World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 6.129

DOPE: DEVASTATION OF POTENTIATION EFFICACY OF HOMEOSTASIS

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Article Received on 04/08/2021 **Article Revised on 25/08/2021** **Article Accepted on 15/09/2021**

ABSTRACT

DOPE: Drugs Oppress People Every-day is performance enhancing substances, also known as performance enhancing drugs (PED), are substances that are used to improve any form of activity performance in humans. All doping drugs are four quadrant molecules having four rings structure moieties. This is called as cyclopentanoperhydrophenanthrene ring which has four rings fused in nature [A, B, C, D] rings; which is steroid. All are anabolic in nature. A well-known example involves doping in sport, where banned physical performance enhancing drugs are used by athletes and bodybuilders. Athletic performance enhancing substances are sometimes referred to as **Dope Drugs.**

KEYWORDS: Steroids, Anabolic agents, Dope, PED, WADA.

INTRODUCTION

The father of anabolic steroids in the United States was John Ziegler (1917–1983), a physician for the U.S. weightlifting team in the mid-20th century.

Figure 1: Father of doping John Ziegler.

Anabolic Androgenic Steroids (AAS): These are the substances that have both anabolic and androgenic properties. 'Anabolic' means 'tissue building' and 'androgenic' means 'masculinizing'. The anabolic properties may affect accelerated growth of muscles and bones while the androgenic properties may affect development of male reproductive system and secondary male sexual characteristics such as hairiness and deep voice. The anabolic androgenic steroids can be derived both endogenously (natural) as well as exogenously (synthetic).[1]

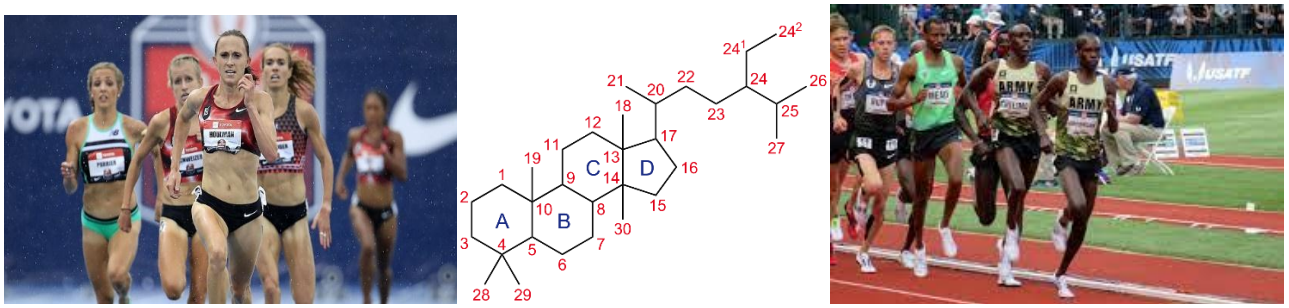


Figure 2: Doping in race.

After administration of anabolic androgenic steroids, the formation of protein is promoted in genital organ, skin, skeleton and muscles. Athletes may be tempted to use anabolic androgenic steroids to improve their physical and physiological capacity to train and compete at highest level by reducing associated fatigues and recovery duration. In an impression to increase muscular power and strength these substances are sometimes taken by athletes involved in weightlifting, throwing and other sports involving strength parameters.[2]

Side Effects of Anabolic Androgenic Steroids

The side effects associated with anabolic androgenic steroids are extremely serious and are divided into general, male specific and female specific.

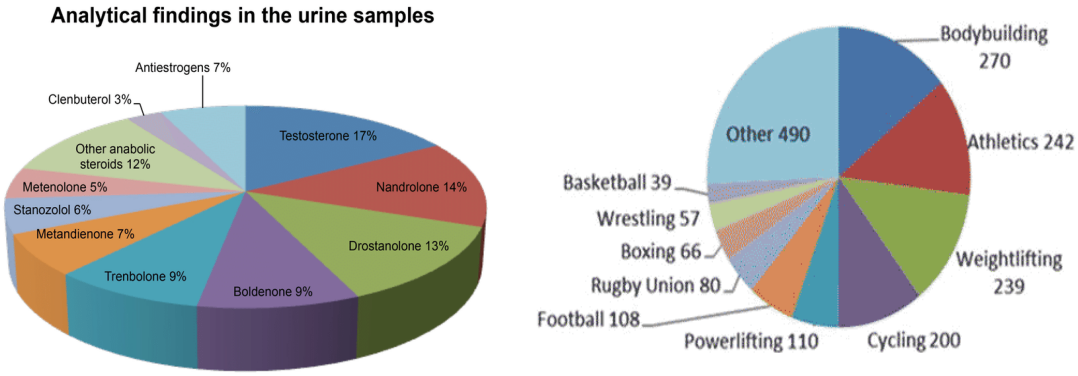


Figure 3: Dope test.

General Side Effects

- Greasy skin and acne
- Infertility
- Hypertension
- Liver and kidney dysfunction
- Aggressive behaviour
- Tumour

Male specific Effects

- Breast development [gynecomastia]
- Testicular atrophy
- Diminished male hormone production
- Diminished sperm production
- Impotence
- Alopecia
- Prostate cancer

Female specific Effects

- Male pattern hair growth and baldness
- Menstruation disturbances
- Decreased size of breast
- Deeper voice (hoarseness)

Figure 4: WADA & Dope test lab.

Other anabolic agents: Other anabolic agents are substances which pharmacologically are not related to anabolic androgenic steroids, but may have the similar anabolic effect. This class of substances has been added in the WADA [World Anti-Doping Agency] list of prohibited substances and methods because of clenbuterol and zeranol abuse in sports.[3]

Side Effects of other Anabolic Agents

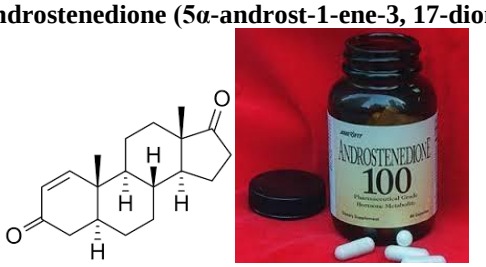
- Trembling
- Restlessness, aggressive behavior
- Anxiety
- Arrhythmias
- Muscle cramps

Figure 5: Dope steroids to athletes.

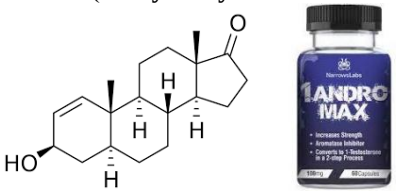
Anabolic androgenic steroids (AAS)

1-Androstenediol (5α-androst-1-ene-3β, 17β-diol)

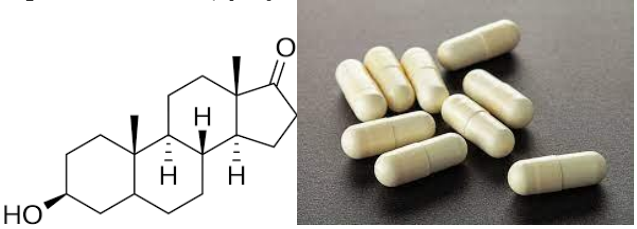
1-Androstenedione (5α-androst-1-ene-3, 17-dione)



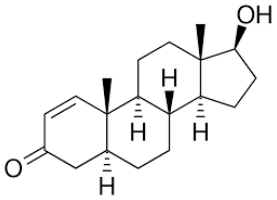
1-Androsterone (3α-hydroxy-5α-androst-1- ene-17-one)



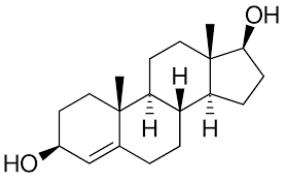
1-Epiandrosterone (3β-hydroxy-5α-androst- 1-ene-17-one)



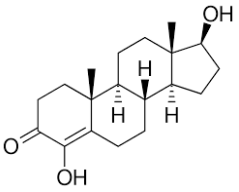
1-Testosterone (17β-hydroxy-5α-androst-1- en-3-one)



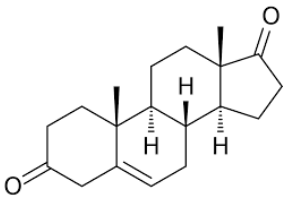
4-Androstenediol (androst-4-ene-3β,17β- diol)



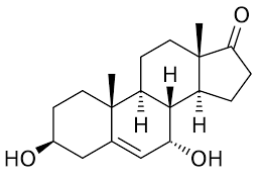
4-Hydroxytestosterone (4,17β-dihydroxyandrost-4-en-3-one)



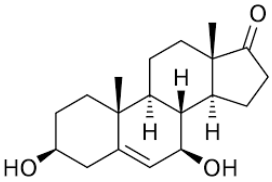
5-Androstenedione (androst-5-ene-3,17- dione)



7α-hydroxy-DHEA (3β,7α-Dihydroxyandrost-5-ene-17-one)



7β-hydroxy-DHEA (3β,7β-dihydroxyandrost-5-ene-17-one)

