

DOPE: Devastation of Potentiation Efficacy of Homeostasis

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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

both endogenously (natural) as well as exogenously (synthetic) [1].

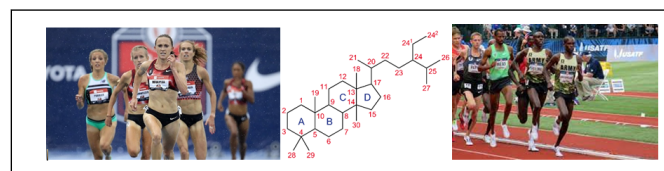


Figure 2: Doping in race.

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].

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

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.

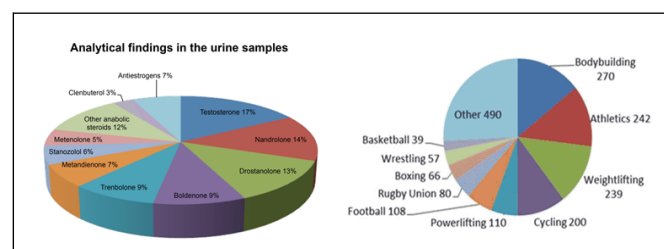


Figure 3: Dope test.

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.

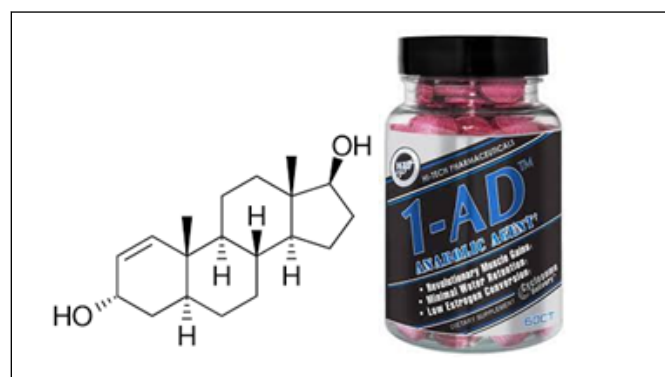
Other anabolic agents: Other anabolic agents are substances which pharmacologically are not related to anabolic androgenic steroids, but may have the similar anabolic effect. This class of substances has been added in the WADA [World Anti-Doping Agency] list of prohibited substances and methods because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

Side Effects of other Anabolic Agents:

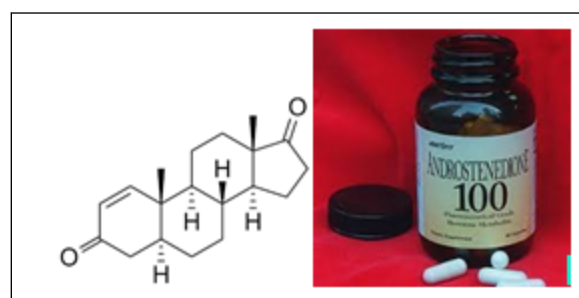
- Trembling
- Restlessness, aggressive behavior
- Anxiety
- Arrhythmias
- Muscle cramps



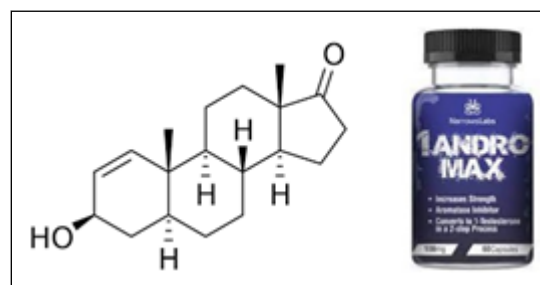
Figure 5: Dope steroids to athletes.

Anabolic androgenic steroids (AAS)**1-Androstenediol (5 α -androst-1-ene-3 β , 17 β -diol)**

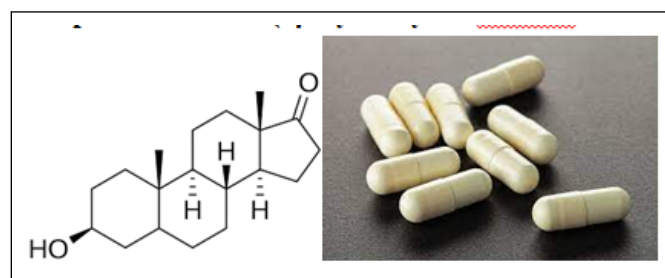
1-Androstenedione (5 α -androst-1-ene-3, 17-dione)



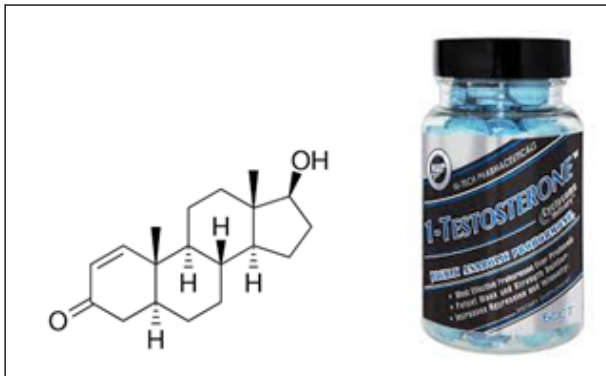
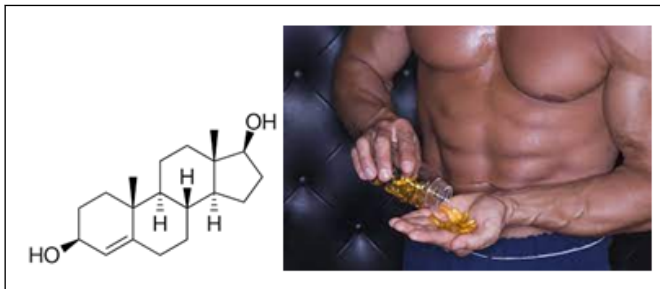
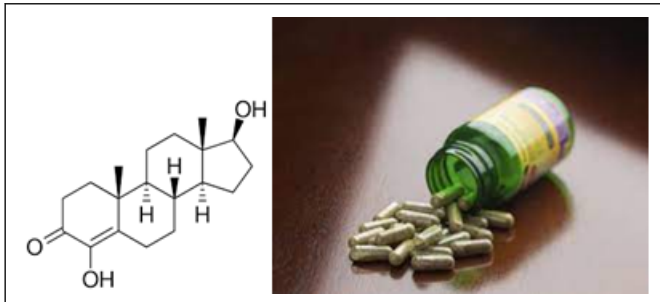
1-Androsterone (3 α -hydroxy-5 α -androst-1-ene-17-one)



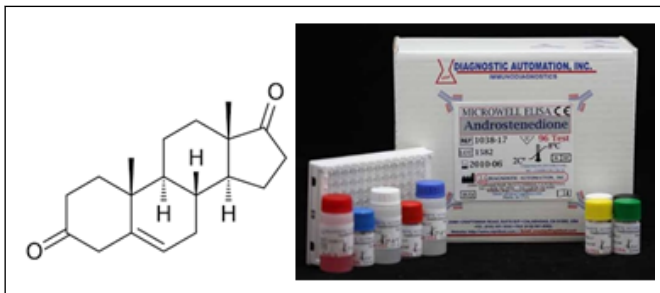
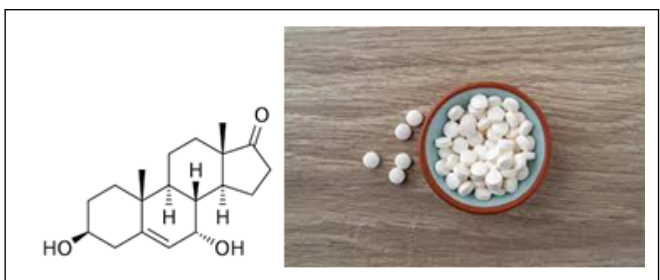
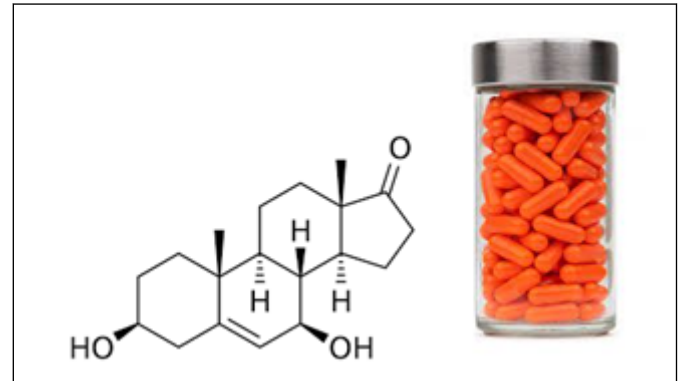
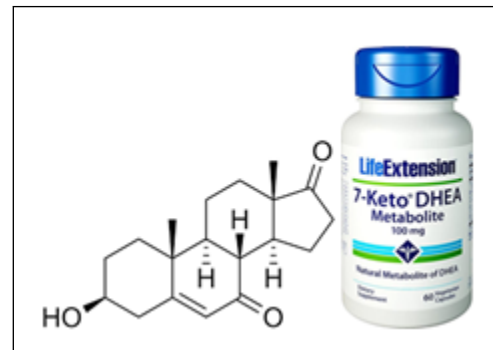
1-Epiandrosterone (3 β -hydroxy-5 α -androst-1-ene-17-one)



