



COMMONLY USED PERFORMANCE-ENHANCING SUBSTANCES IN SPORTS

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Abstract:

Background/Objective: The aim of this review is to raise awareness among people and athletes about misuse or misuse of information about the most commonly used performance enhancing substances. **Methods:** In this study, the related literature was studied by using the screening model. Data were obtained from various articles and internet websites. **Conclusion:** There are many methods in enhancing sportive performance whether it is amateur and professional sports anabolic agent is of these methods to win the competition. Most Athletes are not shy away of using those methods. Although the potential side effects of anabolic androgenic anabolic steroids are known, their unconscious use in different ways requires that this issue be considered as multidimensional. It is thought that societies will be more conscious with scientific studies about these powerful drugs by experts and sports performance coaches in this field. As a result, for any reason, human beings did not hesitate to use every method in order to look more aesthetically appealing and to strengthen physically and physiologically throughout history. The sport is done in order to remain healthy and the sport naturally comprises a sense of competition and the goal of winning. When it is done in the absence of those intentions. It is known that athletes start using unethical methods in enhancing their performance. It is important to explain to the people via scientific methods that they can reach their aims through natural methods and that most importantly is to stay healthy.

Keywords: anabolic steroid, sport performance, hormones

1. Introduction

It has been known that performance enhancing agents have been used for many years in sports. In many studies, it has been reported that these substances are easily used legally or illegally, and they are still widely used for doping or different purposes. It is

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known that hormones that have a strong anabolic effect such as Testosterone and Growth are used illegally by athletes, despite the risks of significant side effects by men, for aesthetic appearance. In fact, these substances are used in physiological doses prescribed by the physician for treatment without any clinical side effects. The increasing use of performance-enhancing substances in recent years necessitates the continuous sharing of the most current and accurate information on this subject with all people. The aim of this review is to raise awareness among people about misuse or misuse of information about the most commonly used performance enhancing substances.

2. Methods

In this study, the related literature was studied by using the screening model. Data were obtained from various articles and internet websites.

2.1 Insulin

In addition to being the primary stabilizer of carbohydrate digestion, insulin is also important for fat and protein metabolism in relation to carbohydrate metabolism, and insulin concentration changes in blood have widespread effects throughout the body. The efficacy of insulin regulatory function on carbohydrate metabolism can also vary from person to person.(1)

2.1.1 Effects of Insulin

- Increases storage of glucose and glycogen in liver.
- Increases protein synthesis and glycogen storage in striated muscles.
- Increase the potassium entry into the cell.
- Reduces glycogenolysis and fatty acid → ketoacid conversion in liver
- Reduces glycogen phosphorylation (ATP synthesis) in striped muscles.

2.1.2 Side Effects of Insulin

- The most common side effects are hypoglycemia.
- Hypoglycemia (blood sugar falls below 50 mg / dl) due to tachycardia, palpitation
- A heartbeat abnormality that causes one's heartbeat), sweating, increased appetite, nausea, confusion, behavioral disorder, seizures and coma.
- Beta blockers increase the risk of insulin hypoglycemia, reduces the need for insulin.
- They increase weight.
- They can cause allergic reactions.
- Hypoglycemia due to overdose of insulin may result from activation of anti-insulin hormones (smoggy phenomenon) (1)

2.2 Gonadotrophin

Gonadotropins are hormones secreted by the anterior lobe of the pituitary gland, regulating the function of ovaries in women and testes in men. Synthesis of sex hormones (estrogens, androgens, progesterone) is necessary for ovulation and spermatogenesis. (1)

2.2.1 Gonadotropin Preparations

- Menotropin: FSH and LH preparation obtained from urine of postmenopausal women. Human menopausal is known as gonadotropin. (used for infertility treatment)
- Urofollitropin: is a FSH preparation from the urine of postmenopausal women. (used for infertility treatment)
- Lutropin alpha: is the recombinant (artificial) form of human LH (sex hormone) hormone.

2.3 Erythropoietin (EPO)

Erythropoietin (or EPO) is a glycoprotein hormone that acts as a cytokine for erythrocytes. It is also called hematopoietin or hemopoietin. It is produced in the kidneys by fibroblast-like cells in the narrow interstitial space between the tubules in the renal cortex and is responsible for the control of erythrocyte production.

Erythropoietin is also used in mammalian cell culture by recombinant DNA technology for therapeutic purposes. It has a role in the treatment of anemia (anemia) due to renal failure or cancer chemotherapy. In addition, it is abused with the aim of doping in sports such as cycling, triathlon and marathon. (1)

3. Commonly Used Anabolic Steroids

3.1 Testosterone

Testosterone is a hormone associated with exercise because of its anabolic effects such as muscle growth and protein storage. (2)

It stimulates the growth of male sex organs and at the same time accelerates the development of male secondary sex characteristics. In women, free testosterone levels are 0.29-3.18 pg / ml in males and 8.69-54.69 pg / ml in males. Testosterone is an androgenic-anabolic steroid hormone. Men; The testicles and the adrenal gland are secreted from the crust, only in the adrenal gland. In men, 95% of testosterone is produced in the testes. Testicular hormones consist of cholesterol. Desmolase enzyme converts cholesterol to pregnenolone. Androstenedione then turns to testosterone (3,4,5).