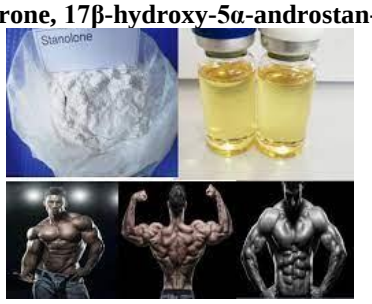


7-Keto-DHEA ((3β)-3-Hydroxyandrost-5-ene-7,17-dione)

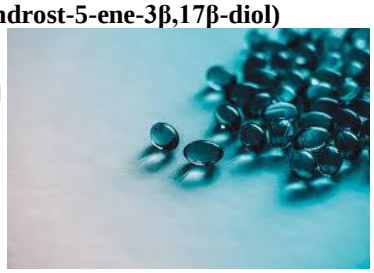
19-Norandrostenediol (estr-4-ene-3,17-diol)

19-Norandrostenedione (estr-4-ene-3,17- dione)

Androstanolone (5α-dihydrotestosterone, 17β-hydroxy-5α-androstan-3-one)

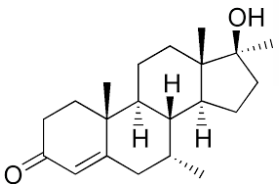


Androstenediol (androst-5-ene-3β,17β-diol)

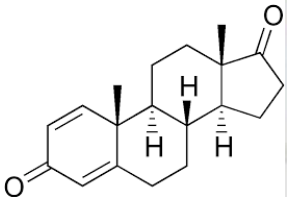


Androstenedione (androst-4-ene-3,17- dione)

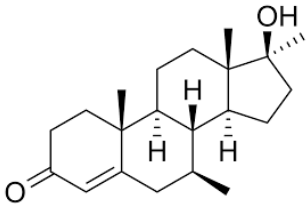
Bolasterone (7α,17α-dimethyltestosterone)



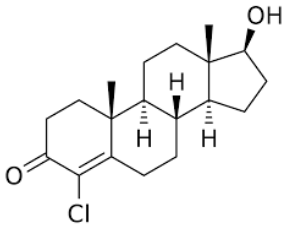
Boldione (androsta-1,4-diene-3,17-dione)



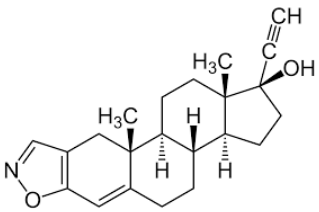
Calusterone (7β,17α-dimethyltestosterone)



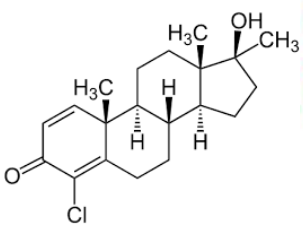
Clostebol (4-chlorotestosterone)



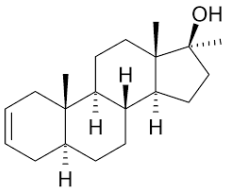
Danazol ([1,2]oxazolo[4',5':2,3]pregna-4-en- 20-yn-17α-ol)



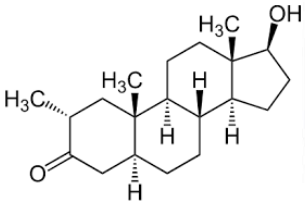
Dehydrochlormethyltestosterone (4-chloro- 17β-hydroxy-17α-methylandrosta-1,4-dien- 3-one)



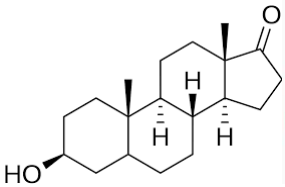
Desoxymethyltestosterone (17α-methyl-5α- androst-2-en-17β-ol and 17α-methyl-5α- androst-3-en-17β-ol)



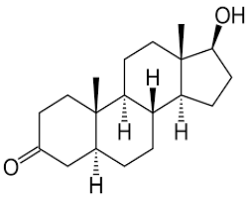
Drostanolone (2α-Methyl-4,5α-dihydrotestosterone)



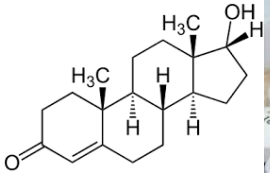
Epiandrosterone (3β-hydroxy-5α-androstan- 17-one)



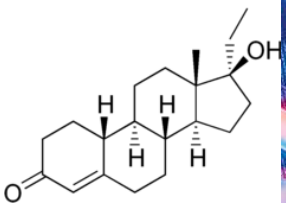
Epi-dihydrotestosterone (17β-hydroxy-5β- androstan-3-one)



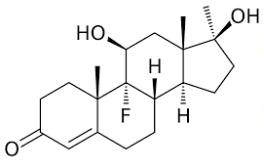
Epitestosterone (androst-4-en-17α-ol-3-one)



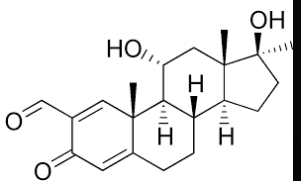
Ethylestrenol (19-norpregna-4-en-17α-ol)



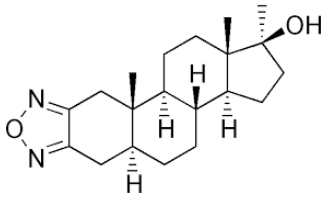
Fluoxymesterone (9α-Fluoro-11β-hydroxy-17α-methyltestosterone)



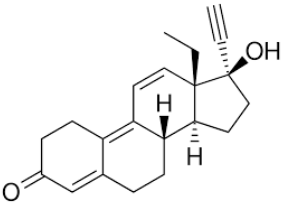
Formebolone (2-formyl-11α-hydroxy-17α-methyl-δ1-testosterone)



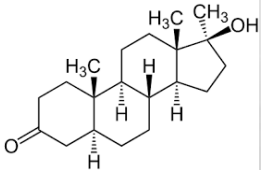
Furazabol (17α-methyl [1,2,5] oxadiazolo[3',4':2,3]-5α-androstan-17β-ol)



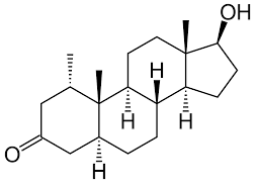
Gestrinone (17α-Ethynyl-18-methyl-$\delta^{9,11}$-19-nortestosterone)



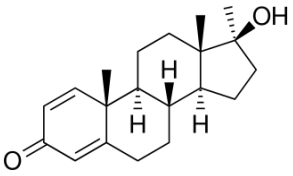
Mestanolone (17α-Methyl-4,5α-dihydrotestosterone)



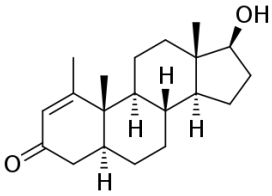
Mesterolone (1α-Methyl-5α-androstan-17β-ol-3-one)



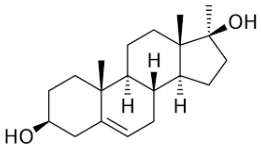
Metandienone (17β-hydroxy-17α- methylandrosta-1,4-dien-3-one)



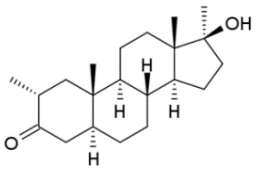
Metenolone (1-Methyl-δ^1-4,5α-dihydrotestosterone)



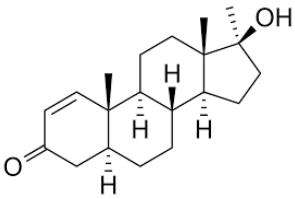
Methandriol (17α-methylandrost-5-ene-3β,17β-diol)



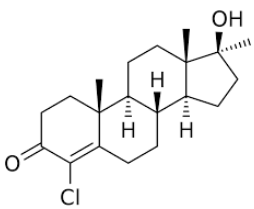
Methasterone (17β-hydroxy-2α,17α- dimethyl-5α-androstan-3-one)

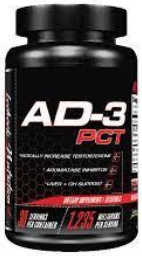


Methyl-1-testosterone (17β-hydroxy-17α- methyl-5α-androst-1-en-3-one)

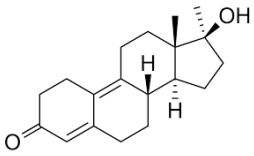


Methylclostebol (4-chloro-17α-methyltestosterone)

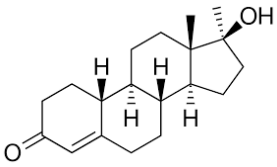




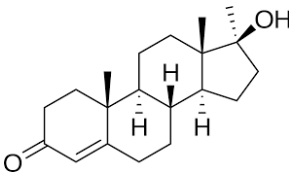
Methyldienolone (17β-hydroxy-17α- methylestra-4,9-dien-3-one)



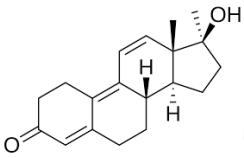
Methylnortestosterone (17β-hydroxy-17α- methylestr-4-en-3-one)