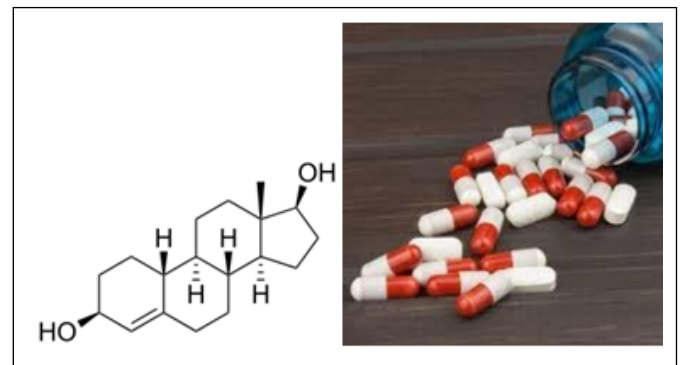
1-Testosterone (17 β -hydroxy-5 α -androst-1-ene-3-one)

4-Androstenediol (androst-4-ene-3 β ,17 β - diol)4-Hydroxytestosterone (4,17 β -dihydroxyandrost-4-en-3-one)

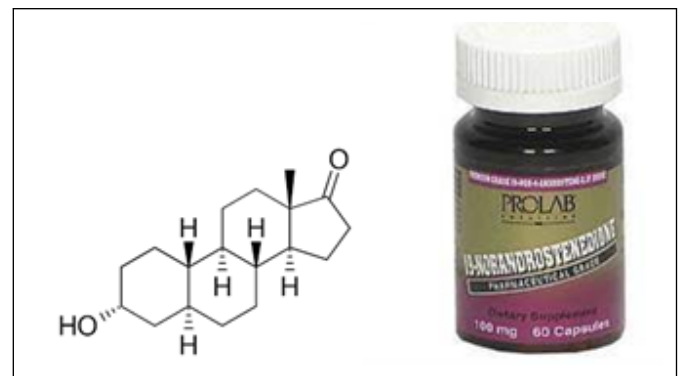
5-Androstenedione (androst-5-ene-3,17- dione)

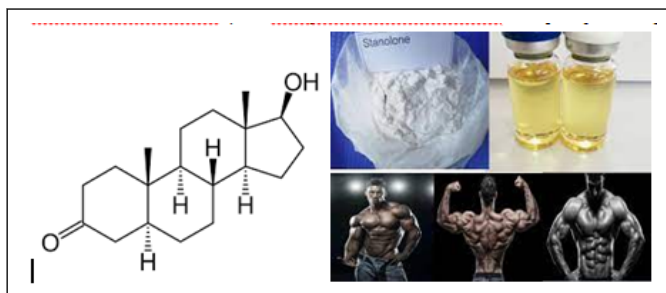
7 α -hydroxy-DHEA (3 β ,7 α -Dihydroxyandrost-5-ene-17-one)7 β -hydroxy-DHEA (3 β ,7 β -dihydroxyandrost-5-ene-17-one)7-Keto-DHEA ((3 β)-3-Hydroxyandrost-5-ene-7,17-dione)

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

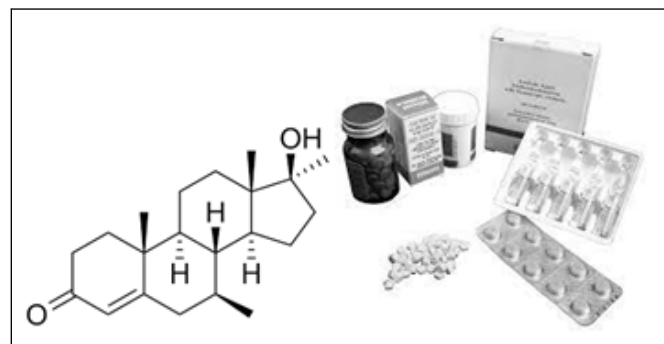


19-Norandrostenedione (estr-4-ene-3,17- dione)

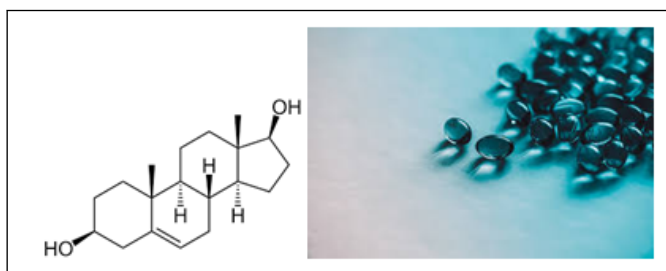
Androstanolone (5 α -dihydrotestosterone, 17 β -hydroxy-5 α -androst-3-one)



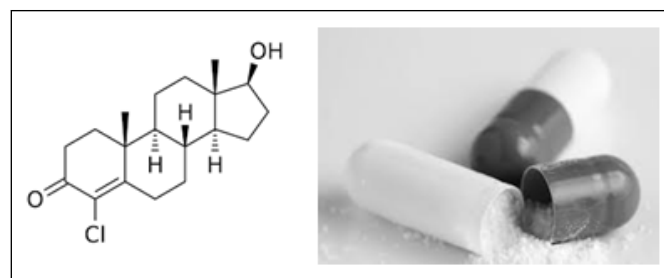
Androstenediol (androst-5-ene-3 β ,17 β -diol)



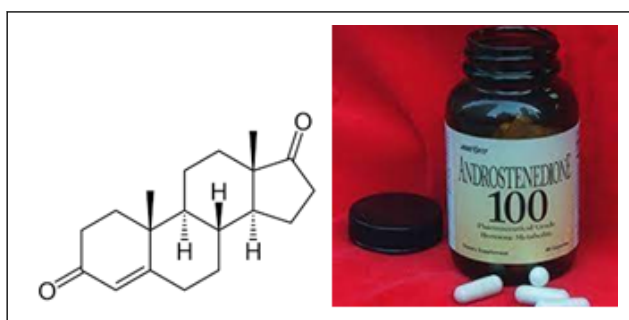
Clostebol (4-chlorotestosterone)



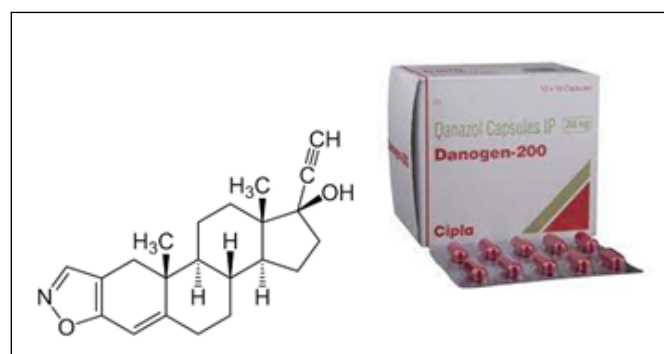
Androstenedione (androst-4-ene-3,17- dione)



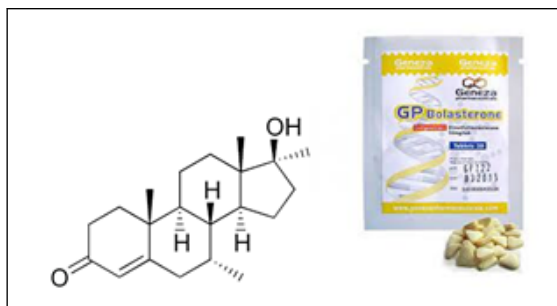
Danazol ([1,2]oxazolo[4',5':2,3]pregna-4-en- 20-yn-17 α -ol)



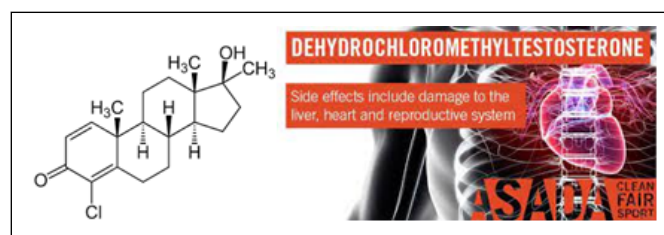
Bolasterone (7 α ,17 α -dimethyltestosterone)



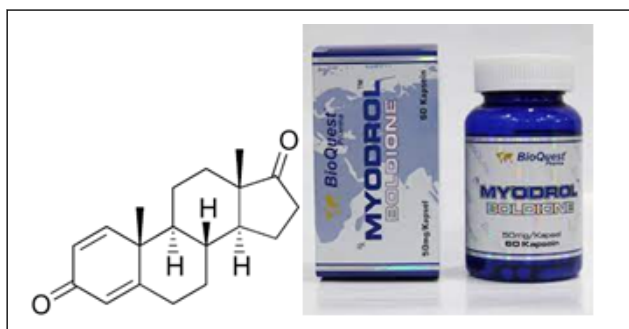
Dehydrochloromethyltestosterone (4-chloro- 17 β -hydroxy-17 α -methylandrosta-1,4-dien- 3-one)



