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What are anabolic steroids and who uses them?

Anabolic steroids typically include testosterone and testosterone-like products. They are either the same as, or derivatives of, testosterone that is produced naturally in the body. They are often used by men, aged late teens to mid-thirties, to improve strength, performance, and body image (bodybuilders).

How are anabolic steroids taken?

They can either be ingested as pills, injected into muscle as liquid, or applied to skin as a cream.

Are there any approved medical uses for anabolic steroids?

Some men experience low testosterone levels either early or late in life and may be prescribed testosterone by their doctors. There are also “off-label” or non-approved uses for conditions including osteoporosis and to help with weight gain in patients who have severe wasting diseases such as cancer or HIV.

Are anabolic steroids illegal?

Possession of anabolic steroids or other substances used to make anabolic steroids without a prescription is a federal crime.

What are the complications of using anabolic steroids?

Many parts of the body are affected by anabolic steroids. Effects on different organs and systems may include the following:

Brain

Stroke

Blood clots

Heart

Enlarged heart

Heart attack

Decrease in “good” cholesterol

Sudden death

Liver

Bleeding around or within the liver; may lead to rupture of the liver’s blood vessels and death

Reproductive

Testicle shrinkage, decreased sperm counts

Development of breast tissue in males (“gynecomastia”)

Women may have irregular periods, breast atrophy, and development of male characteristics (male pattern hair growth, voice changes)

Musculoskeletal

Tendon and ligament rupture

Skin

Acne

Scarring from injection

Skin stretching (“striae”)

Infection

Skin or blood infection from injecting

Sharing needles may lead to HIV or Hepatitis B and C

Cancer

Testicular and prostate cancer

Associated with kidney and liver cancers

Psychiatric

Agitation, aggressiveness (“roid rage”)

Depression, anxiety, difficulty concentrating, difficulty sleeping

If I stop taking anabolic steroids, are there any long-term effects?

Yes. The effects on the heart and liver can be permanent despite stopping use. Breast tissue development in men is permanent. People may have decreased libido, fatigue, and muscle pain after stopping anabolic steroids.

How long are anabolic steroids detectable in the urine?

This may depend on several factors and varies from person to person. Anabolic steroids taken as pills may be detectable for several months, while they may be detectable for days to weeks if injected into muscle.

The History of Doping

The term “doping” refers to the use of prohibited medications, drugs, or treatments by athletes with the intention of improving athletic performance. The practice of doping by athletes dates back centuries. However it has recently received increased attention due to a wide variety of potential performance enhancing drugs that are now available, and also due to prominent cases of doping by elite athletes that have been reported in the media.

The idea of performance enhancement through drug therapies and diet can be traced back centuries to the time of the invention of sports. Individuals chosen to be athletes were fed specific diets and certain herbs and plants thought to improve physical power and performance. In 1904, doping was first noted at the Olympic Games in a runner who was injected with strychnine to assist with speed, and purportedly giving him the strength to finish the race.

Regulations

Despite the visible improvement in performance noted in countless athletes throughout several centuries, it was also noted that the athletes would often suffer adverse health effects and even premature death that seemed to be associated with the doping practices. These adverse outcomes and deaths lead to the first ban on doping by the International Association of Athletics Federation in 1928. This ban proved to be inadequate however, as the ability to test for banned

substances was quite limited at that time. In 1967 the International Olympic Committee (IOC) banned doping, and in 1999 the IOC led the initiative to form the World Anti-Doping Agency (WADA). Today WADA forms the backbone of anti-doping laws and testing worldwide, and assists in setting the standard for other agencies and sports. WADA's main activities include education of the health risks of doping, scientific research of doping practices, development of anti-doping capabilities, and development of testing methods for doping detection.

According to the World Anti-Doping Code, which was established by WADA in 2008, a substance or treatment constitutes doping if it meets two of the three following criteria:

- It enhances performance
- It presents a risk to the athlete's health
- It is contrary to the spirit of the sport

This code consists of a yearly-published list of prohibited substances and treatment methods that athletes are not allowed to use. Various penalties can be enforced upon athletes found to be in violation of the Anti-Doping Code. Many athletes found in violation of the code have previously suffered punishments ranging from being stripped of Olympic medals or sports titles to lifetime bans from future competition in sport.

