Androgenic Steroids

Anabolic / Androgenic Steroids, hereafter to be referred as AAS, have been used by athletes to improve performance for more than 30 years. The non-medical use of AAS is widespread among athletes engaged in power sports such as Olympic sports, power-lifting, body building, football and now professional baseball. Their popularity stems from their perceived contribution to increase muscle bulk and strength to the United States alone. Approximately 2% of athletes between the age of 10 and 14, and 5% to 10% of high school athletes have used AAS, even though their use is prohibited. In addition, approximately 5% of college athletes currently use AAS. Because of legal and administrative issues it is difficult to estimate the number of Olympic and professional athletes currently using drugs. However, a number of Olympic Gold Medalists have had their medals withdrawn for using such substances. The use of AAS for improved competitiveness violates ethical principles and is strictly prohibited by the MLB, the United States Olympic Committee (USOC) the NCAA, and NFL, NBA.

How do Anabolic Steroids Work?

AAS are synthetic derivatives of hormones testosterone, which is responsible for development of male characteristics. The pituitary gland in the brain controls the production of testosterone in the male testes. Testosterone has both androgenic (masculinizing effects) and anabolic (tissue-building) properties. The main function of testosterone in an adult are to:

- Promote secondary male sex characteristics, such as hair patterns and deepening voice

- Increase muscle mass

Anabolic steroids were developed by structurally altering testosterone to reduce its breakdown, and to maximize its tissue-building (anabolic) effects. The more commonly used anabolic steroids are listed in Table 1-1. This class of steroids was first used therapeutically to treat certain disorders of the blood, bone mass deterioration, protein-wasting states, and as a replacement therapy for male children deficient in testosterone.

AAS should not be confused with cortcosteriods, which act as anti-inflammatory agents and are used to treat a variety of medical conditions.

Table 1-1

Commonly Used Anabolic / Androgenic Steroids

Generic Name	Street Name
Bolasterone	
Boldenone	Vebonol
Clostebol	Steranobol
Dehydrochlormethyltestosterone	Turnibol
Fluoxymesterone	Android F, Halotestin, Ora-Testry
Mesterolone	Androvine, Proviron
Metandienone	Primobolan, Primonabol-Depot
Methandrostenolone	Dianabol
Methyltestosterone	Android, Estratest, Methandren
Nandrolone	Durabolin, Deca-Durabolin
Norethandrolone	Nilevar
Oxandrolone	Anavar
Oxymesterone	Oranabol, Theranabol
Oxymetholone	Anadrol, Nilevar, Anapolon 50
Stonozolol	Winstrol, Stroms
Testosterone	Malogen, Malogex, Delatestryl
Human Growth Hormone	HGH

How Anabolic Steroids Alter Metabolism

In a progressive weight-training program, muscles are challenged to grow in size and strength in order to meet the increasing workload placed upon them. The structure of muscles consists chiefly of protein. Strength and size gains are achieved primarily by increasing the amount of protein inside the muscle. Protein requirements of the human body are determined by a complicated and difficult procedure called nitrogen balance. The body must ingest an adequate supply of protein in the diet to process, absorb, and retain nitrogen to support the weight training.

The stress of intensive strength training induces a catabolic state. In this state, muscle protein is broken down, but a state of anabolism or muscle protein formation follows. By unknown mechanism, AAS enhances the anabolic process. Anabolic steroids improve the body's nitrogen balance by reversing the catabolic state; thus muscle protein synthesis is supported within muscle cells and the cells of other tissues. In brief, the daily requirement for protein is 0.6 to 0.8 grams per pound of body weight. Protein intakes in excess of 0.8 grams per pound do not cause an increase in protein stores, but such intakes do increase the work of the kidney. The kidneys are responsible for excreting the waste products from digestion of excess protein.

Purported Beneficial Effects of Anabolic Steroids

There are several purported effects of AAS, which may be beneficial to athletes. The first is an increase in lean mass. In muscle cells this would result in an increase production of proteins responsible for muscle contraction, energy production and energy storage. The second is strength. AAS may regulate the movement of calcium

from within the cells, which could lead to an increase in the speed and force of contraction. Another potential benefit of AAS is an increase in aggression, which may allow the athlete to do more work. At times this may be desirable whereas in other situations it may actually compromise the individual training program.

Overall, the potential beneficial effects of anabolic steroids include:

Increase in muscle size

Increased muscle strength

Increased aggression

A perception of improved performance

Increased motivation

Decreased fatigue

Adverse Effects of Anabolic Steroids

The use of anabolic steroids is strongly associated with numerous undesirable effects, many of which may not be predictable on the basis of the dose or frequency with which they are used. These potentially dangerous substances are usually taken without supervision, although this is illegal and there have been many reports of serious illness or deaths resulting from their use. AAS may falsely increase the perception of strength and cause an individual to lift heavier weight than he should. This often results in torn muscles, and ruptured tendons, in particular tears of biceps and deltoids, because the strength of the muscles increases more rapidly than the strength of the tendon. The immune system may be impaired, but this abnormality may not be detected after its use. Importantly, transmission of hepatitis B and AIDS can occur from needle or drug sharing. Various cancers have also been associated with AAS use. Liver, cardiovascular, hormonal, and reproductive and nervous systems are most affected, but other systems may also be adversely affected.