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

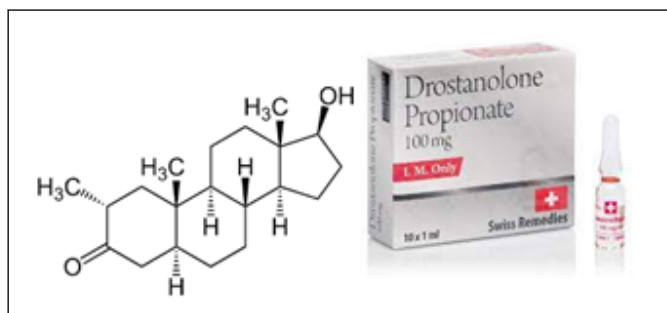
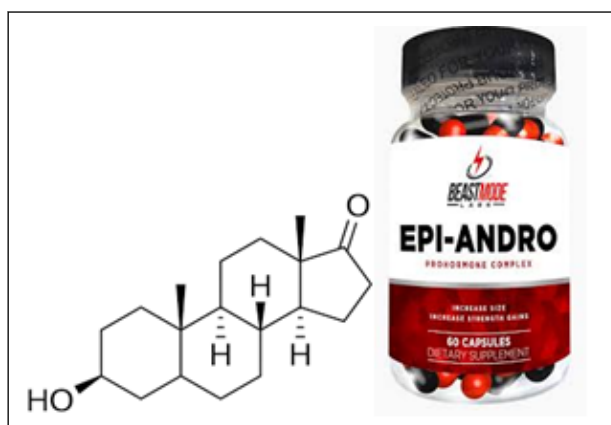
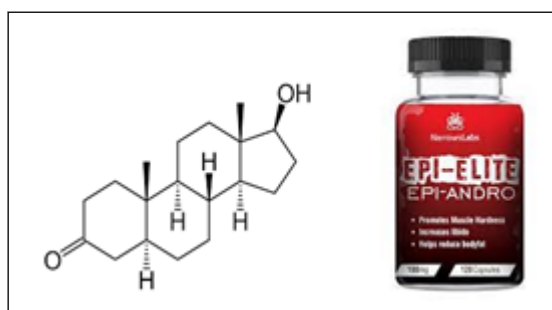
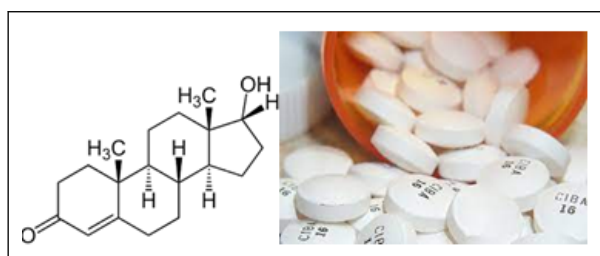
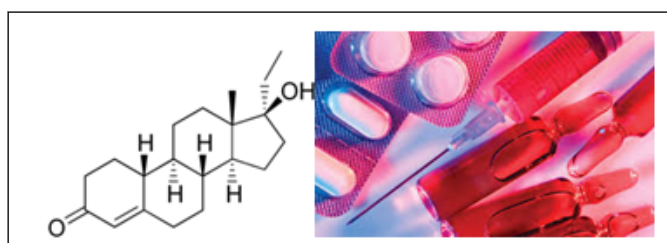
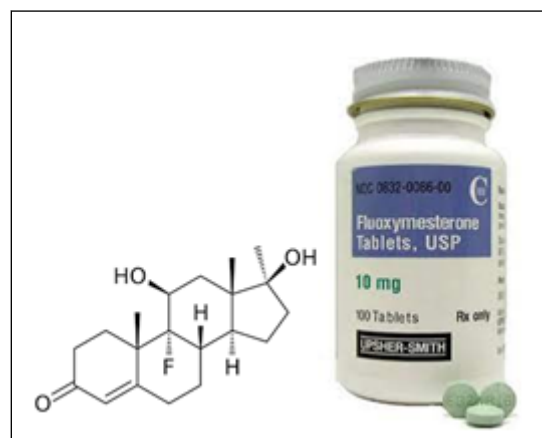
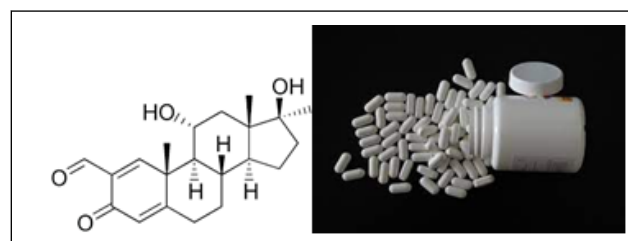
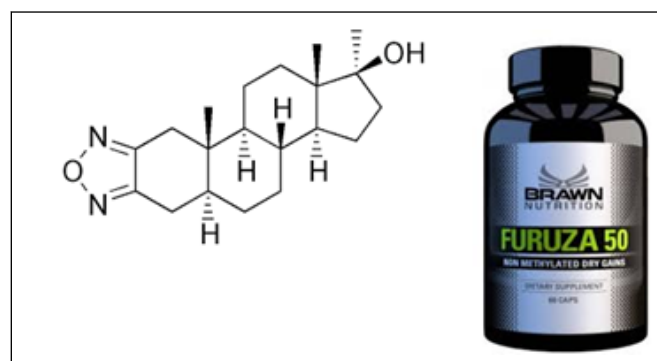
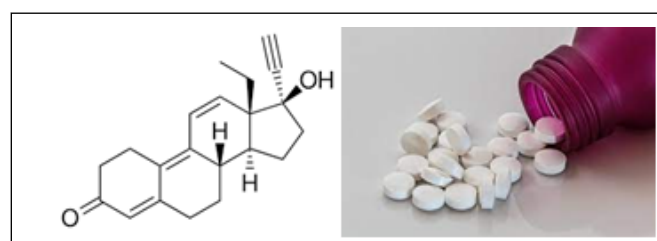


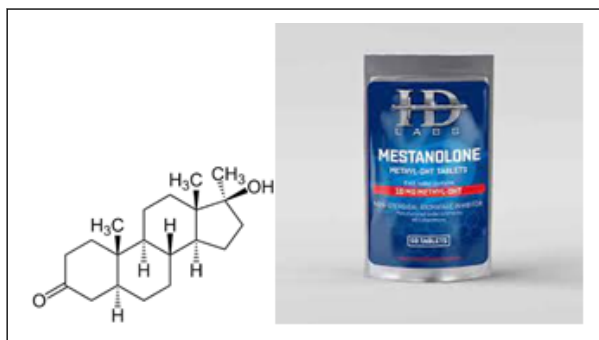
Desoxymethyltestosterone (17 α -methyl-5 α - androst-2-en-17 β -ol and 17 α -methyl-5 α - androst-3-en-17 β -ol)



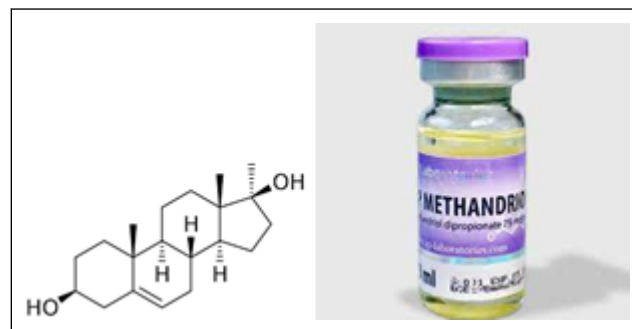
Calusterone (7 β ,17 α -dimethyltestosterone)



Drostanolone (2 α -Methyl-4,5 α -dihydrotestosterone)**Epiandrosterone (3 β -hydroxy-5 α -androst-17-one)****Epi-dihydrotestosterone (17 β -hydroxy-5 β -androst-3-one)****Epitestosterone (androst-4-en-17 α -ol-3-one)****Ethylestrenol (19-norpregna-4-en-17 α -ol)****Fluoxymesterone methyltestosterone)****(9 α -Fluoro-11 β -hydroxy-17 α -****Formebolone (2-formyl-11 α -hydroxy-17 α -methyl- δ 1-testosterone)****(2-formyl-11 α -hydroxy-17 α -methyl- δ 1-testosterone)****Furazabol (17 α -methyl [1,2,5] oxadiazolo[3',4':2,3]-5 α -androst-17 β -ol)****Gestrinone (17 α -Ethynyl-18-methyl- δ 9,11-19-nortestosterone)****(17 α -Ethynyl-18-methyl- δ 9,11-19-nortestosterone)****Mestanolone (17 α -Methyl-4,5 α -dihydrotestosterone)**



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



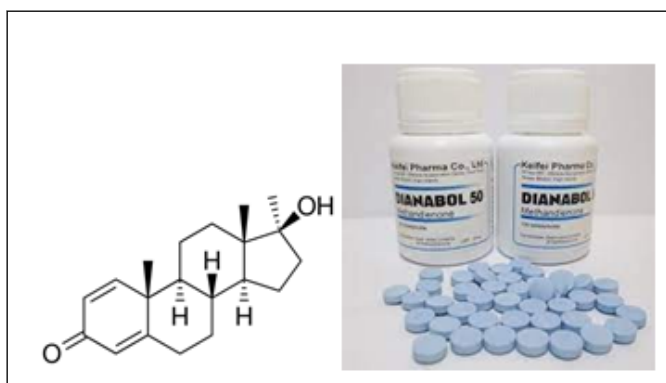
Methasterone (17 β -hydroxy-2 α ,17 α - dimethyl-5 α -androstan-3-one)



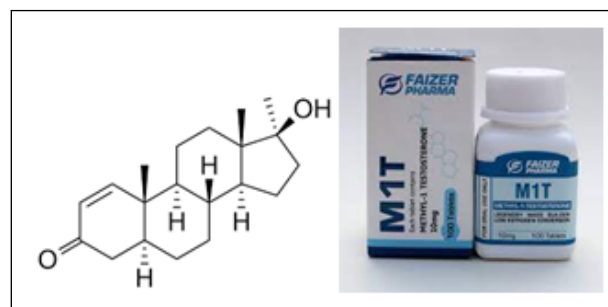
Metandienone (17 β -hydroxy-17 α - methylandrosta-1,4-dien-3-one)