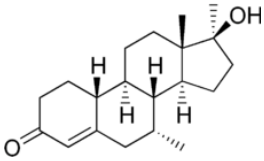
Methyltestosterone (17α-Methyltestosterone)



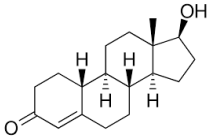
Metribolone (methyltrienolone, 17β-hydroxy- 17α-methylestra-4,9,11-trien-3-one)



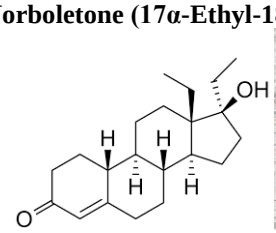
Mibolerone (7α,17α-dimethyl-19-nortestosterone)



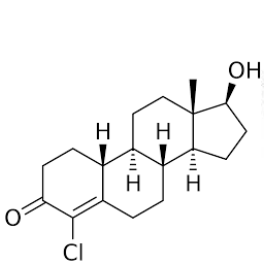
Nandrolone (19-nortestosterone)



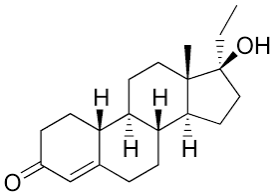
Norboletone (17α-Ethyl-18-methyl-19-nortestosterone)



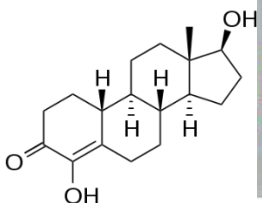

Norclostebol (4-chloro-17β-ol-estr-4-en-3- one)



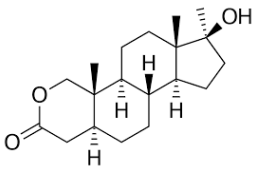

Norethandrolone (17α-Ethyl-19-nortestosterone)



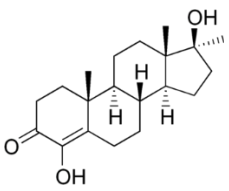
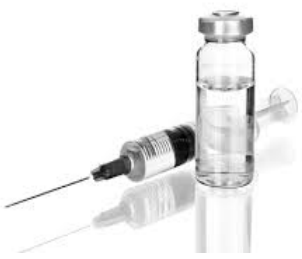

Oxabolone (4-Hydroxy-19-nortestosterone)



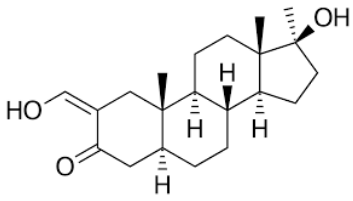

Oxandrolone (17α-Methyl-2-oxa-5α-androstan-17β-ol-3-one)



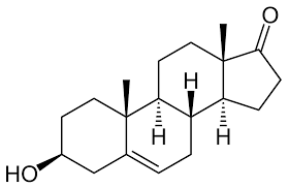

Oxymesterone (4-Hydroxy-17α-methyltestosterone)

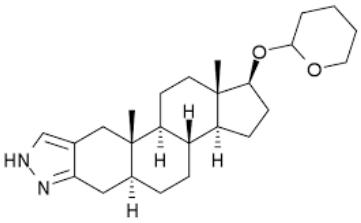
Oxymetholone (2-Hydroxymethylene-17α-methyl-4,5α-dihydrotestosterone)

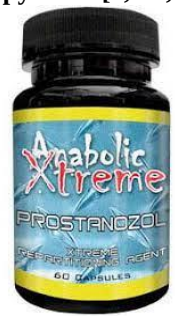


Prasterone (dehydroepiandrosterone, DHEA, 3β-hydroxyandrost-5-en-17-one)

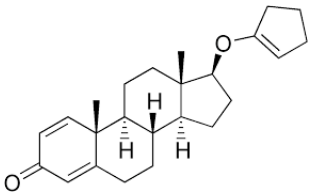


Prostanozol (17β-[(tetrahydropyran-2-yl) oxy]-1'H-pyrazolo[3,4:2,3]-5α-androstane)

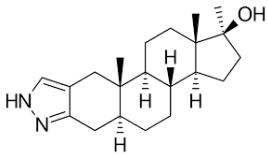




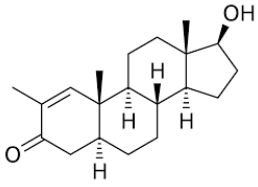
Quinbolone (1-Dehydrotestosterone 17β-cyclopent-1-enyl ether)



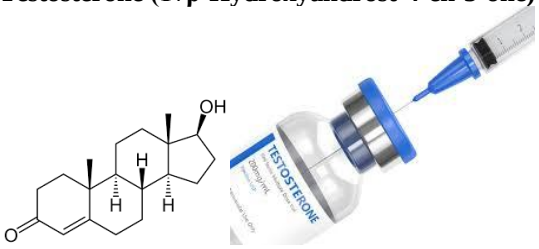
Stanozolol (17α-Methyl-2'H-5α-androst-2-eno[3,2-c]pyrazol-17β-ol)



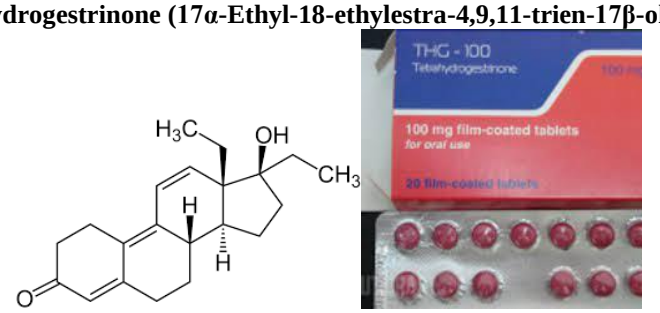
Stenbolone (2-Methyl-5α-androst-1-en-17β-ol-3-one)



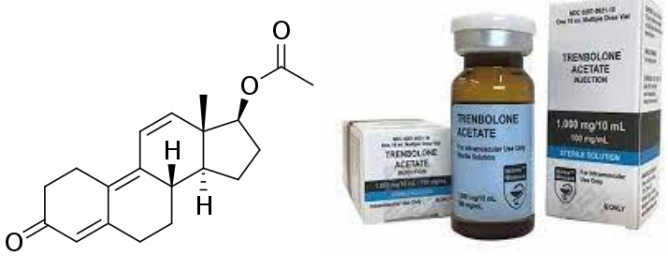
Testosterone (17β-Hydroxyandrost-4-en-3-one)



Tetrahydrogestrinone (17α-Ethyl-18-ethylestra-4,9,11-trien-17β-ol-3-one)



Trenbolone acetate (17β-hydroxyestr-4,9,11-trien-3- one acetate)



and other substances with a similar chemical structure or similar biological effect(s).

Other anabolic agents
Including, but not limited to
Clenbuterol, selective androgen receptor modulators [SARMs, e.g. andarine, LGD-4033 (ligandrol), enobosarm (ostarine) and RAD140], tibolone, zeranol and zilpaterol.[4-10]

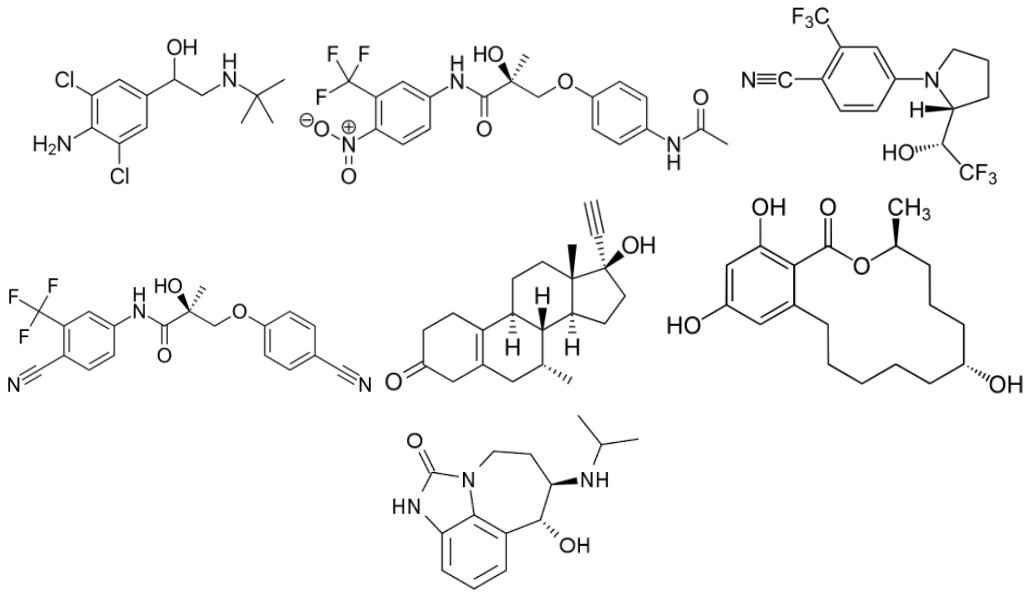


Figure 6: SARMs.

