

Drugs and the Athlete: What is the price for winning at any cost?

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Man has always sought to go faster, higher, quicker and has embarked on all kinds of means in order to achieve these aims. The first use of performance enhancing compounds can be traced back to the ancient Olympic Games, but the first list of banned ergogenic aids was only issued in 1967. Yet athletes are still being found positive. They should be educated that these drugs are not only on the list because they are illegal means of achieving results, but all of them have side effects which can lead to severe short-term and long-term health problems for athletes. Drug doping in Maltese sports could become a major ethical, educational, financial, and health management problem. Community pharmacists have an important role to play in advising athletes, sportsmen and women about which drugs or OTCs can or cannot be taken during sports events.

Introduction

Man has always sought to go faster, higher, quicker and has embarked on all kinds of means in order to achieve these aims.¹ The first use of performance enhancing compounds can be traced back to the 300 BC, at the ancient Olympic Games, when mushroom and plant extracts were used. The first reported death associated with drug use by a sportsman is in 1866, when European cyclists took *'caffeine based sugar cubes dipped in nitroglycerin and vin mariani, a mixture of ground coca leaves and wine'*. The issue of drugs in sport was brought to public awareness after several events, including amphetamine use by US troops in World War II, widespread allegations of drug abuse at the 1964 Tokyo Olympics and the televised death of Tom Simpson in the 1967 Tour de France.¹

In 1967, the International Olympic Committee (IOC) Medical Commission was formed, which published a banned list of performance enhancing drugs. As testing technology developed more drugs were added to the list of banned substances.² Yet still today, at each major event, athletes are still being tested positive and some athletes have even withdrawn from competition rather than risk being tested.³ In the 1983 Pan American games, 19 athletes tested positive for anabolic steroids, while Ben Johnson made headline news following his disqualification in 1988 Olympics in Seoul for taking stanazolol⁴.

Yet steroids are not the only culprits and several OTC preparations may also be guilty parties.⁵ In the 2000 Summer Olympics, a Romanian female gymnast was stripped of her gold medal when tested positive for pseudoephedrine, from a Nurofen Cold and Flu[®] preparation, a medication prescribed by a physician for a common cold.¹ Even locally in this season, at least two

footballers playing with the Maltese football league, were found positive after taking anti-cold medication intended for their children, which they had no idea was prohibited.

Community pharmacists have an important role to play in advising athletes, sportsmen and women about which drugs or OTCs can or cannot be taken in sports events. It has become even more important with the publication of the recent Sports Law, which will open the way for a Legal Notice on drug doping in sports, making positive results a criminal offence.

What is drug doping in sports?

Doping is defined as *'the use of an artifice, whether substance or method, potentially dangerous to athletes' health and/or capable of enhancing their performances, the presence in the athlete's body of a substance, the ascertainment of the use of a method, as per the list annexed to World Anti-Doping Code.'*²

The List includes a whole range of drugs including:

- Therapeutic drugs used to treat legitimate illness or injury (prescribed or OTC)
- Social drugs of abuse
- Ergogenic drugs (licit and illicit)
- Drugs used to mask the presence of other drugs in urine

In fact, virtually all drugs in the banned list have legitimate therapeutic indications (table 1).

Prohibited doping methods include blood doping and pharmacological, chemical, and physical manipulation. These methods attempt to mask the use of the prohibited substances listed above. Blood doping is the administration of blood, red blood cells, artificial oxygen carriers (substances that substitute blood), and/or related red blood products to an athlete for athletic performance enhancement.²

There may also be pharmacological, chemical and physical manipulations,

and attempts to alter the integrity and validity of samples used in drug testing. Examples of such methods include the use of diuretics, catheterisation, inhibition of renal excretion, sample substitution, and sample tampering.³

What are the main effects of drugs on athlete?