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



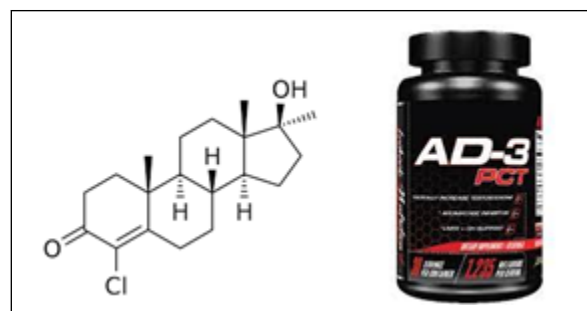
Metenolone (1-Methyl- δ 1-4,5 α -dihydrotestosterone)



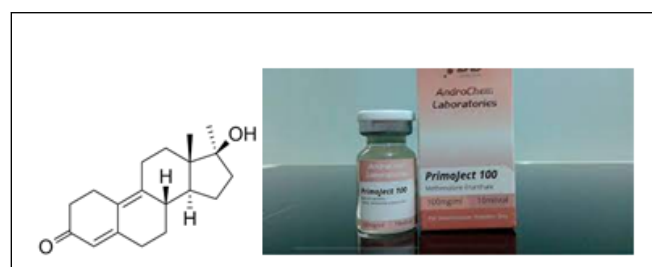
Methylclostebol (4-chloro-17 α -methyltestosterone)



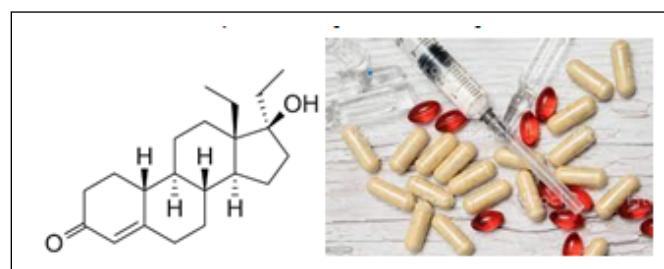
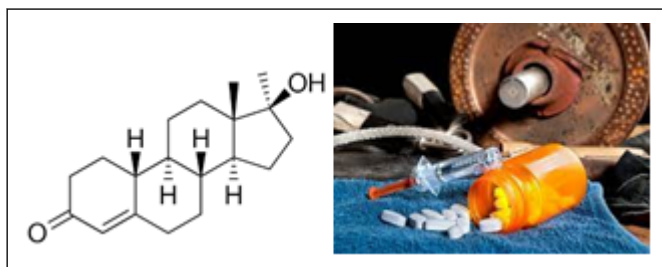
Methandriol (17 α -methylandrosta-5-ene-3 β ,17 β -diol)



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

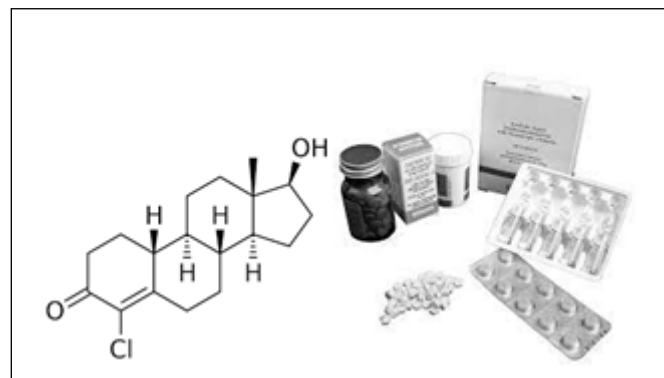
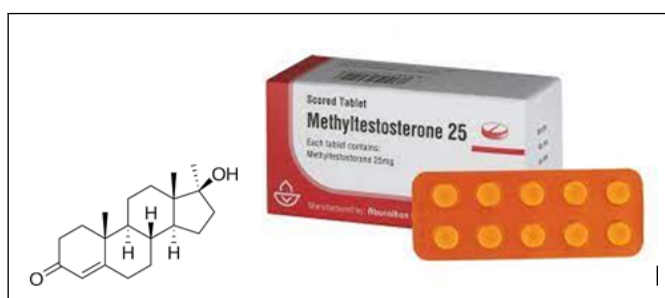


Methylnortestosterone (17 β -hydroxy-17 α -methyl-4-en-3-one)

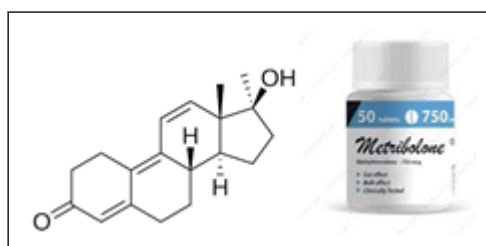


Norclostebol (4-chloro-17 β -ol-estr-4-en-3-one)

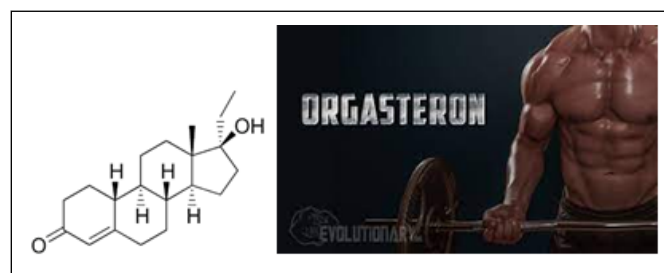
Methyltestosterone (17 α -Methyltestosterone)



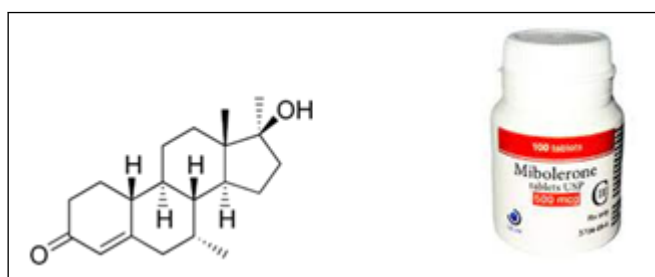
Metribolone (methyltrienolone, 17 β -hydroxy-17 α -methylene-4,9,11-trien-3-one)



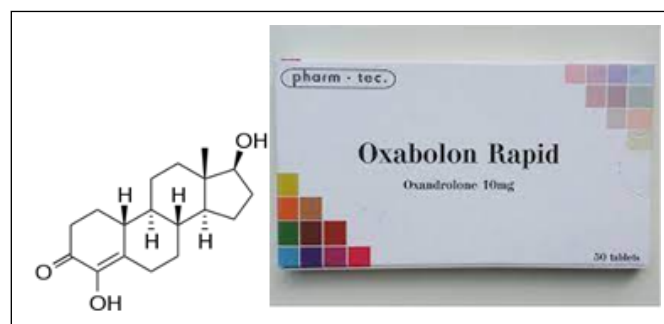
Norethandrolone (17 α -Ethyl-19-nortestosterone)



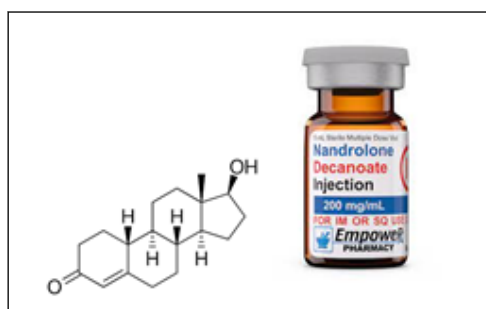
Mibolerone (7 α ,17 α -dimethyl-19-nortestosterone)



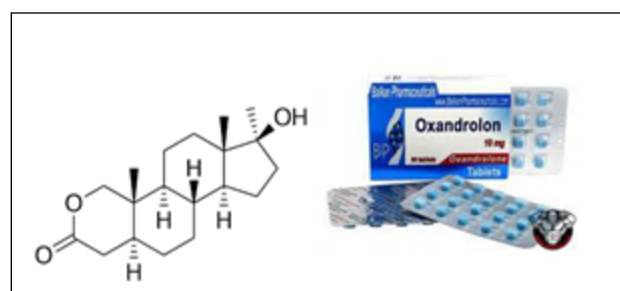
Oxabolone (4-Hydroxy-19-nortestosterone)



Nandrolone (19-nortestosterone)

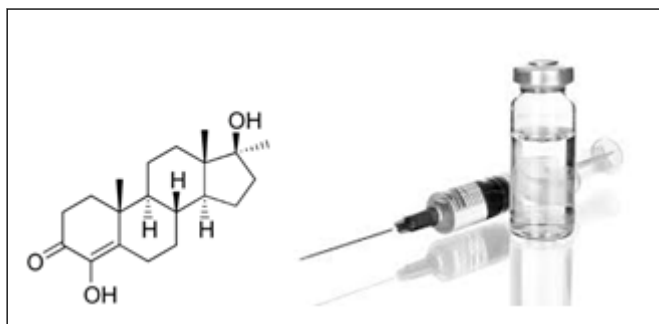


Oxandrolone (17 α -Methyl-2-oxa-5 α -androstan-17 β -ol-3-one)

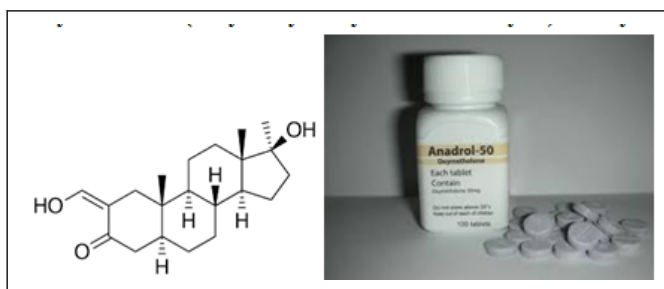


Norboletone (17 α -Ethyl-18-methyl-19-nortestosterone)