The following substances, and other substances with similar chemical structure or similar biological effect(s), are prohibited.

Erythropoietin [EPO] and agents affecting erythropoiesis

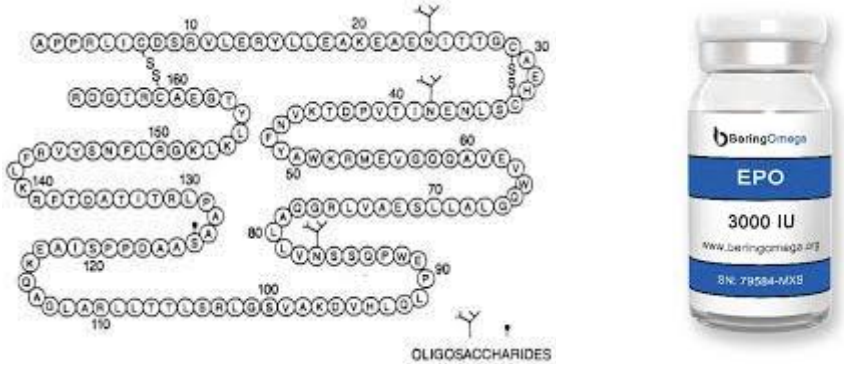


Figure 7: EPO.

Including, but not limited to

Erythropoietin receptor agonists, e.g. darbepoetins (dEPO); erythropoietins (EPO)

EPO-based constructs [e.g. EPO-Fc, methoxy polyethylene glycol-epoetin beta (CERA)]; EPO-mimetic agents and their constructs (e.g. CNTO-530, peginesatide).

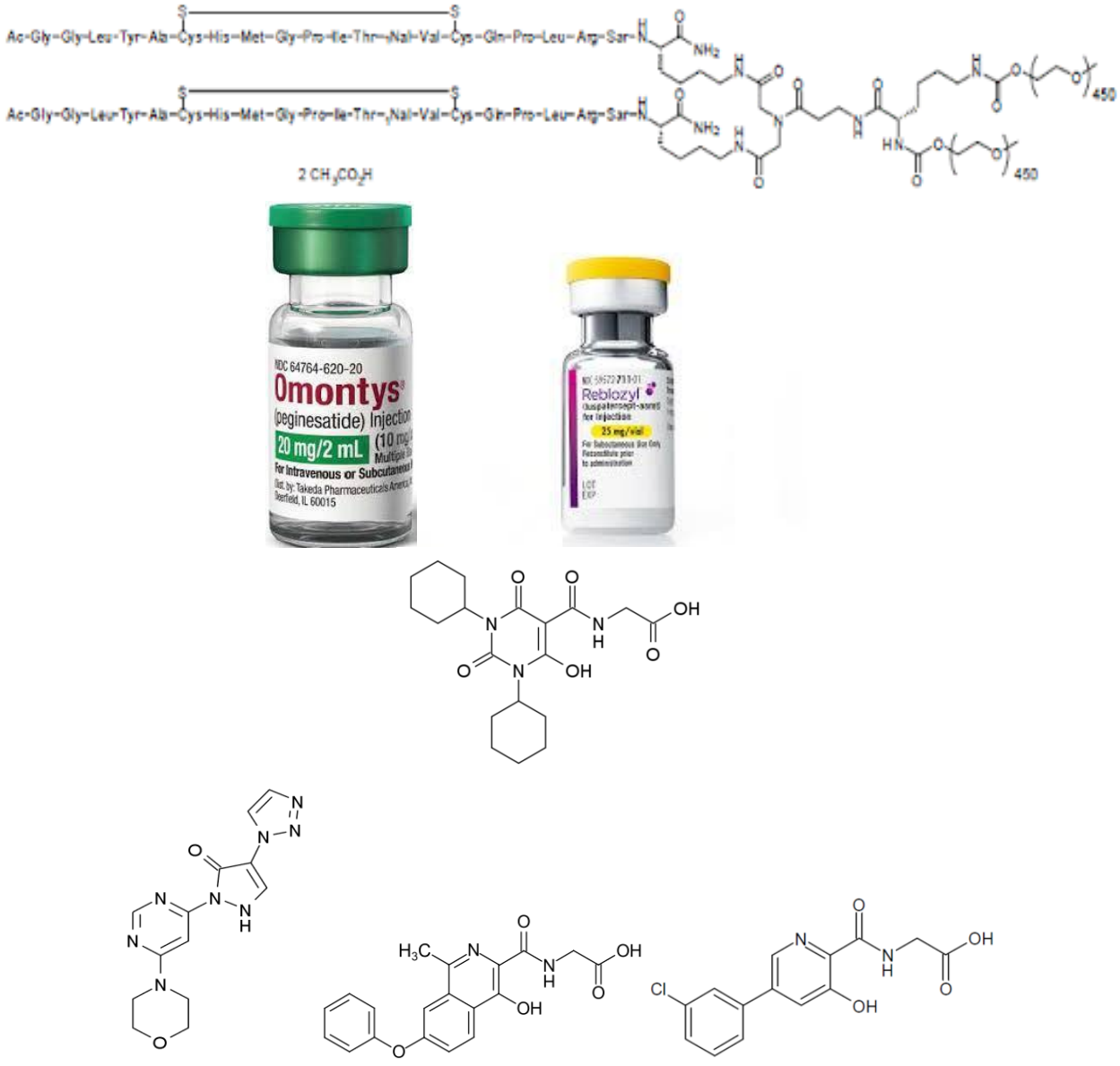
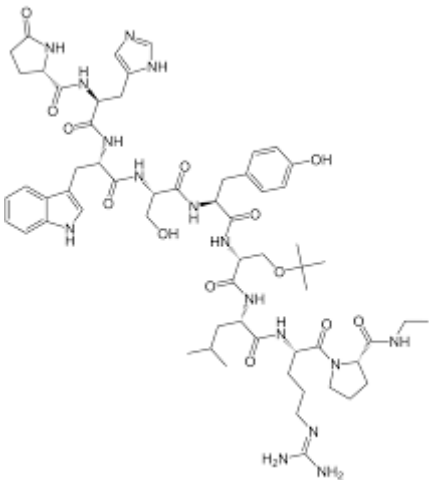


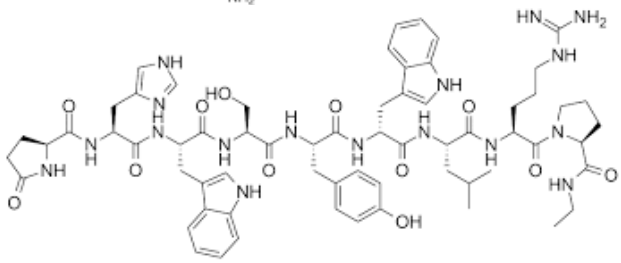
Figure 8: EPO agonists.

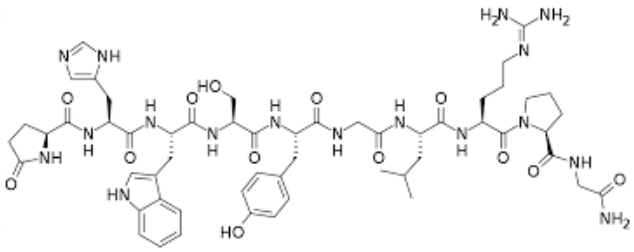
Hypoxia-inducible factor (HIF) activating agents, e.g. cobalt; daprodustat (GSK1278863); IOX2; molidustat (BAY 85-3934); roxadustat (FG-4592); vadadustat (AKB-6548); xenon.
GATA inhibitors, e.g. K-11706.
Transforming growth factor beta (TGF-β) signalling inhibitors, e.g. luspatercept; sotatercept.

Innate repair receptor agonists, e.g. asialo EPO; carbamylated EPO (CEPO).

Peptide hormone and their releasing factors: Chorionic gonadotrophin (CG) and luteinizing hormone (LH) and their releasing factors in males, e.g. buserelin, deslorelin, gonadorelin, goserelin, leuprorelin, nafarelin and triptorelin.







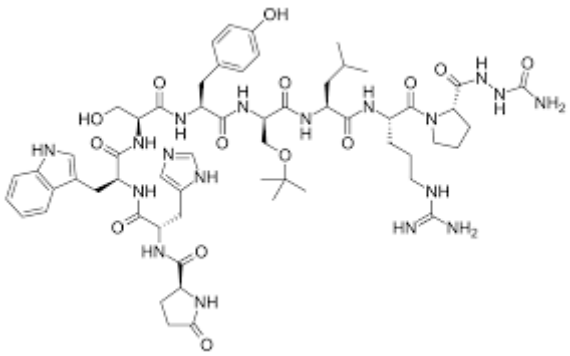


Figure 9: Peptide hormones and releasing factors.

Corticotrophins and their releasing factors, e.g. corticorelin.