Methods and Goals of Doping

The goals of doping practices typically fall into four broad categories. These are substances that increase muscle mass, substances that decrease recovery time, substances that increase energy and/or endurance, and substances that mask the presence of other drugs. A few examples of substances and methods used in doping are noted below.

Anabolic Drugs (Anabolic Steroids)

Anabolic steroids have been prevalent in professional sports since they were first used in the 1950s in weight lifters. They have been used extensively in strength-based sports such as weight lifting, football, baseball and many other sports. Anabolic steroids are typically synthetic derivatives of testosterone. The goal of their use in doping is to increase muscle mass and lean body weight. These medications can be taken either orally or by injection, and many different forms are often taken simultaneously to maximize their desired effects. Users often take these drugs for their desired effects such as increased muscle strength and size, however many major and minor adverse health effects are related to their use. Relatively minor health effects such as skin infections, acne, irreversible gynecomastia (male development of breast tissue), and testicular shrinkage are well described with anabolic steroid use. Additionally severe and potentially life-threatening effects such as psychosis, bleeding around the liver, increased risk of heart attack, and sudden death has been associated with anabolic steroid use. Due to the many

adverse health effects associated with anabolic steroid use, they are listed as controlled substances in the United States, are permanently listed on the World Anti-Doping Code, and are routinely tested for in elite athletes.

Stimulants

Stimulant drugs are composed of a large and diverse group of drugs, which when used for doping purposes have the intent to increase an athlete's stamina, decrease their sensation of fatigue and pain, and improve their mental function and behavior. There are many well-known agents in this class including cocaine, amphetamines, and ephedrine. Amphetamines were initially desirable in athletes as they decreased the sensation of pain and fatigue.

Amphetamines have been documented to have been used in many sports such as cycling, soccer and track and field, and were first noted in the Olympics of 1936. However, despite their widespread use, amphetamines were quickly found to be associated with many undesirable and sometimes life-threatening effects. Amphetamines have been linked with increased risk of seizures, heart attacks and sudden death along with many other effects, and therefore have been banned for use both in sport and also are illegal for personal use as well. Stimulant drugs are the second largest class of banned drugs on the WADA Anti-Doping Code, and are also routinely tested for in elite athletes

Hormones

The endocrine system is the system in the human body that produces and regulates hormones. Hormones are responsible for almost every bodily function including muscle development and growth. Several hormones have been discovered which function to increase protein production and therefore are involved in increasing muscle mass. Hormones such as insulin and human growth hormone (hGH) have been used by athletes in an attempt to increase muscle mass and definition. While some of these therapies have been successful previously, they are also associated with severe health effects such as low blood sugar, fluid overload and limb swelling, overgrowth of bone and heart attacks. Due to these and many other dangerous health effects, these substances are also listed on the Anti-Doping Code.

Oxygen Transport (“Blood Doping”)

Lastly, athletes may try to improve their performance in sport by increasing the amount of oxygen in their bloodstream. As oxygen one of the basic nutrients for all cells, increased oxygen delivery to tissues can improve endurance and athletic performance. Athletes have attempted to achieve this goal in many ways. Some athletes will have their own blood drawn months in advance of a competition, only to be re-transfused into the same athlete just prior to the competition to increase their blood volume and the amount of oxygen in that blood during the

competition. Other athletes have used certain medications such as erythropoietin, that work to increase the body's production of red blood cells, which carry oxygen to the cells. Overall, increased red blood cell volume ensures increased oxygen delivery to cells, and likely improved endurance. However, the body is quite sensitive to such changes, and as the volume of blood increases, the blood thickens, increasing the risk of high blood pressure, strokes, heart attacks, and sudden death.

Summary

Hundreds of drugs and methods have been used in doping for the purpose of sports performance enhancement. While this practice has been around for centuries, it is still prevalent in sports competitions at all levels. While many methods are associated with increased performance, almost all methods are deleterious to the athlete's health in some manner. Regulations and testing by many agencies, including WADA and the IOC aim to decrease the incidence of doping and eliminate its use in sport. However, given the importance placed on athletic achievement, the fame awarded to elite athletes in today's culture, and the rapid development of new performance enhancing therapies, it is likely that doping will be a problem that will continue for many years to come.