Oxymesterone (4-Hydroxy-17 α -methyltestosterone)



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



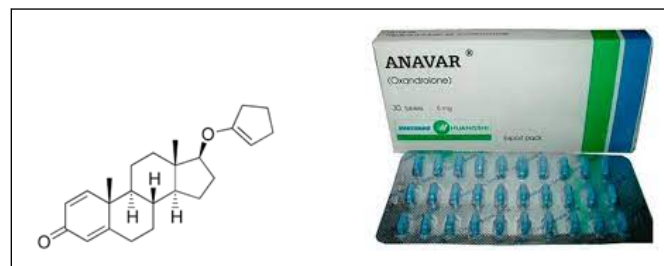
Prasterone (dehydroepiandrosterone, DHEA, 3 β -hydroxyandrost-5-en-17-one)



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



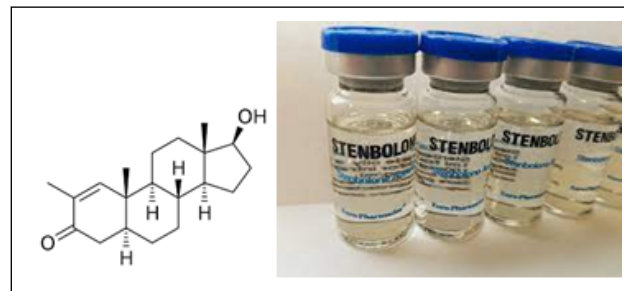
Quinbolone (1-Dehydrotestosterone 17 β -cyclopent-1-enyl ether)



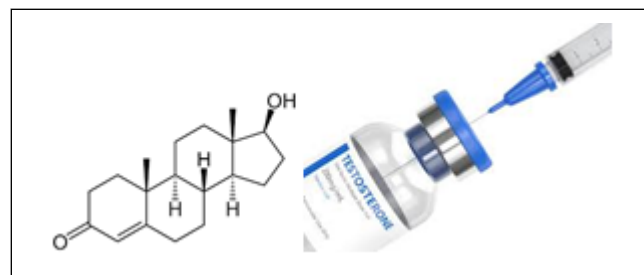
Stanozolol (17 α -Methyl-2'H-5 α -androst-2-eno[3,2-c]pyrazol-17 β -ol)



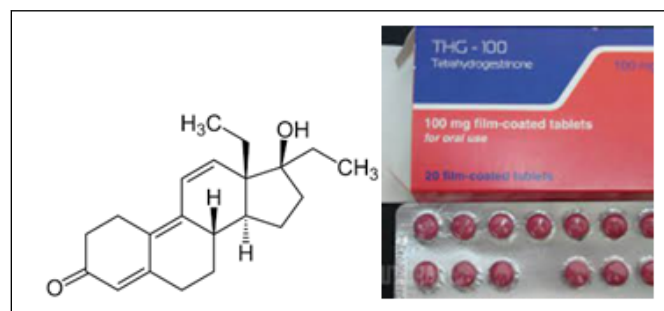
Stenbolone (2-Methyl-5 α -androst-1-en-17 β -ol-3-one)



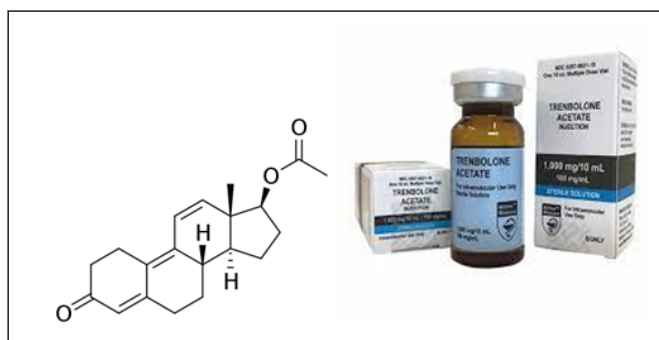
Testosterone (17 β -Hydroxyandrost-4-en-3-one)



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



Trenbolone acetate (17 β -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].

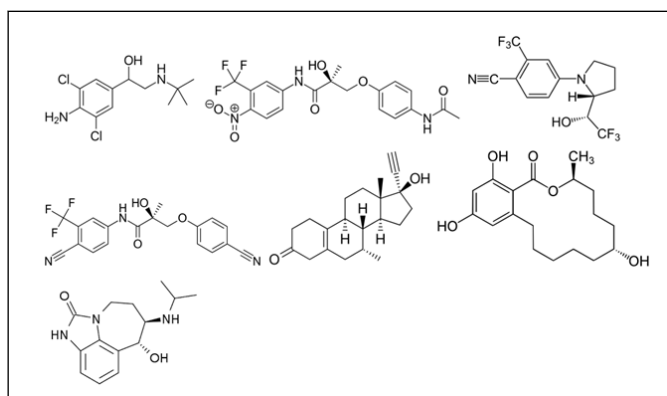


Figure 6: SARMs.

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

Erythropoietin [EPO] and agents affecting erythropoiesis:

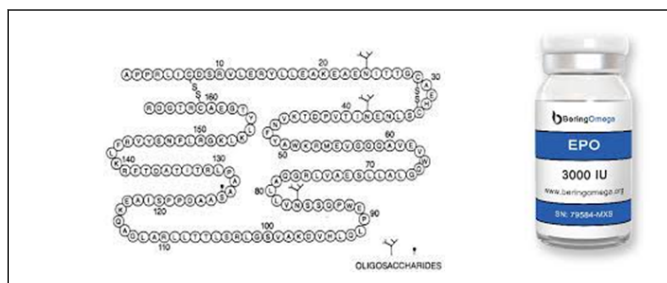


Figure 7: EPO.

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).

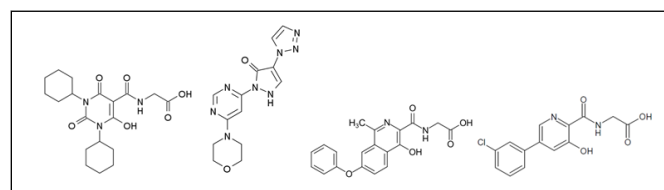
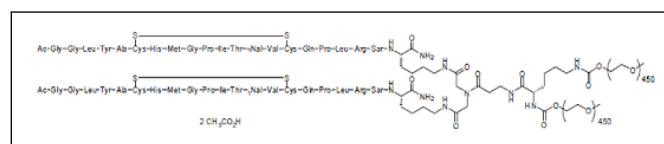
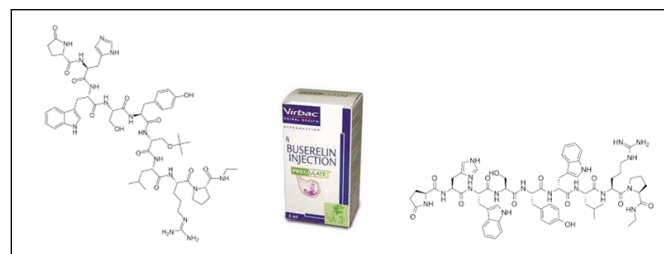


Figure 8: EPO agonists.

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.



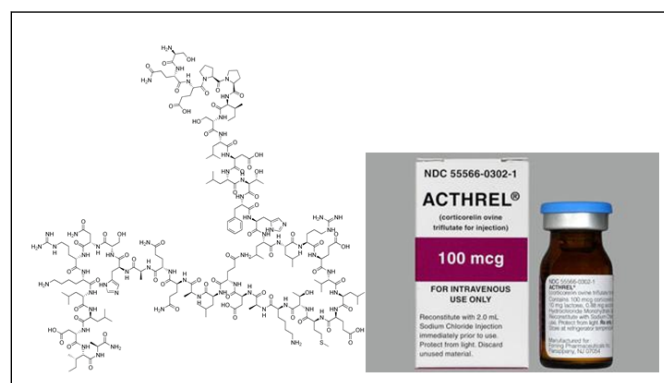
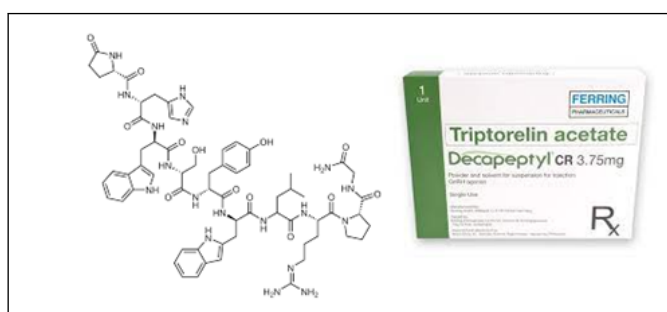
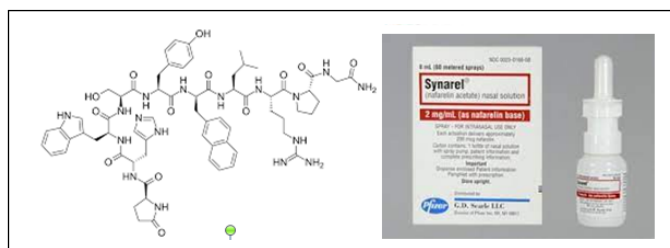
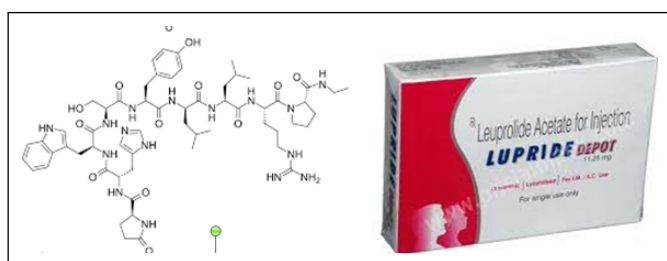
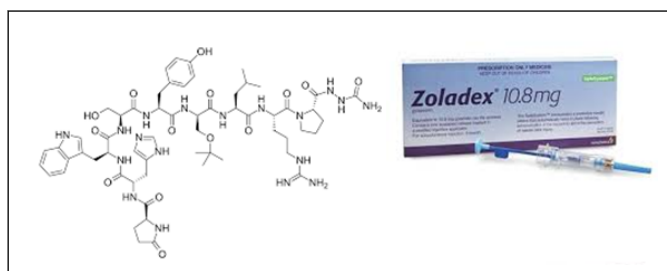
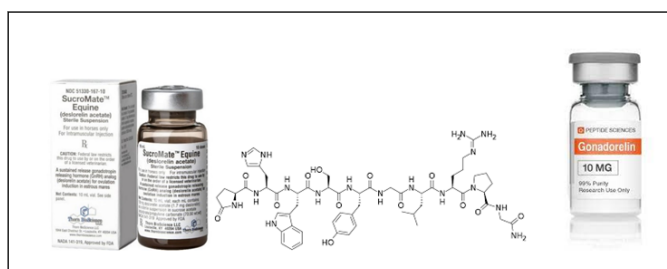