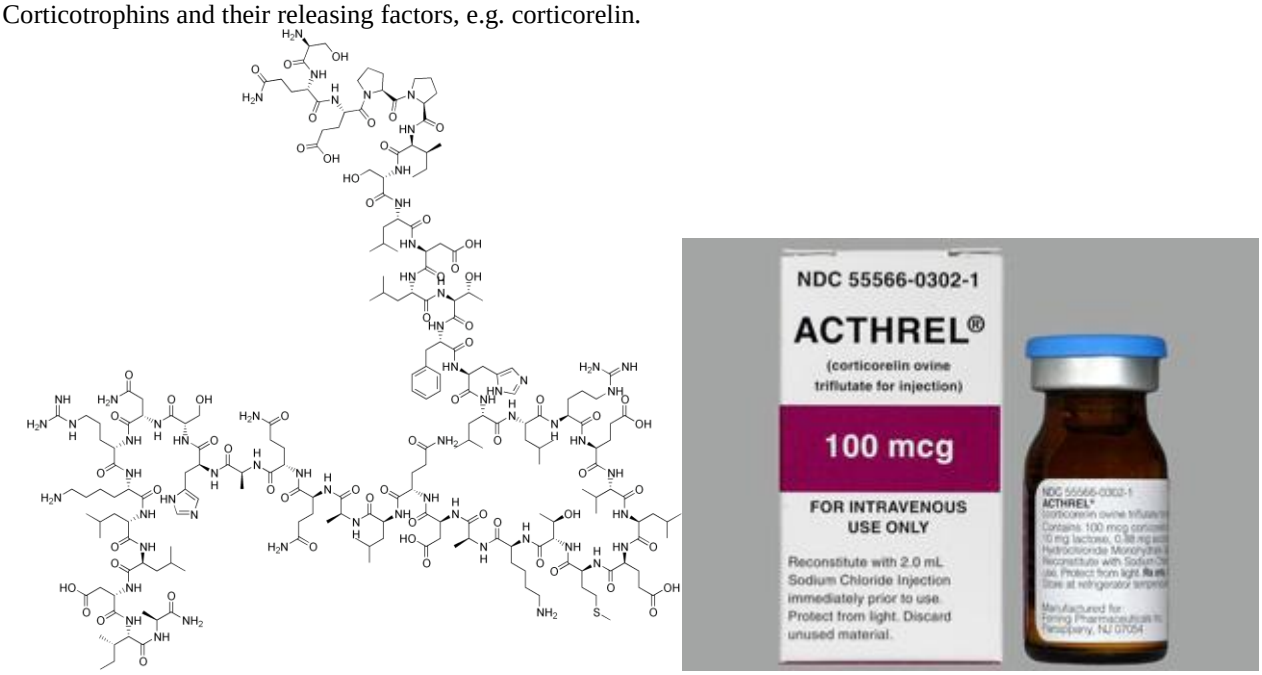
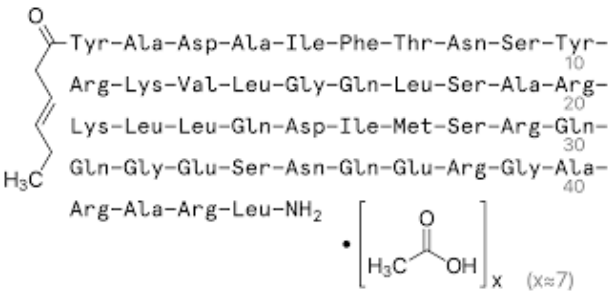


Figure 10: Corticotrophins and releasing factor.

Growth hormone (GH), its fragments and releasing factors, including, but not limited to: growth hormone fragments, e.g. AOD-9604 and hGH 176-191; growth hormone-releasing hormone (GHRH) and its analogues, e.g. CJC-1293, CJC-1295, sermorelin and tesamorelin; growth hormone secretagogues (GHS), e.g. lenomorelin (ghrelin) and its mimetics, e.g. anamorelin, ipamorelin, macimorelin and tabimorelin; GH-releasing peptides (GHRPs), e.g. alexamorelin, GHRP-1, GHRP-2 (pralmorelin), GHRP-3, GHRP-4, GHRP-5, GHRP-6, and examorelin (hexarelin).[11-14]



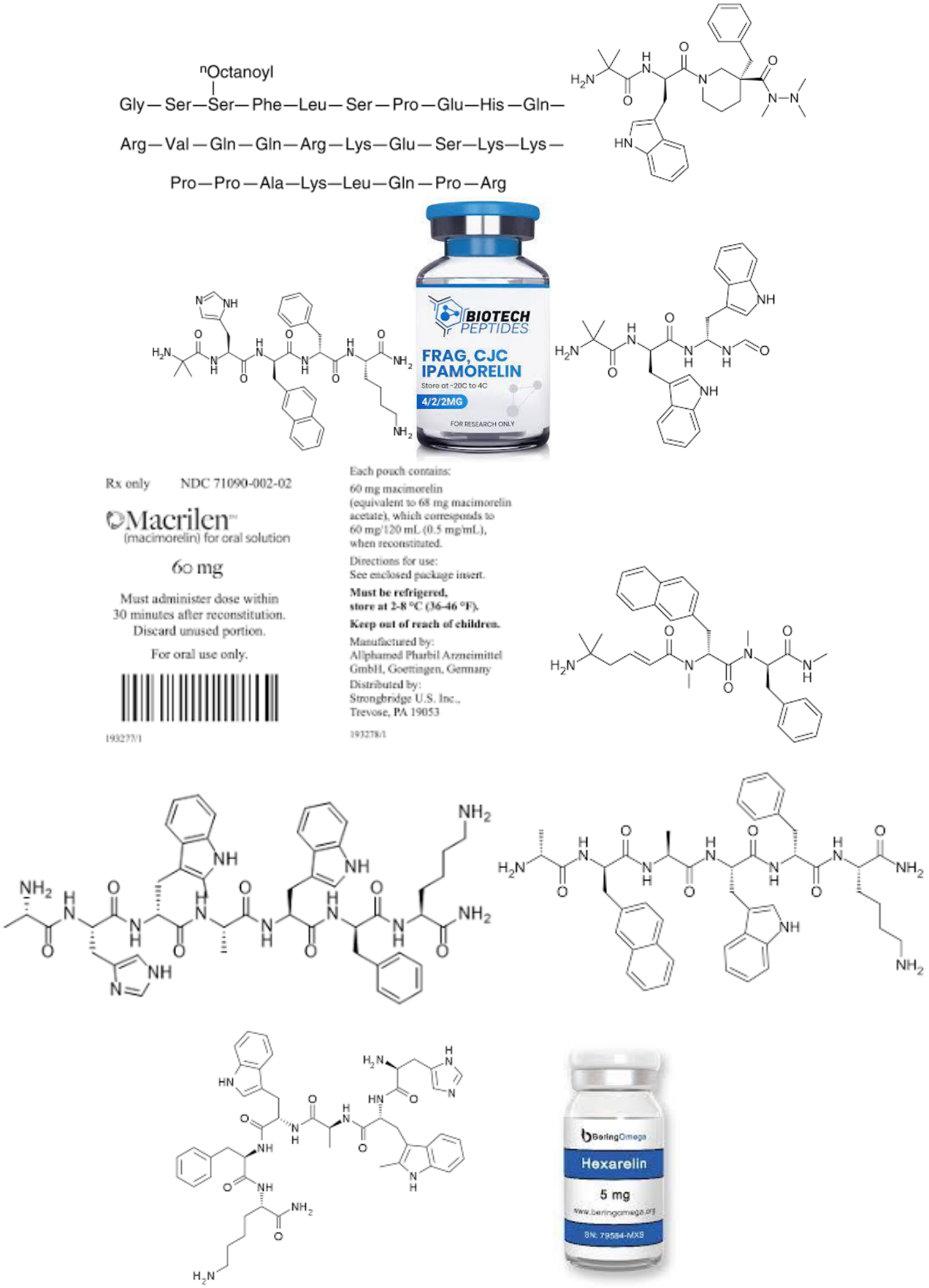
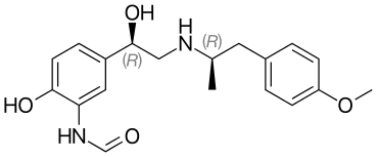


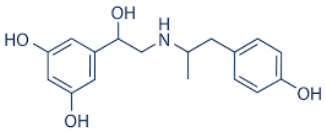
Figure 11: Growth hormone and releasing factor.

