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PERFORMANCE-ENHANCING DRUGS (PEDS): MENACE IN MEGA SPORTS EVENTS

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Abstract:

Wide variety of drugs, related substances and biological agents are routinely misused in sports mega events. These agent consumption during sports temporarily enhance performance but some produces acute and longlasting complications. Misused drugs in sports belongs to different classes which enlisted and discussed in detail. Performance enhancing dug is one of the classes discussed here with specific doping incidences detected in mega world sports events of variety of sports. Significant doping cases involving major prohibited drugs happen latest are compiled here. More emphasis given to drugs action on body and concerned sport where its use more common.

Key words: Doping, PEDs, Steroids, Stimulants, Erythropoietin

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INTRODUCTION:

Mega sports events like of Olympic, World cups, League tournaments and more are at center stage of world events, much of money, fame and self- esteem of players and countries also involved in conduction of these. Many events are marred by Doping and drug abuse related incidents by Athletes. Athletes of all ages feel the drive to succeed with pressure from both internal and external sources. All type of athletic competition- especially in professional sports require mental and physical toughness beyond that of average person. As a result of pressure and to maintain and improve sports performance, one of the most common forms of drug use in sport is performance- enhancing drugs (PEDs). The common categories of PEDs includes

1. Anabolic-androgenic steroids
2. Hormone and metabolic modulators
3. Peptide substances, Growth Hormones, growth factors and related substances.
4. Corticosteroids.
5. Beta –2 agonists
6. Beta-Blockers
7. Diuretics.
8. Psychomotor Stimulants
9. Cannabinoids

Anabolic steroids:

These are synthetic substances that resemble male sex hormones (e.g.,Testosterone), promote the growth of skeletal muscle and caused increased production of red blood cells and the development of male characteristics in both males and females. They can be injected, taken orally, or applied externally as a gel or cream. [1,3] Examples include Oxymetholone, oxandrolone, methandrostenolone, trebolone, dehydrochloromethyltestosterone, boldenone, boldione, stanozolol, methandienone, methasterone, norandrosterone, drostanolone, oxymesterone, closbetol, budesonide, methyltestosterone, ligandrol. Major metabolites found in urine after metabolism of testosterone amd its analogues are Etiocholanolone, androsterone. Many anabolic steroids such as boldenone and its synthetic intermediate boldione are used as veterinary medicine to increase muscle growth in livestokes but still primely abused by certain athletes. Despite their reported toxicological effects on the cardiovascular, hepatic and neuro-endocrine systemthese agents extensively abused in sports activities.

Nandrolone is most commonly abused agent since it is not metabolized to dihydrotestosterone and have milder unwanted side effects than testosterone. World Anti-doping agency revealed that metabolite 19-norandrosterone, a nandrolone derivative, was one of the most common anabolic steroid found in athletes. Abused dose is normally 10-100 times the therapeutic dose. Anabolic agent ligandrol was latest abused drug from this category.

Clenbuterol is popular drug among some athletes due to anabolic effect together with the fat reducing effect of this drug. In many countries this drug is for animal use.

Hormone and metabolic modulators.[2,3]

These are substances which influence the hormones and modify their effects or accelerate or slow down specific enzyme reaction, which act on the body's metabolism. for example, Anti-oestrogen can block the conversion of the male sex hormone testosterone into the female sex hormone oestrogen. These are prohibited as doping agents since 2001for men and since 2005 for women.

Clomiphene is a selective estrogen receptor modulator (SERM) commonly used in female fertility brand and sometimes used to treat male infertility. In men drug can alter testosterone levels by interfering with the negative feedback. Men who use anabolic steroids, are highly likely to use clomiphene or tamoxifen as an accompanying drug.

Tamoxifene, toremifene and fulvestrant are breast cancer medication taken along with steroids to counteract the adverse side effects of steroid. many athelets who comes positive test for anabolic stroids also tests positive for tamoxifene. At higher doses testosterone converted to estrogen and develops condition called gynaecomastia, which cause them to grow breasts. These drugs prevent this conversion of testosterone in body.

Aromatase Inhibitors

Anastrozole, letrozole, exemestane are also used by athletes to suppress development of feminine symptoms on after administering high doses of testosterone.

Peptide substances, Growth Hormones, growth factors and related substances.[3]

Erythropoietin (EPO) is naturally occurring substance that stimulates red blood cell production. Human EPO has become readily available as a synthetic drug and other similar drugs, such as darbepoetin Alfa. Both rhEPO and darbepoetin influence the oxygen carrying capacity of the blood by increasing the number of cells to unnatural level. Darbepoetin is substance analogue and mimetic of r-EPO. Doping in sports is discouraged by the screening of athletes for

rhEPO in urine. Test distinguishes between endogenous and recombinant human epo.

Methoxy polyethylene glycol-epoetin beta is long-acting erythropoietin receptor activator. It stimulates the red blood cell production by interacting with EPO receptor sites in the bone marrow.