Figure 10: Corticotrophins and releasing factor.

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].

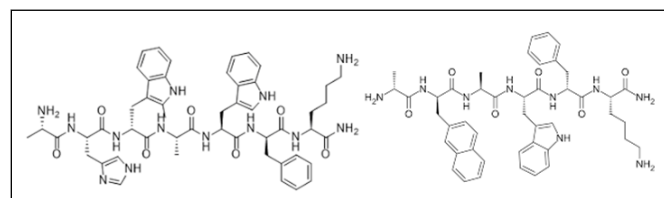
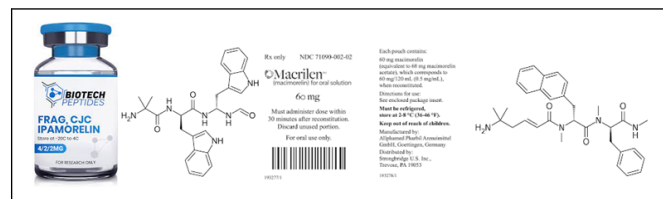
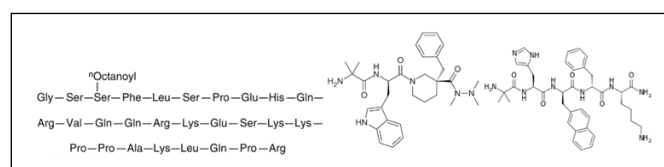
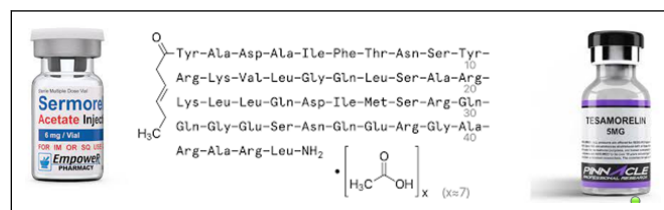


Figure 9: Peptide hormones and releasing factors. Corticotrophins and their releasing factors, e.g. corticorelin.

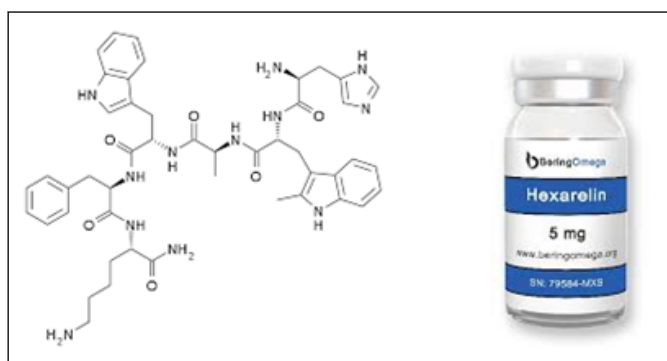


Figure 11: Growth hormone and releasing factor.

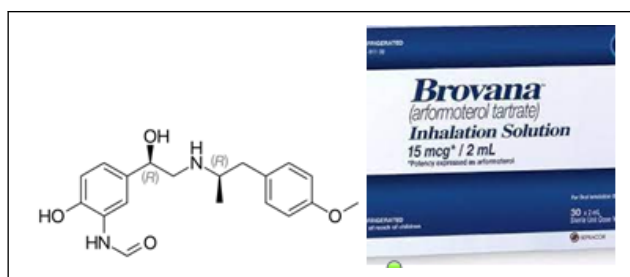
Growth factors and modulators

Including, but not limited to:

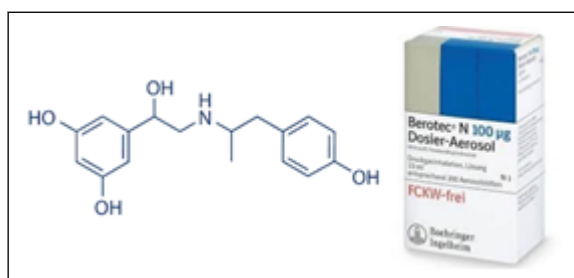
Fibroblast Growth Factors (FGFs), Hepatocyte Growth Factor (HGF), Insulin-like growth factor 1 (IGF-1) and its analogues, Mechano growth factors (MGFs), Platelet-Derived Growth Factor (PDGF), Thymosin- β 4 and its derivatives e.g. TB-500, Vascular Endothelial Growth Factor (VEGF) and other growth factors 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:

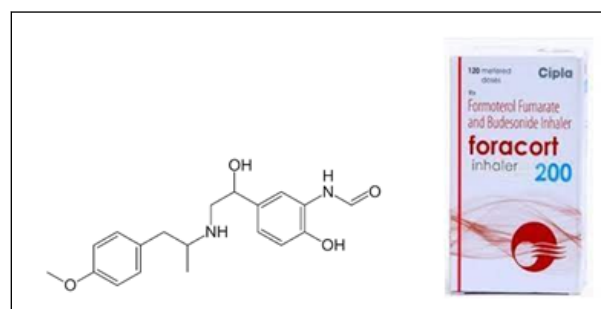
Arformoterol (N-[2-hydroxy-5-[(1R)-1-hydroxy-2-[[2(R)-1-(4-methoxyphenyl)propan-2-yl]amino]ethyl]phenyl]formamide)



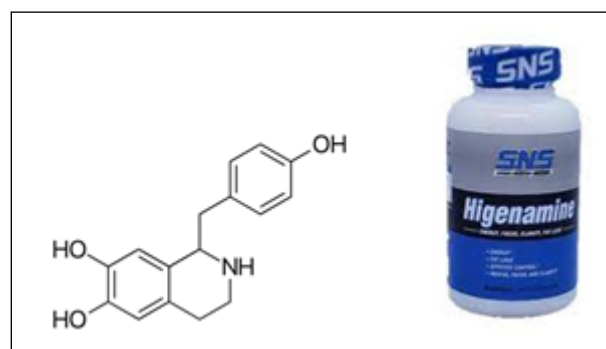
Fenoterol ((RR,SS)-5-(1-hydroxy-2-[[2-(4-hydroxyphenyl)-1-methylethyl]amino]ethyl)benzene-1,3-diol)



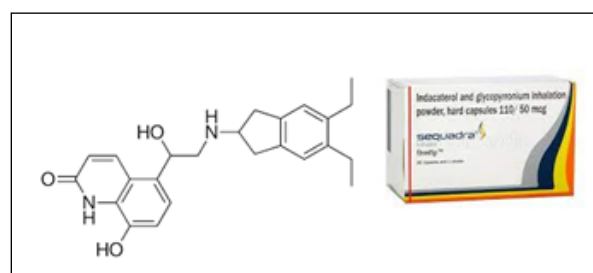
Formoterol ((RR,SS)-N-[2-hydroxy-5-[1-hydroxy-2-[1-(4-methoxyphenyl)propan-2-ylamino]ethyl]phenyl]formamide)



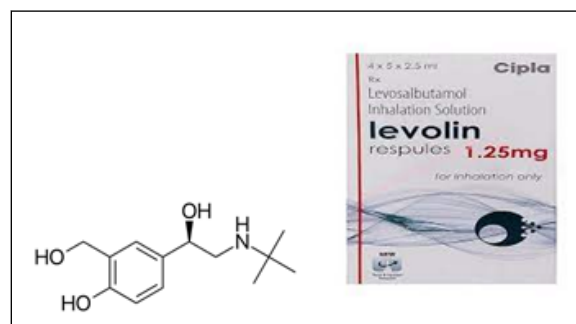
Higenamine (1-[[4-Hydroxyphenyl]methyl]-1,2,3,4-tetrahydroisoquinoline-6,7-diol)



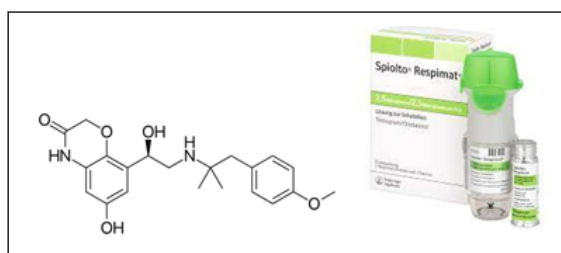
Indacaterol (5-[2-[[5,6-Diethyl-2,3-dihydro-1H-inden-2-yl]amino]-1-hydroxyethyl]-8-hydroxyquinolin-2(1H)-one)