Growth factors and modulators
Including, but not limited to
Fibroblast growth factors (FGFs), Hepatocyte growth factor (HGF), Insulin-like growth factor 1 (IGF-1) and its analogues, Mechano growth factors (MGFs), Platelet-derived growth factor (PDGF), Thymosin-β4 and its derivatives e.g. TB-500, Vascular endothelial growth factor (VEGF) and other growth factors or growth factor modulators affecting muscle, tendon or ligament protein synthesis/degradation, vascularisation, energy utilization, regenerative capacity or fibre type switching. All selective and non-selective beta-2 agonists, including all optical isomers, are prohibited.[15]

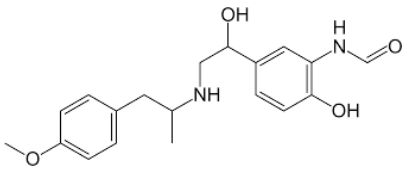
Including, but not limited to
Arformoterol (N-[2-hydroxy-5-[(1R)-1-hydroxy-2-[[(2R)-1-(4-methoxyphenyl)propan-2-yl]amino]ethyl] phenyl] formamide)



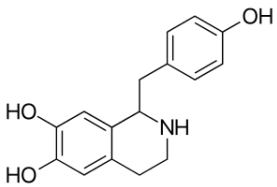
Fenoterol ((RR,SS)-5-(1-hydroxy-2-{[2-(4-hydroxyphenyl)-1-methylethyl]amino}ethyl)benzene-1,3-diol)



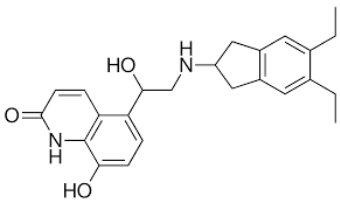
Formoterol ((RR,SS)-N-[2-hydroxy-5-[1-hydroxy-2-[1-(4-methoxyphenyl) propan-2-ylamino]ethyl] phenyl]formamide)



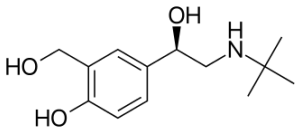
Higenamine (1-[(4-Hydroxyphenyl)methyl]-1,2,3,4-tetrahydroisoquinoline-6,7-diol)



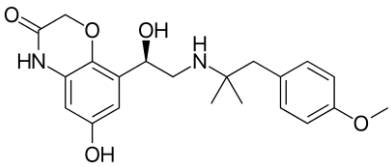
Indacaterol (5-[2-[(5,6-Diethyl-2,3-dihydro-1H-inden-2-yl)amino]-1-hydroxyethyl]-8-hydroxyquinolin-2(1H)-one)



Levosalbutamol (4-[(1R)-2-(tert-butylamino)-1-hydroxyethyl]- 2-(hydroxymethyl)phenol)



Olodaterol (6-hydroxy-8-{(1R)-1-hydroxy-2-{[1-(4-methoxyphenyl)-2-methylpropan-2-yl]amino}ethyl}-4H-1,4-benzoxazin-3-one)



Procaterol ((±)-(1R,2S)-rel-8-Hydroxy-5-[1-hydroxy-2-(isopropylamino)butyl]-quinolin-2(1H)-one)

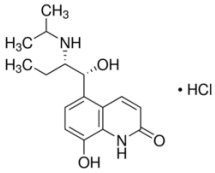
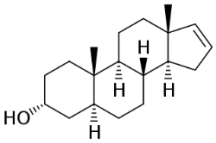


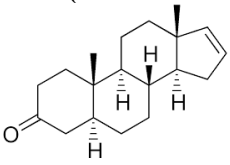
Figure 12: Growth factors modulators.

Aromatase inhibitors

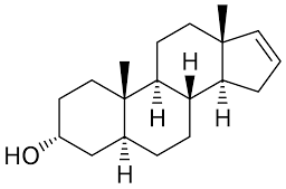
2-Androstenol (5α-androst-2-en-17-ol)



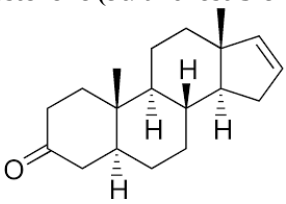
2-Androstenone (5α-androst-2-en-17-one)



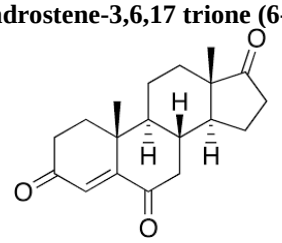
3-Androstenol (5α-androst-3-en-17-ol)



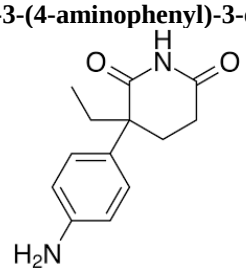
3-Androstenone (5α-androst-3-en-17-one)



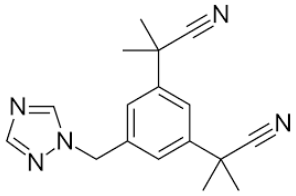
4-Androstene-3,6,17 trione (6-oxo)



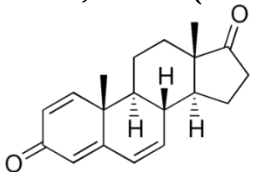
Aminoglutethimide ((RS)-3-(4-aminophenyl)-3-ethyl-piperidine-2,6-dione)



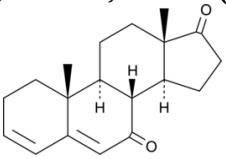
Anastrozole (2,2'-[5-(1H-1,2,4-triazol-1-ylmethyl)-1,3-phenylene]bis(2-methylpropanenitrile)



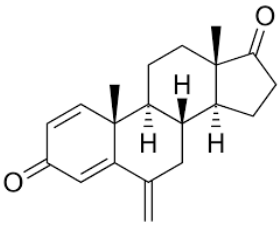
Androsta-1,4,6-triene-3,17-dione (androstatrienedione)



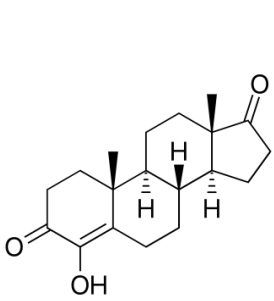
Androsta-3,5-diene-7,17-dione (arimistane)



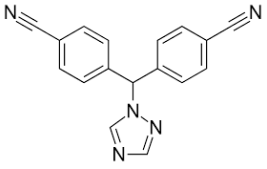
Exemestane (6-Methylideneandrosta-1,4-diene-3,17-dione)



Formestane (4-Hydroxyandrost-4-ene-3,17-dione)



Letrozole (4,4'-((1H-1,2,4-triazol-1-yl)methylene)dibenzonitrile)



Testolactone (13-Hydroxy-3-oxo-13,17-secoandrosta-1,4-dien-17-oic acid δ-lactone)

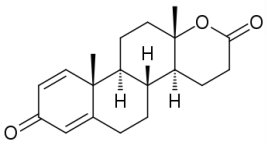
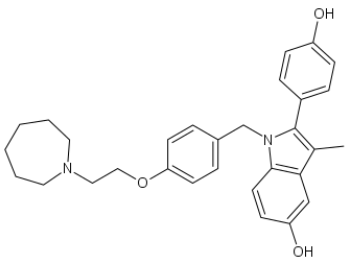
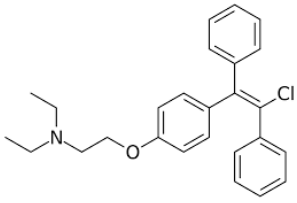


Figure 13: Aromatase inhibitors.

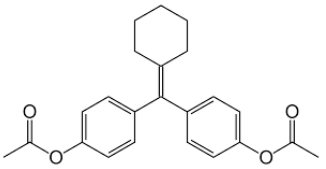
Anti-estrogenic substances [anti-estrogenic and selective estrogenic receptor modulators SERMS Including, but not limited to
Bazedoxifene (1-[4-[2-(azepan-1-yl)ethoxy]benzyl]-2-(4-hydroxyphenyl)-3-methyl-1H-indol-5-ol)



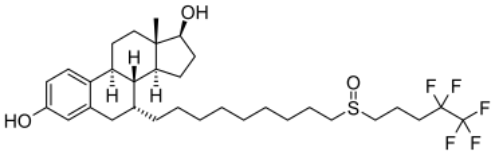
Clomifene ((E,Z)-2-(4-(2-chloro-1,2-diphenylethenyl)phenoxy)-N,N-diethylethanamine)



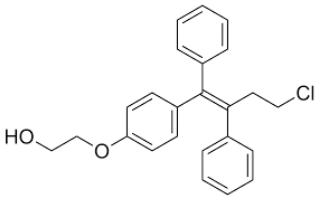
Cyclofenil ([4-[(4-Acetoxyphenyl)-cyclohexylidene-methyl]phenyl] acetate)



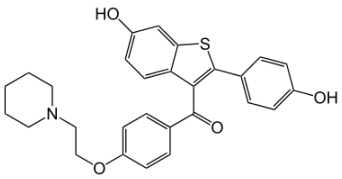
Fulvestrant (Pentafluoropentyl)-sulfinyl]nonyl]estra-1,3,5(10)-triene-3,17β-diol)



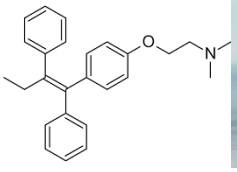
Ospemifene (2-(p-((Z)-4-chloro-1,2-diphenyl-1-butenyl)phenoxy)ethanol)



Raloxifene ([6-hydroxy-2-(4-hydroxyphenyl)-benzothiophen-3-yl]-[4-[2-(1-piperidyl)ethoxy]phenyl]-methanone)



Tamoxifen ((Z)-2-[4-(1,2-Diphenylbut-1-enyl)phenoxy]-N,N-dimethylethanamine)



Toremifene (2-[4-[(1Z)-4-Chloro-1,2-diphenyl-but-1-en-1-yl]phenoxy]-N,N-dimethylethanamine)

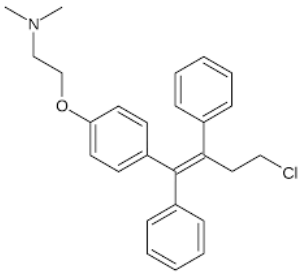
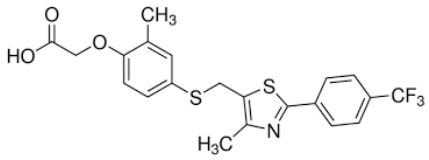


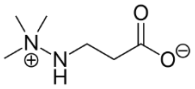
Figure 14: Antiestrogenic substances.