Testosterone formation varies in certain periods of life. The first testosterone release passes through the maternal blood of the chorionic gonadotrophin released from the placenta during fetal life during pregnancy and stimulates the many Leydig cells in the testicles, creating and releasing testosterone. Testosterone is not usually produced during childhood (up to 10 to 13 years of age) (6).

During puberty, serum testosterone concentrations between 13 and 17 years of age increase significantly in men compared to women. Serum testosterone concentration is 500-700 ng / dL in males and 30-50 ng / dl in females. Due to the high concentration of testosterone during puberty, the characteristics that distinguish male from females develop much more during this period (7).

The injectable compounds have a wide range of half-lives. Among the testosterone esters, testosterone propionate remains in the circulation for approximately 1.5 days, whereas testosterone buciclate lasts for three months after a single injection (8).

3.1.1 Testosterone and Sports

Testosterone is excreted in the liver. Testosterone inactivation and excretion decrease as blood flow to the liver decreases during exercises and temporary increases in blood testosterone levels can be observed in the exercise (9).

The free testosterone concentration is reduced by 19-25% by endurance training. This decline is one of the reproductive system abnormalities caused by endurance exercises. Driving training does not change free testosterone levels. Short term intense weight training in women does not lead to a change in free testosterone levels (10).

Blood testosterone levels were found to be increased in acute exercise in both young and old. Increased catecholamines in the exercise affect the central nervous system and hypothalamus and indirectly cause testosterone release from the testes. (11)

3.2 Growth Hormone (GH)

The use of human growth hormone as a performance enhancer has become a prominent issue in recent years. hGH is released from somatotrophic cells of the anterior pituitary gland and stimulates growth with insulin-like growth factor-1 (IGF-1) activity. These hormones increase the lipolysis and increase the fat percentage of the lean body while decreasing the fat mass as a result of the protein-anabolic effect. But there is no significant effect on total body weight. In a few studies about the effects of GH on sportive performance, it is assumed that it has effects on increasing muscle mass and exercise capacity (12).

Although there is no scientific evidence supporting the use of hGH in athletes, studies are ongoing. Most of the expected benefit is theoretically based on the known physiological pathways. Long-term use of hGH activates the renin-angiotensin system, resulting in fluid accumulation and may cause side effects such as arthralgia, carpal tunnel syndrome and pseudotumor cerebri. Cardiovascular disease, hyperlipidemia, cancer and insulin resistance are other reported side effects (13,14).

It was found that there are basically two separate forms of blood in the GH. One of these forms is the pituitary GH, the other is the placental GH, which is only found in pregnant women (15).

3.2.1 Growth Hormone (Gh) And Sports

The effect of GH on osteoblastic activity is explained by two separate mechanisms. The first of these is that the growth hormone allows the long bones to extend through the pineal cartilage. In this process, new cartilage tissue is stored first, and then this cartilage tissue is ossified (16).

Although the mechanism to increase GH secretion of exercise is not known exactly, it can be said that exercise intensity can be an important determinant and that the variables such as increased plasma lactic acid and blood glucose levels affect GH secretion. The effect of this hormone on all tissues with growth characteristics, especially musculoskeletal system, is now known (17,18).

Exercise shows an increase in GH in parallel with the increase in the intensity of exercise. This increase in growth hormone is higher in endurance exercises and it is attributed to the effect of growth hormone on the use of free fatty acids as an energy source. Hence, growth hormone is a hormone that affects performance (19), especially in exercises with long duration submaximal severity (endurance type).

Table 1: Examples of commonly used oral anabolic steroids

Generic name or category	Examples of trade names
Methandrostenolone	Dianabol
Oxandrolone	Anavar
Stanozolol	Winstrol
Oxymetholone	Anadrol
Fluoxymesterone	Halotestin
Methyltestosterone	Oreton-M
Mesterolone	Proviron

Table 2: Examples of commonly used injectable anabolic steroids

Generic name or category	Examples of trade names
Testosterone esters	Delatestryl, Sustanon
Nandrolone esters	Deca-Durabolin
Stanozolol	Strombaject
Methenolone enanthate	Primobolan Depot
Boldenone undecylenate	Parenabol
Trenbolone acetate	Parabolan

Table 3: Adverse Effects Associated With Anabolic Steroid Use

Affected system	Adverse effects
Cardiovascular	Lipid profile changes
	Elevated blood pressure
	Decreased myocardial function
Endocrine	Gynecomastia
	Decreased sperm count
	Testicular atrophy
	Impotence and transient infertility
Genitourinary	Males
	Decreased sperm count
	Decreased testicular size

	Females
	Menstrual irregularities
	Clitoromegaly
	Masculinization
	Males and females
	Gynecomastia
	Libido changes
Dermatological	Acne
	Male pattern baldness
Hepatic	Increased risk of liver tumors and liver damage
Musculoskeletal	Premature epiphyseal plate closure
	Increased risk of tendon tears
	Intramuscular abscess
Psychological	Mania
	Depression
	Aggression
	Mood swings

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