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)

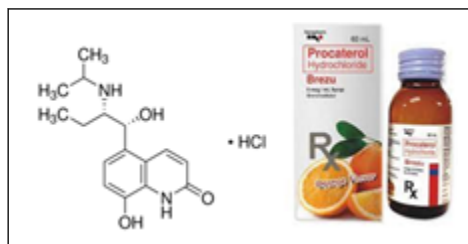
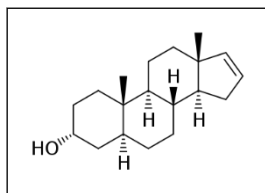


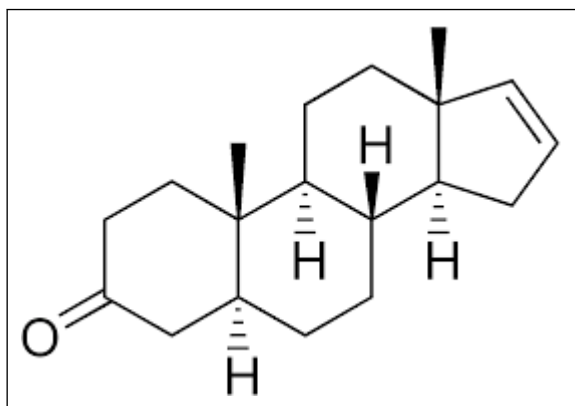
Figure-11: Growth factors modulators.

Aromatase inhibitors

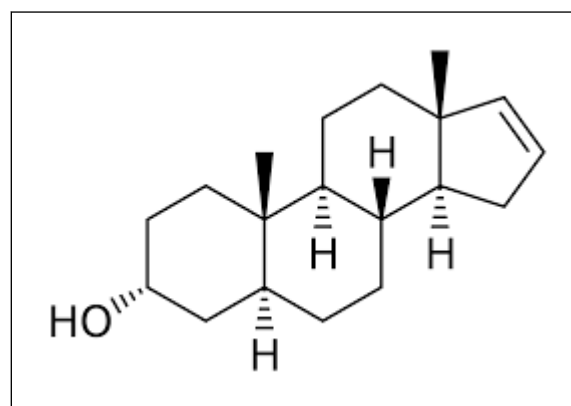
2-Androst-enol (5α-androst-2-en-17-ol)



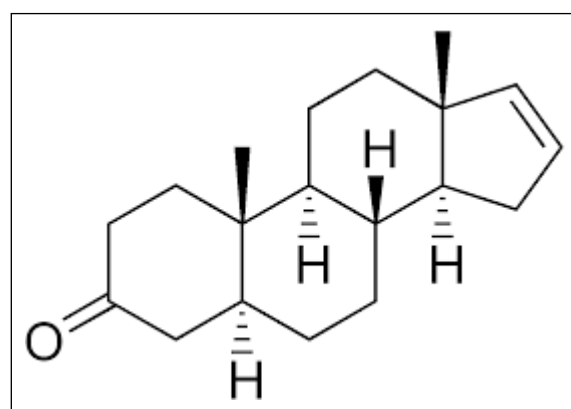
2-Androstenone (5α-androst-2-en-17-one)



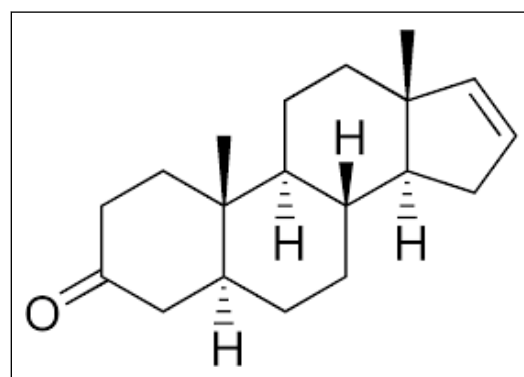
3-Androst-enol (5α-androst-3-en-17-ol)



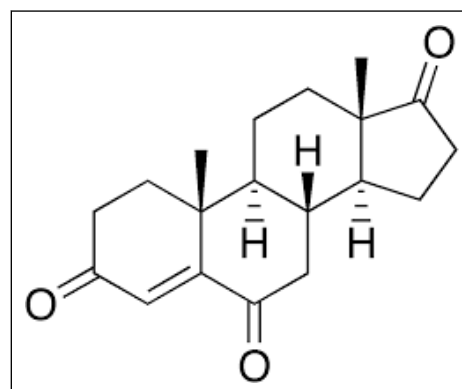
3-Androstenone (5α-androst-3-en-17-one)



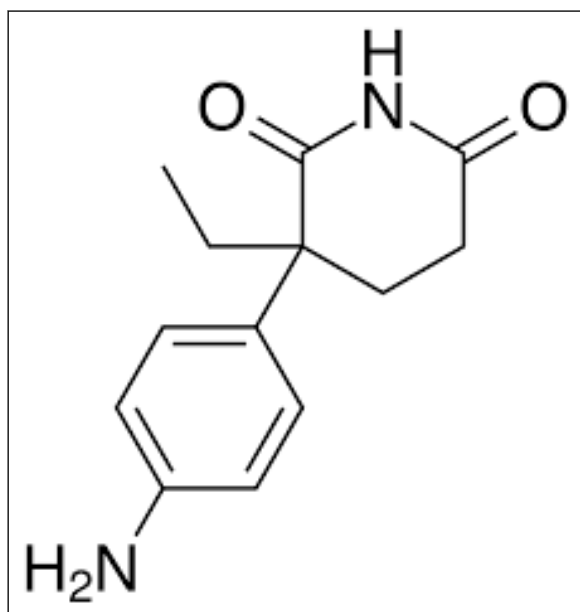
4-Androstene-3,6,17 trione (6-oxo)



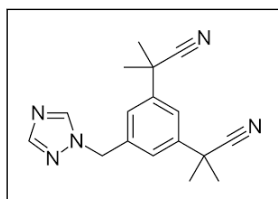
Aminoglutethimide ((RS)-3-(4-aminophenyl)-3-ethyl-piperidine-2,6-dione)



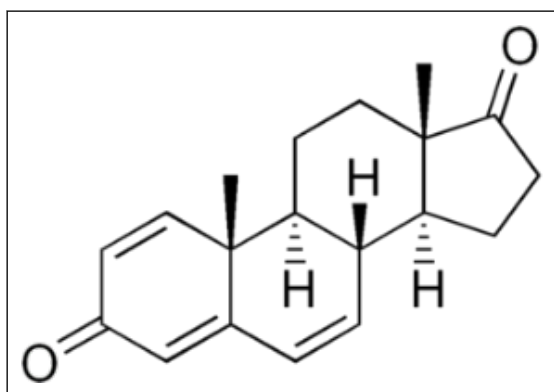
Anastrozole (2,2'-[5-(1H-1,2,4-triazol-1-ylmethyl)-1,3-phenylene]bis(2-methylpropanenitrile))



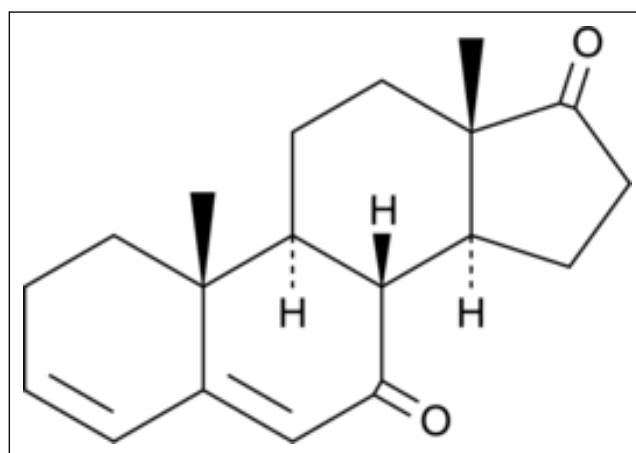
Androsta-1,4,6-triene-3,17-dione (androstatrienedione)



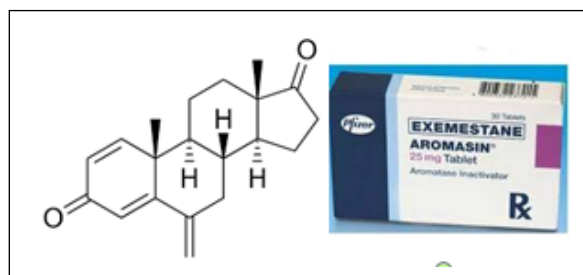
Androsta-3,5-diene-7,17-dione (arimistane)



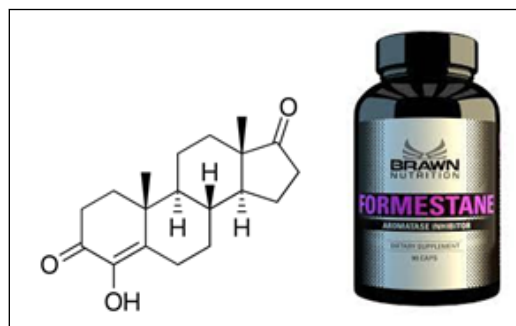
Exemestane (6-Methylideneandrosta-1,4-diene-3,17-dione)



Formestane (4-Hydroxyandrosta-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 12: Aromatase inhibitors.