Metabolic modulators: Activators of the AMP-activated protein kinase (AMPK), e.g. AICAR, SR9009; and peroxisome proliferator-activated receptor delta (PPARδ) agonists, e.g. 2-(2-methyl-4-((4-methyl-2-(4-(trifluoromethyl)phenyl)thiazol-5-yl)methylthio)phenoxy) acetic acid (GW1516, GW501516)



Insulins and insulin-mimetic

Meldonium (2-(2-Carboxylato-ethyl)-1,1,1-trimethylhydrazinium)

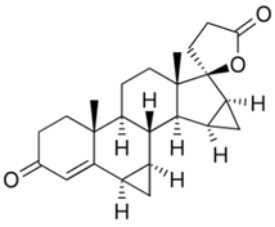


Trimetazidine (1-(2,3,4-trimethoxybenzyl)piperazine)

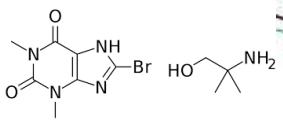
Figure 15: Metabolic modulators.

Exceptions

Drospirenone (17β-Hydroxy-6β,7β:15β,16β-dimethylene-3-oxo-17α-pregn-4-ene-21-carboxylic acid)



Pamabrom (1:1 mixture of 2-amino-2-methyl-1-propanol and 8-bromotheophyllinate)



and topical ophthalmic administration of carbonic anhydrase inhibitors (e.g. dorzolamide, brinzolamide); Local administration of felypressin in dental anaesthesia.

The detection in an Athlete's Sample at all times or In-Competition, as applicable, of any quantity of the following substances subject to threshold limits: formoterol, salbutamol, cathine, ephedrine, methylephedrine and pseudoephedrine, in conjunction with a diuretic or masking agent, will be considered as an Adverse Analytical Finding (AAF) unless the Athlete has an approved Therapeutic Use Exemption (TUE) for that substance in addition to the one granted for the diuretic or masking agent.

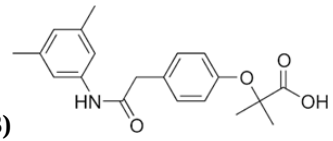
Prohibited methods

Manipulation of blood & blood components: The Administration or reintroduction of any quantity of autologous, allogenic (homologous) or heterologous blood, or red blood cell products of any origin into the circulatory system.

Artificially enhancing the uptake, transport or delivery of oxygen. Including, but not limited to:

Perfluorochemicals; **efaproxiral (RSR13)** and modified haemoglobin products, e.g. haemoglobin-based blood substitutes and microencapsulated haemoglobin products, excluding supplemental oxygen by inhalation.

Any form of intravascular manipulation of the blood or blood components by physical or chemical means.[16-18]



Efaproxiral (RSR13)

2-[4-[2-[(3,5-dimethylphenyl)amino]-2-oxoethyl]phenoxy]-2-methylpropanoic acid

Chemical & physical manipulation: Tampering, or Attempting to Tamper, to alter the integrity and validity of Samples collected during Doping Control.

Including, but not limited to:

Sample substitution and/or adulteration, e.g. addition of proteases to Sample.

Intravenous infusions and/or injections of more than a total of 100 mL per 12-hour period except for those legitimately received in the course of hospital treatments, surgical procedures or clinical diagnostic investigations.

Gene & cell doping: The following, with the potential to enhance sport performance, are prohibited:

The use of nucleic acids or nucleic acid analogues that may alter genome sequences and/ or alter gene expression by any mechanism. This includes but is not limited to gene editing, gene silencing and gene transfer technologies.

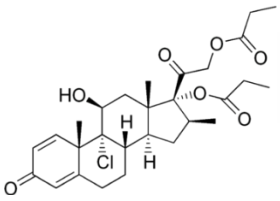
The use of normal or genetically modified cells.

Stimulants

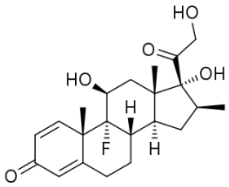
All glucocorticoids are prohibited when administered by oral, intravenous, intramuscular or rectal route.

Including, but not limited to

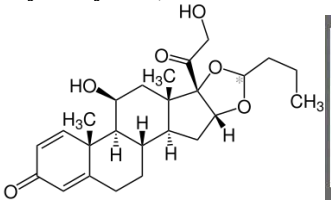
Beclomethasone



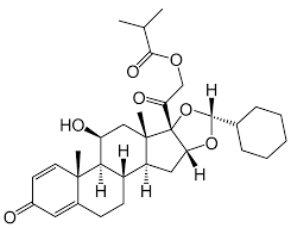
Betamethasone ((11β,16β)-9-Fluoro-11,17,21-trihydroxy-16-methylpregna-1,4-diene-3,20-dione)



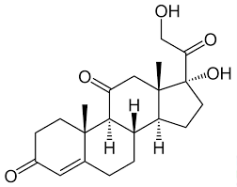
Budesonide (1β,21-Dihydroxy-16α,17α-[butane-1,1-diylbis(oxy)]pregna-1,4-diene-3,20-dione)



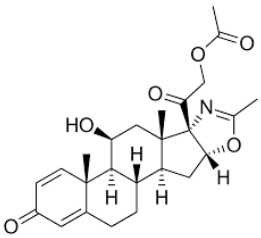
Ciclesonide ([2-[(1S,2S,4R,6R,8S,9S,11S,12S,13R)-6-cyclohexyl-11-hydroxy-9,13-dimethyl-16-oxo-5,7-dioxapentacyclo[10.8.0.02,9.04,8.013,18]icosa-14,17-dien-8-yl]-2-oxoethyl] 2-methylpropanoate)



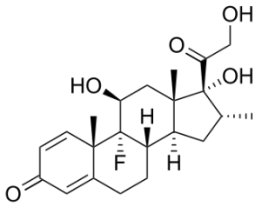
Cortisone (17α,21-Dihydroxypregn-4-ene-3,11,20-trione)



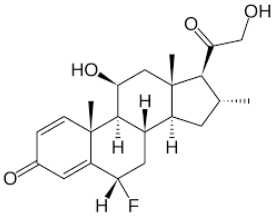
Deflazacort ([2-[(1S,2S,4R,8S,9S,11S,12S,13R)-11-hydroxy-6,9,13-trimethyl-16-oxo-5-oxa-7-azapentacyclo [10.8.0.02,9.04,8.013,18]icosa-6,14,17-trien-8-yl]-2-oxoethyl] acetate)



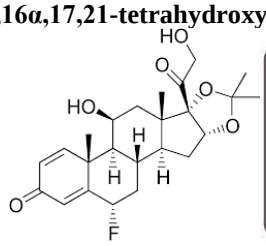
Dexamethasone (8S,9R,10S,11S,13S,14S,16R,17R)-9-Fluoro-11,17-dihydroxy-17-(2-hydroxyacetyl)-10,13,16-trimethyl-6,7,8,9,10,11,12,13,14,15,16,17-dodecahydro-3H-cyclopenta[a]phenanthren-3-one)

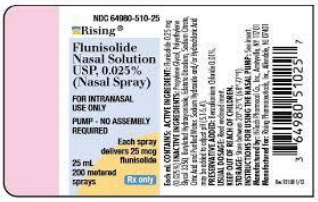


Flucortolone (6S,8S,9R,10S,11S,13S,14S,16R,17S)-6-fluoro-11-hydroxy-17-(2-hydroxyacetyl)-10,13,16-trimethyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-one)

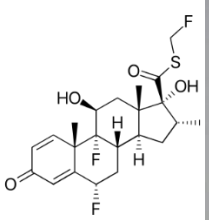


Flunisolide (6α-Fluoro-11β,16α,17,21-tetrahydroxypregna-1,4-diene-3,20-dione acetone cyclic 16,17-acetal)

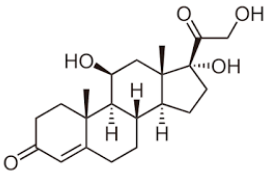




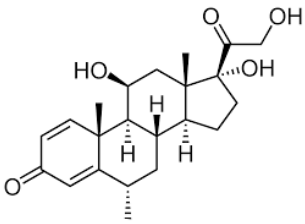
Fluticasone (6α,9α-Difluoro-11β,17α-dihydroxy-16α-methyl-21-thia-21-fluoromethylpregna-1,4-dien-3,20-dione