Athletes should be educated that these drugs are not only on the list because they are illegal means of achieving results, but all of them have side effects which can lead to severe short-term and long-term health problems for athletes.⁵

One common health problem has been defined as the *female triad*. This is the result of extended eating disorders combined with intensive training, consisting of disordered eating, amenorrhoea (cessation of menses for at least 3 to 6 months) and premature osteoporosis.⁶

Anabolic Steroids

Non-medical use of anabolic steroids is illegal and banned by most, if not all, major sports organisations. Still, some athletes persist in taking them, believing that these substances provide a competitive advantage. But beyond the issues of popularity or legality is the fact that anabolic steroids can cause serious physical and psychological side effects.⁴

Anabolic steroids - or more precisely, anabolic-androgenic steroids - are the synthetic derivatives of the naturally occurring male anabolic hormone testosterone. Both anabolic and androgenic have origins from the Greek anabolic, meaning "to build," and androgenic, meaning "masculinizing." Testosterone's natural androgenic effects trigger the maturing of the male reproductive system in puberty, including the growth of body hair and the deepening of the voice. The hormone's anabolic effect helps the

Table 1: Partial list of banned drugs according to WADA²

STIMULANTS amphetamines and derivatives cocaine ephedrine caffeine phenylephrine beta 2 agonists e.g. clenbuterol	PEPTIDE HORMONES AND ANALOGUES HCG corticotrophin growth hormone erythropoetin
DIURETICS spironolactone bumetanide frusemide amiloride	ANABOLIC STERIODS danazol methyltestosterone stanazolol oxymetholone nandrolone
NARCOTIC ANALGESICS dextropropoxyphene methadone morphine pethidine	BETA BLOCKERS atenolol labetolol nadolol propranolol
	Misc & MASKING AGENTS epitestosterone (if urine conc of test:epitest > 6) probenecid

body retain dietary protein, which aids in the development of muscles.⁸

Steroids can be taken orally or they can be injected. Those that are injected are broken down into additional categories, those that are very long-lasting and those that last a shorter time. In recent years, use has shifted to the latter category - shorter-lasting, water soluble injections. These have a shorter half life, are excreted more quickly but these C-17-alkylated derivatives are more hepatotoxic. Most healthy males produce less than 10 milligrams of testosterone a day.⁴ Females also produce testosterone but in minute amounts. Some athletes however, may use up to hundreds of milligrams a day, far exceeding the normally prescribed daily dose for legitimate medical purposes. Anabolic steroids do not improve agility, skill or cardiovascular capacity.⁸

Although anabolic steroids are derived from a male sex hormone, men who take them may actually experience a "feminisation" effect along with a decrease in normal male sexual function. Some possible effects include, reduced sperm count, impotence, development of breasts, shrinking of the testicles, and difficulty or pain while urinating.

On the other hand, women often experience a "masculinisation" effect from anabolic steroids, including facial hair growth, deepened voice, breast reduction and menstrual cycle changes.⁶ Abuse of such steroids turned East German female swimmers into "lumbering beauties" in 1970s/1980s.⁴

Steroids have very severe side effects such as aggressive behaviour and rage, headache, acne, altered libido, euphoria and appetite, liver complications, hepatitis, hepatic tumours, non specific elevations in Liver Function Tests (LFT), irreversible virilization, hirsutism, baldness, coarse voice, gonadotrophin suppression,

glucose intolerance and altered thyroid and Low Density Lipoprotein (LDL), reports of Myocardial Infarction (MI), left ventricular hypertrophy, hypertension, teratogenic, uterine and breast atrophy.⁴

Recent evidence suggests that long-time steroid users and steroid abusers may experience the classic characteristics of addiction including cravings, difficulty in stopping steroid use and withdrawal symptoms. Adolescents may also experience premature closure of the growth centers of long bones, which may result in stunted growth.⁷

Beta-blockers

Beta-blockers that lower blood pressure are also on the banned list as they assist in keeping the hands of the athlete steadier when used in archery and pistol shooting. The side effects include bradycardia, heart failure peripheral vasoconstriction, bronchoconstriction (care in asthmatics), depression, lethargy and nightmares.⁹

Diuretics

Diuretics have important therapeutic indications for the elimination of excess fluid from body tissue in certain pathological conditions, which requires strict medical supervision. Diuretics are abused by athletes to reduce weight quickly in sports where weight categories are involved and to reduce the concentration of prohibited substances by diluting urine.³ Reducing weight in a short period of time has the potential for serious health side effects. Also, using diuretics to deliberately cheat drug tests is ethically unacceptable. They cause dehydration and muscle cramps, dizziness, high potassium and calcium levels, low blood sugar levels, headache and nausea, vomiting and drowsiness.⁸