The most frequently reported negative effects are listed in table 1-2. Many of these are reversible when steroids are discontinued, but some can be permanent or irreversible. If used in young athletes, these agents limit final height because of early termination of bone growth. Clearly, the health risk far outweighs any benefits anabolic steroids may confer. The most common problem includes liver dysfunction. This serious medical problem occurs frequently in users of oral AAS.

The cardiovascular effects of AAS in men and women include high blood pressure; increase in serum cholesterol concentration and serum LDL (the bad cholesterol), and a decrease in serum HDL (the good cholesterol). Heart attacks, strokes and blood clots in the lungs have also been reported in AAS users.

The hormonal effects of AAS use in males include decreased natural testosterone production, decreased sperm count, production of abnormal sperm and shrinkage of the testes. Breast tissue enlargement is also common, as are acne, glucose intolerance, and baldness. Women AAS users have slightly different hormonal responses, including thickening of the vocal cords with resulting deepening of voice, male pattern baldness, facial hair growth and enlargement of the clitoris, all of which are irreversible. Breast tissue shrinkage, menstrual irregularities, infertility, glucose intolerance and acne are also common in women who use AAS.

Perhaps the most significant short-term adverse effects are the psychological changes associated with AAS use. For men and women AAS users, increased aggression, rage reaction ("roid rage"), altered libido, anxiety and panic disorders, psychosis ("bodybuilder's psychosis") depression, mania and addiction have been noted.

Many of the side effects may cause permanent impairment, and some are potentially, if not outright, lethal.

Table 1-2

Adverse Effects of Anabolic Steroids in Men: Physiologic and Psychological

Physiological Effects

Irreversible

Breast enlargement	Atrophy of the tetesticles
Decreased sperm production	Accelerated baldness
Decreased testosterone levels	Elevation of cholesterol
Liver tumors	High blood pressure
Acne	Liver dysfunction

Psychological Effects

Irritability	Depression
Mood Swings	Addiction
Mania	Psychosis

Legalities of Steroid Use

There are also legal ramification associated with AAS use. Since early 1991, AAS and related compounds have been classified as drugs controlled by the Food and Drug Administration (FDA). These drugs have a high potential for physical and psychological dependence as well as their catabolic effects on various body systems. Transportation or distribution of these agents is punishable by fines of up to $ 500,000,00 and / or a prison sentence of up to 15 years.

Medical Used of Corticosteriods

As stated previously, AAS should not be confused with cortcosteriods. Cortcosteriods, or glucocorticoids, are a category of synthetic hormones used to restrain inflammation and control itching. They are commonly used topically for skin disorders, and given by injection into joints, which are inflamed. Cortcosteriods have been classified by the USOC as subject to restrictions; a physician must declare the intent to treat prior to a competition.

Other Harmful Chemicals

Growth Hormone

Human growth hormone (hGH) is a hormone produced in the brain. The hormone is commonly used to increase the height of very short children and until recently to increase strength in the elderly. Athletes have been known to use hGH at a black market cost of about $ 2,000 for an 8-week course. The known effects of hGH in the athlete are shown in table 1-3.

Table 1-3

Physiologic Effects of Growth Hormone

Increases muscle mass

Increases fat breakdown for energy

Conserves blood glucose and muscle glucose storage

Increases height in the skeletally, immature individual

Increases size of hands, feet and jaw

Enhances healing of musculoskeletal injuries

Unfortunately, the increase in muscle does not increase muscle strength as much as strength training. No increase in height has been seen in fully-grown person. However, HGH may increase hand, foot, and jaw, body size. There is little known about the adverse effects of HGH use in the normal athlete, but the skeletal muscle growth may be abnormal and therefore the muscle may be weak. Given that the USOC, NFL, IOC ban this drug, it should not be used for any performance enhancing.

Clenbuterol

Clenbuterol, a drug used by veterinarians to increase muscle mass in livestock, is being used by many athletes, primarily those in strength-related sports. However, increase in muscle strength have not been shown in humans. In addition, there are numerous adverse side effects, including rapid heart rate, muscle tremors, headaches, nausea, dizziness, fever and chills. Although technically classified as B2-agonist, it is officially considered an anabolic agent by the USOC, and thus on their list of prohibited substances.