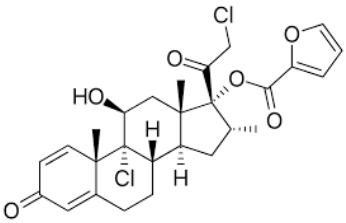
Hydrocortisone (11β,17α,21-Trihydroxypregn-4-ene-3,20-dione)



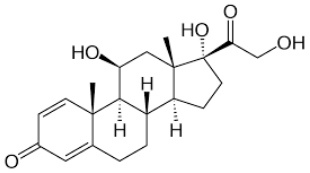
Methylprednisolone (11β,17,21-Trihydroxy-6α-methylpregna-1,4-diene-3,20-dione)



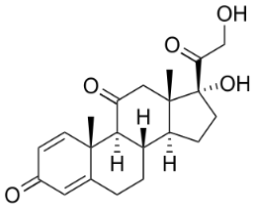
Mometasone (9α,21-Dichloro-11β,17α-dihydroxy-16α-methylpregna-1,4-diene-3,20-dione 17α-(2-furoate))



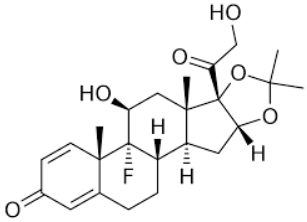
Prednisolone ((11β)-11,17,21-Trihydroxypregna-1,4-diene-3,20-dione)



Prednisone (17,21-dihydroxypregna-1,4-diene-3,11,20-trione)



Triamcinolone acetonide (4aS,4bR,5S,6aS,6bS,9aR,10aS,10bS)-4b-fluoro-6b-glycoloyl-5-hydroxy-4a,6a,8,8-tetramethyl-4a,4b,5,6,6a,6b,9a,10,10a,10b,11,12-dodecahydro-2H-naphtho[2',1':4,5]indeno[1,2-d][1,3]dioxol-2-one)



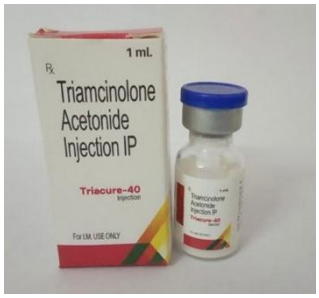


Figure 16: Glucocorticoids.

Beta-blockers are prohibited In-Competition only, in the following sports, and also prohibited
Out-of-Competition where indicated (*).

Archery (WA)*, Automobile (FIA), Billiards (all disciplines) (WCBS), Darts (WDF), Golf (IGF), Shooting (ISSF, IPC)*. *Also prohibited Out-of-Competition: Skiing/Snowboarding (FIS) in ski jumping, freestyle aerials/halfpipe and snowboard halfpipe/big air.[19,20]

Underwater sports (CMAS) in constant-weight apnoea with or without fins, dynamic apnoea with and without fins, free immersion apnoea, Jump Blue apnoea, spearfishing, static apnoea, target shooting, and variable weight apnoea

Including, but not limited to: Acebutolol, Alprenolol, Atenolol, Betaxolol, Bisoprolol, Bunolol, Carteolol, Carvedilol, Celiprolol, Esmolol, Labetalol, Metipranolol, Metoprolol, Nadolol, Nebivolol, Oxprenolol, Pindolol, Propranolol, Sotalol, Timolol

Figure 17: Dope & Race.

Dope testing: The National Dope Testing Laboratory is equipped with state-of-the-art technologies and the most modern equipment. The use of Gas Chromatography coupled with Mass Spectrometry (GC-MS) is the most common and the oldest technology being used worldwide for dope testing. Nowadays, the use of liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) has become quite widespread. This technique has helped detect the difficult drugs falling into various categories of banned substances and is becoming increasingly more important in the fight against doping. Apart from GC-MS and LC-MS/MS, the use of Gas Chromatography coupled with tandem Mass Spectrometry (GC-MS/MS) and Isotope-ratio mass spectrometry (IRMS) is also very prevalent in sports dope testing. Both GC-MS/MS and LC-MS/MS are used primarily to analyse urine samples. The analysis of the blood matrix requires a completely different type of equipment which is commonly used in hospital laboratories.[21]

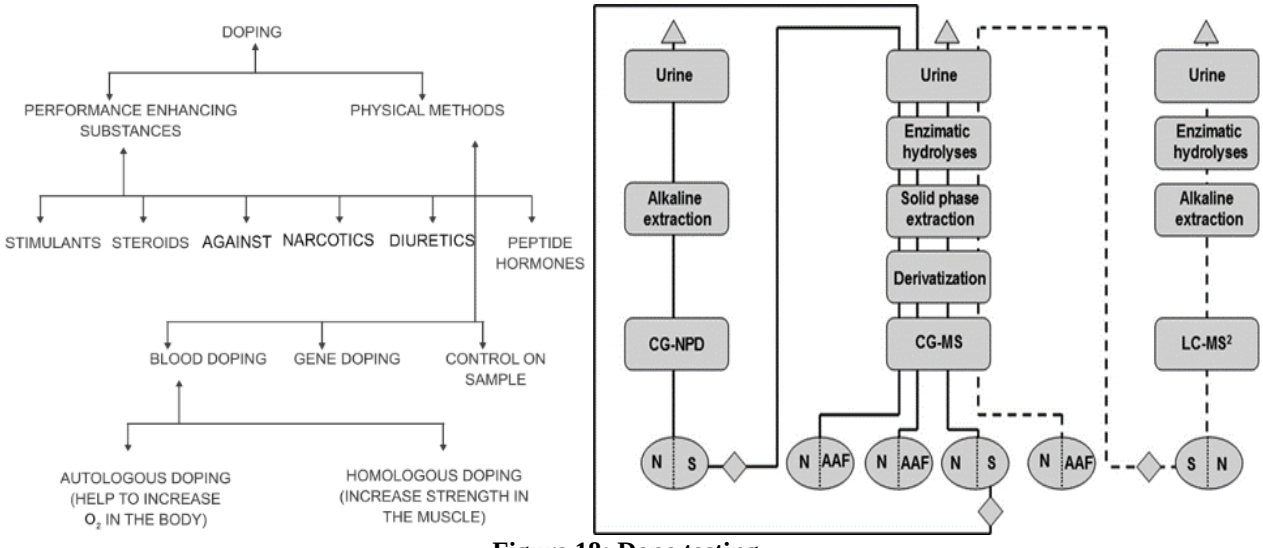


Figure 18: Dope testing.

Analogy of dope drugs with medication therapy: Mostly all dope drugs are cyclopentanoperhydrophenanthrene structure in nature. All are highly lipid soluble in nature and having high potency anabolic in nature. The four quadrants of this steroidal nature of all doping drugs are capable to be soluble in lipid layer of muscle due to high logP values. The cumulative nature of all these agents shows anabolic reflections towards pharmacokinetic profile because their absorption, distribution, metabolism and excretion parameters are also of high extent due to solubilisation in adipose tissues can show high activation in energy

profile in body homeostasis that can produce extra energy to body which helps to athletes to cross the milestones of success. Steroidal nature of doping agents can be detected by chromatography with molar mass content in urine sample [LC-MS] because after ADME the excretions of metabolites of these agents are also of steroidal units because after metabolism the structural units are also remain same but their substitutions at different parts get into polar units to be excreted easily from body. Cholestane, Coprosten, Pregnane, Androsten, Estrane, etc steroidal units which are present in doping drugs are lipid soluble which prefer adipose tissues to accumulate but after metabolic steps after phase-I & II these are converted into nonpolar entity to polar entity which can be easily excreted from body that can be detected by chromatography.

CONCLUSION

Depending on the sport practiced and the physical attributes it requires, the athletes will look for one or more of the following benefits of doping: recovering from an injury, increasing body recovery capacity after training, increasing muscle mass and strength, decreasing fat tissue, increasing endurance. After critically looking at all aspects of performance-enhancing drug use, we have concluded, as a team, that doping is negatively affecting sports. Performance-enhancing drugs are a bad thing for several reasons. They have terrible side effects on athletes and destroy their bodies in the long run. They give athletes an unfair advantage in sports which is a form of cheating in our opinion. They also promote a do-anything-to-win attitude and an attitude that “ideal” bodies cannot be achieved through hard work and effort. Most importantly, this topic is becoming a social issue because of the prevalence and the effect that it is having on our youth and teenagers. Athletes using drugs are encouraging young people, who view them as role models, to use these drugs to improve their performance and the looks of their bodies. Science has created many drugs and made the population aware of the harm they can do. They have promoted the use in the medical field to speed the healing of injuries. They have in no way recommended the use of these drugs as performance-enhancing drugs in sports. Science has played a huge role in the use of performance-enhancing drugs but they have not made them for this reason. Doping should be banned in all sports leagues, and a no tolerance policy should be enforced.

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