Anti-Asthma preparations

Highly trained athletes are repeatedly exposed to cold air and to many pollen allergens in spring, while competitive swimmers are exposed to chlorine derivatives from swimming pool disinfectants which may lead them to greater susceptibility to asthma. In the last Olympic Games, about 10% of athletes showed evidence of asthma or used antiasthmatic medication.⁹ Antiasthmatic preparations e.g. salbutamol and terbutaline by aerosol or inhalent route are now permitted if the prescribing physician sends recent evidence of bronchial challenge tests just prior to the holding of the event to IOC. This new regulation is causing a great deal of controversy since many are claiming that such tests could be detrimental to their well being and physical fitness.⁶

Clenbuterol (Clenasma®), a beta-2-agonist used for chronic obstructive airways disease is on the banned list as it has a unique anabolic effect. In fact, it is used as a veterinary agent to increase lean weight in livestock and poultry.⁹

Stimulants

Stimulants such as amphetamine, caffeine, cocaine, and ephedrine, increase alertness and reduce fatigue. Stimulants alter cardiovascular cooling that may predispose athletes to heat exhaustion. They also may increase competitiveness, hostility, and the chance of injury from accidents caused by the user's poor judgment. Addiction is also possible with the use of stimulants. Caffeine, which is found in many energy drinks, sport gels, alcoholic beverages and diet aids, is considered illegal when present in urine at a concentration of greater than 12mg/L which is the equivalent of drinking around eight cups of coffee in a three hour period.³ It does not improve maximal oxygen capacity

directly, but could permit the athlete to train at a greater power output and/or to train longer. It causes jitters, insomnia, and inability of focus.¹⁰

Blood doping

Blood doping is the administration of blood to raise the blood's oxygen carrying capacity, thus enhancing aerobic athletic performance. Athletes may use their own blood or someone else's blood. Erythropoietin increases oxygen absorption, reduces fatigue, and improves endurance by increasing the rate of red cell production. It can lead to increased thickening (blood viscosity) of the blood which may cause high blood pressure, stroke and heart failure.⁶

Hormones

Hormones, including human chorionic gonadotrophin (hCG) and corticotrophin, (ACTH, tetracosactide), are used in sports for a variety of effects. HCG and other related compounds lead to increased rate of production of endogenous androgenic steroids. Corticotrophin has been used to increase the blood levels of endogenous corticosteroids to obtain the euphoric effect of this hormone. The use of growth hormones can cause many serious side effects, including diabetes and Creutzfeldt-Jacob disease.²

Narcotic analgesics

Narcotic analgesics mainly function as painkillers but also may produce euphoria or psychological stimulation, false feelings of invincibility, and illusions of physical prowess. These drugs also increase the pain threshold, which can cause greater injury because an athlete may not be aware of the original injury. Use of narcotics can also lead to physical dependence.³

Food and other supplements

Vitamins and mineral supplements

Vitamins and mineral supplements provide no ergogenic benefits and athletes who have a well-balanced diet will not need additional vitamins.¹ Excess vitamin C may lead to the formation of kidney stones and vitamin B6 can induce liver and nerve damage. No physiological benefits have been proven with Pangamic acid or "vitamin B15". Low iron stores may be observed in female athletes and long distance "endurance" athletes.

Chromium has a role in insulin production and protein synthesis and strenuous exercise may lead to a deficiency. Coenzyme-Q is a vital component in energy production; aerobic power and exercise performance was improved after ingestion.⁸

Increased protein intake

Increasing protein intake is unlikely to result in additional increases in muscle tissue synthesis because there is a limit to the rate at which protein tissue can be accrued. Branched-chain amino acids may enhance endurance performance by delaying the onset of central nervous system fatigue. Glutamine is a non-essential amino acid which helps augment protein synthesis and prevents breakdown.¹

Creatine

Creatine, which is found naturally in meat and fish, is the latest ergogenic aid. It causes an increase in body mass and is useful in team sports. It is not illegal but more research is needed to look at its long-term effects such as muscle cramping, nausea and seizures, serious kidney problems.⁸

Conclusion

Sports in Malta has recently been given a new dimension with physical

education now being an official SEC subject and a new Minister for Sports. As athletic competition continues to intensify, even local athletes will strive for higher levels of performance to achieve success. Drug doping in Maltese sports could become a major ethical, educational, financial, and health management problem. This brief review of the major banned groups of drugs illustrates that while there may be some benefits to taking drugs for sport, they are often outweighed by the risks which can be permanent and fatal.⁵ The pressures to win may, at times, be large enough to drive athletes to drugs, but is it worth it considering the humiliation they face if they are found out? The Maltese athletes, coaches, trainers and managers too should be educated and community pharmacists certainly have an important role to play in this respect.

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