Hematide is an investigational synthetic peptide, substituted with polyethylene glycol.it is novel erythropoietic agent and still prone to misuse.

Human Chronic Gonadotropine (hCG) or Luteinizing hormone stimulates the production of testosterone in males and hence used by athletes to enhance muscle strength.HCG is only prohibited in males.

Corticosteroids

Corticosteroids are not androgenic anabolic steroids still contain steroidal moiety in their structure and used for different purpose as anti-inflammatory medications. These are prednisolone, prednisone, dexamethasone, betamethasone. Some used systemically and other used topically and increase endurance towards pain.

Beta–2 agonists

Beta agonists works by opening up the airways to the lungs by decreasing broncho constrictions. Agents such as fenoterol, eformoterol, salbutamol, clenbutrol, terbutaline[4], ephedrine are reported in doping incidents. Salbutamol and terbutaline are short acting beta -2 agonists while salmeterol and formoterol are long acting beta -2 agonists. Research emphasized that these drugs don't just keep lung tubes dilated but also increase muscle strength and power. [4]There are credible evidences that oral terbutaline is ergogenic as well as improve endurance one's ability to work their muscles in the absence of oxygen.

Beta blockers

These agents block norepinephrine and epinephrine from binding to beta receptors on nerves. By doing so they reduce heart rate, reduce blood pressure by dilating blood vessels and constricts air passages by stimulating the muscles that surrounds the air passage to contract. Overall they help fight anxiety and serve as muscle relaxant. They also reduce tremors. They are substance prohibited in particular sports. They are banned in sports such as archery and shooting in competition and out of competition. Some common examples are acebutolol, metoprolol, esmolol, atenolol, carvedilol, timolol.

Diuretics and other masking agents

These agents are products that have the potential to impare the excretion of prohibited substances, to conceal their presence in urine or other samples used in doping control. Agents used in these are acetazolamide, finasteride, furosemide, hydrochlorothiazides, spironolactone, thiazides, canrinone.

Diuretics used to flush out previously prohibited substances with force diuresis and in sports where weight classes are involves to achieve acute weight loss.

Finasteride is a substance which prevents conversion of testosterone to dihydrotestosterone in the body, contained in particular in a number of hair loss treatments, it was banned following compelling research showing that they could mask steroids in doping control process.

Furosemide[7] used as masking agent for many steroidal drugs and is frequently misused this purpose.

Psychomotor Stimulants.

Stimulants directly affects the central nervous system, they work to speed up speed up Parts of brain and body, increasing the heart rate, blood pressure, metabolism and body temperature of user. They are used by athletes to reduce tiredness and fatigue, and to increase alertness, competitivness and aggresivness. The most common stimulants detected in antidoping tests include amphetamines, cocaine, MDMA (ecstasy), pethidine, 5-methylhexan-2-amine methylphenidate and Methylhexamine.

Cacaine doping also happens where metabolites of cocaine such as Benzoylecgonine and ecgonine methyl ester found in sample. Ephedrine, oxilofrine higenamine also used as stimulant. Hegenamine is constituents of some pre-workout, energy and weight loss product.

Trimetazodine a stimulant commonly used in sports doping as it relieved exercise induced angina.

Cannabinoides.

World Anti-Doping Agency (WADA) included cannabis in its prohibited list in 2004, claiming that it may improve performance in some sports and is an illegal drug in most countries. Cannabies smoking can be helpful for some activities such as extreme sports, as it improves muscle relaxation, reduces anxiety and extinct fear memories leading to enhanced performance. It also improves sleep time and recovery. Over 60 cannabinoids are present in

cannabis, with delta 9-tetrahydrocannabinol (THC)the main psychoactive constituent and responsible for the observed toxic effects after smoking. Drug can be detected in blood and urine for at least 4 weeks in some cases. Cannabinol is other constituent that having 10% psychoactive activity as THC.

Other substances

Few incidences of use of meldonium a metabolic modulator among athletes increasing mainly for arresting oxidation of body fats to increase recovery rate or exercise performance. Trebolone acetate increase red blood cell count and blood oxygenation enhanced. This allows muscular endurance and fast recovery. Many time it is used as veterinary medicine in livestocks.

CONCLUSION:

Performance enhancing drugs are more and more prone to doping and misuses because benefits associated with their administration. Many new analouges,congeners and derivativesare administered frequently though athletes counceiling and stringent punishments such such as suspension and lifelong ban from sports are handed. Many analouges of Sex hormones, corticosteroids and veterinary steroidal drugs are frequently results positive in doping tests. Blood component altering methods are still occurs in endurance sports. Psychomotar stimulants also quite common during certain sports. Beta agonists and beta blockers also used in doping. Cannabinoids and opioids seldomly used**.** Many sports such as athletics, cycling, wrestling, bodybuilding, football, cricket, pistol/rifle Shooting shows high incidences of drugs doping.

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