Stimulants

Stimulants are agents, which increase arousal of the central nervous system (CNS). These agents are used medically in treatments of various conditions, including depression, narcolepsy (sudden and irresistible onset of sleep), and in the treatment of diseases of the bronchial tubes. Athletes often abuse a number of stimulants because they think their performance will improve. Most stimulants are banned by most governing bodies, the NFL, NBA, NCAA, IOC, USOC.

The major classes of CNS stimulants are:

Amphetamines

Ephedrine

Caffeine

This section will discuss only those agents, which are illegal and produce harmful effects:

Amphetamines

One class of stimulants is Amphetamines. The term amphetamines also include methyl amphetamine, dim ethyl-amphetamine, and benzyl amphetamine, which are metabolized to amphetamine after ingestion. In the 1960's, these drugs were widely used by athletes in the belief that they improved strength and endurance. Stimulants such as amphetamines and many over-the-counter amphetamine " look alike" have pronounced effects throughout the body. Taking these agents will result in the physiologic and psychological effects noted in table 1-3 and 1-4.

Table 1-4
Reported Physiologic Effects of Amphetamines

Increase heart rate

Increase cardiac output

Elevates blood pressure

Increase conversion of glycogen to glucose

Elevates serum glucose

Elevates serum free fatty acids

Dilates blood vessels in the skin

Increase muscle cell excitability

Amphetamines can mask symptoms of fatigue. They may restore reaction time in a weary athlete, but cannot improve reaction time or diligence in a well-rested and motivated athlete. The potential beneficial effect is most marked when performance is reduced by fatigue or lack of sleep.

Exercise itself induces these same effects, so amphetamines have not been shown to make a net contribution to the physiological mechanism, which support athletic performance. They clearly make no difference in maximal aerobic capacity, but there is some evidence for small increase in speed and the time it takes to fatigue in endurance events. It could be that the primary performance enhancement benefit rendered by amphetamines lies in their psychological effects as listed in table 1-4.

Table 1-5
Psychological Effects of Amphetamines

Delayed onset of the sensation of fatigue

Increase alertness

Mood elevation

Increased aggression

Improved self-confidence

Suppression of inhibitions

Perhaps more so than with many drugs, the use of amphetamines is associated with detrimental side effects that cannot only erode athletic performance, but can also harm health and threaten life. These are listed in table 1-5. Because of these side effects and the illegality of their use, these drugs must be avoided.

Table 1-6
Adverse Effects of Amphetamines

Nervous System Effects

Acute Effects

Irritability	Confusion	Insomnia
Paranoia	Restlessness	Delirium
Headache	Dry Mouth	Vomiting
Abdominal Pain	Uncontrolled Aggression	

Chronic Effects

- Uncontrolled Involuntary Movements
- High Blood Pressure
- Addiction
- Cerebral Hemorrage

Ephedrine and Pseudoephedrine

Ephedrine, and it's most notable derivative, Pseudoephedrine, are adrenaline-like CNS stimulants found in many over-the-counter cold and hay fever preparations as well as in many herbal products, in particular the herb known as Ma Huang. Like Clenbuterol, ephedrine is a B-agonist, and has properties similar to that of amphetamines. It is often combined with caffeine. At doses higher than found in over-the-counter medications, restlessness muscle tremors, anxiety, and headaches are frequently produced. Ephedrine is not widely used in sports to improve performance and there is no scientific evidence that it does. However, many people have used ephedrine and Ma Huang to lose weight through an increase in resting metabolic rate and metabolism of fat. Recently a number of people have died from drinking tea-containing ephedrine. Given that it is banned by the by a number of professional and international sports organizations, and also that there is a potential life -threatening agent. The use of this and any product containing ephedrine and / or Ma Huang should not be used.

DHEA

DHEA, or dehydroepiandrosterone, is a hormone released by your adrenal glands into your bloodstream each morning; from there it travels to other tissue and is converted into small amounts of testosterone (estrogen for women). It has been shown that levels of DHEA decline with age, and finding has created a sensation among the manufacturing world. Although DHEA has been available for decades, it has only been on the market since about 1994. It is now being touted as the miracle drug of the 21st century. There is no question that it is a miracle drug to companies producing and selling it, but the true benefits in humans has not been determined. The various claims being advertised for DHEA include:

Lengthening of Life

Prevention of cancer, heart disease and osteoporosis

Burning of fat stores

Stimulates libido

Boosts energy levels and mood

Enhances immune system

None of these claims have been demonstrated, and there are a number of reasons why it may be hazardous. As stated previously, DHEA is a hormone and it can be converted to testosterone. Increased testosterone levels could increase your risk of prostate cancer. The other potential dangers of DHEA will unfold as more research is conducted, and people who are taking it regularly are followed. To date it has not been banned by the USOC, but that may only be because it is so new on the market.

Summary

In conclusion, none of the chemical agents discussed above offer any guarantee that your performance will improve. However, there is a good chance you could compromise your health, professional career by using them. The benefits of these agents are limited and potential harmful effects are clear.

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