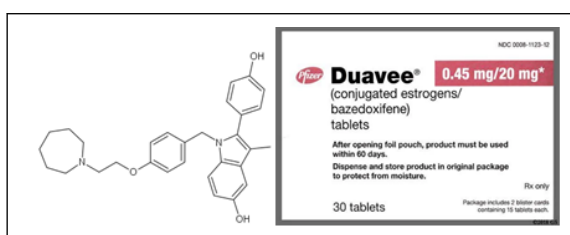
Anti-estrogenic substances [anti-estrogenic and selective estrogenic receptor modulators SERMS

Including, but not limited to:

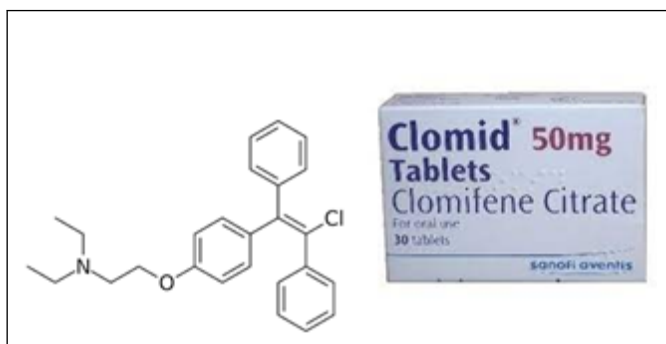
Bazedoxifene (1-[4-[2-(azepan-1-yl)ethoxy]benzyl]-2-(4-hydroxyphenyl)-3-methyl-1H-indol-5-ol)



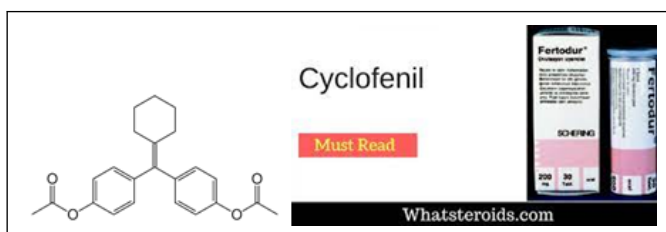
Clomifene ((E,Z)-2-[4-(2-chloro-1,2-diphenylethenyl)phenoxy]-N,N-diethylethanamine)



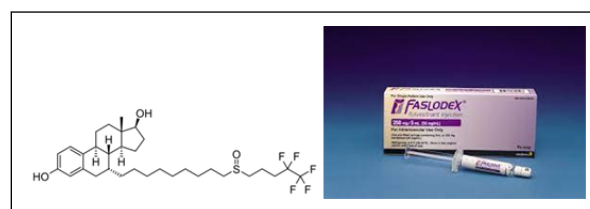
Cyclofenil ([4-[(4-Acetoxyphenyl)-cyclohexylidene-methyl]phenyl] acetate)



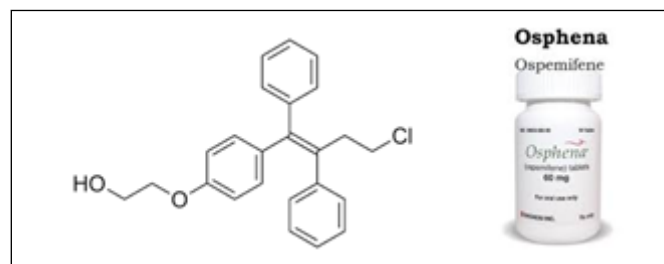
Fulvestrant (Pentafluoropentyl)-sulfinyl]nonyl]estra-1,3,5(10)-triene-3,17β-diol)



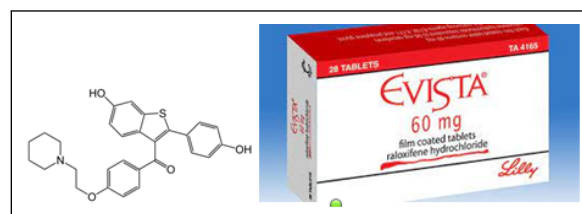
Ospemifene (2-(p-((Z)-4-chloro-1,2-diphenyl-1-butenyl)phenoxy)ethanol)



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)

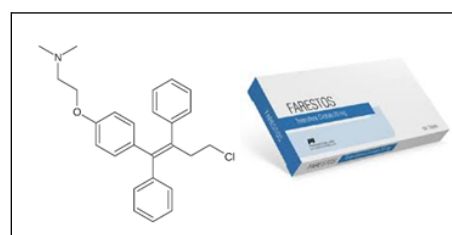


Toremifene (2-[4-[(1Z)-4-Chloro-1,2-diphenyl-but-1-en-1-yl]phenoxy]-N,N-dimethylethanamine)



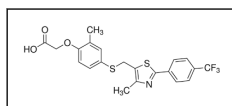
Figure-13: Antiestrogenic substances.

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)

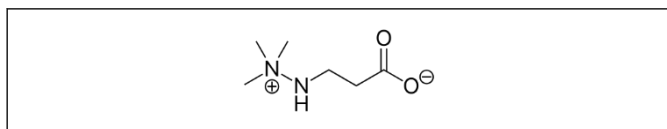
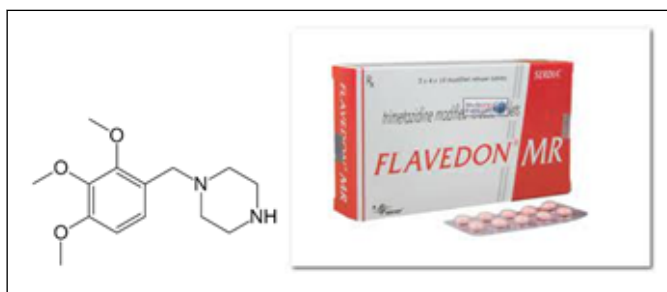


Figure 14: Metabolic modulators.

Exceptions

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



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

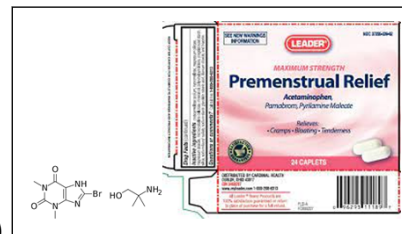


And topical ophthalmic administration of carbonic anhydrase inhibitors (e.g. dorzolamide, brinzolamide); Local administration of felypressin in dental anaesthesia. The detection in an Athlete's Sample at all times or In-Competition, as applicable, of any quantity of the following substances subject to 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: ample 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.

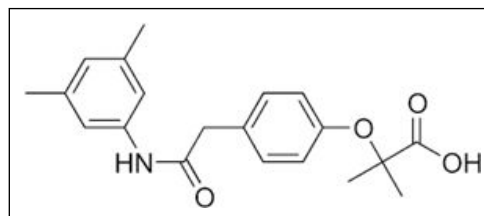
Gene & cell doping: The following, with the potential to enhance sport performance, are prohibited: The use of nucleic acids or nucleic acid analogues that may alter genome sequences and/ or alter gene expression by any mechanism. This includes but is not limited to gene editing, gene silencing and gene transfer technologies. The use of normal or genetically modified cells.

Stimulants

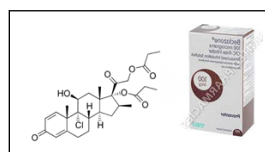
All glucocorticoids are prohibited when administered by oral, intravenous, intramuscular or rectal route.

Including, but not limited to:

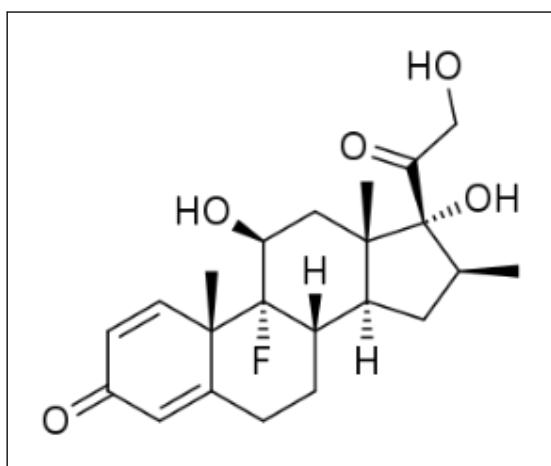
Beclomethasone



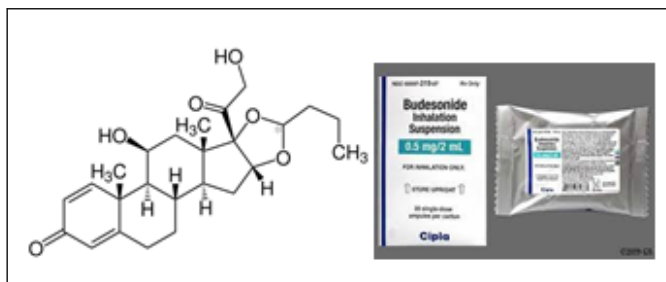
Betamethasone(11 β ,16 β)-9-Fluoro-11,17,21-trihydroxy-16-methylpregna-1,4-diene-3,20-dione)



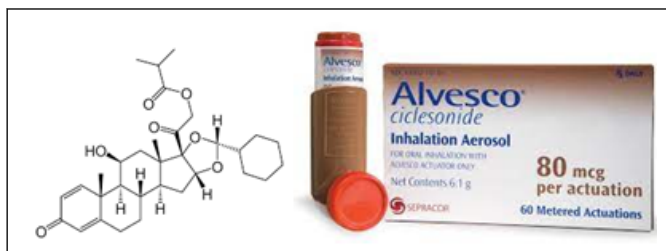
Budesonide (1 β ,21-Dihydroxy-16 α ,17 α -[butane-1,1-diylbis(oxy)]pregna-1,4-diene-3,20-dione)



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 (17 α ,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)



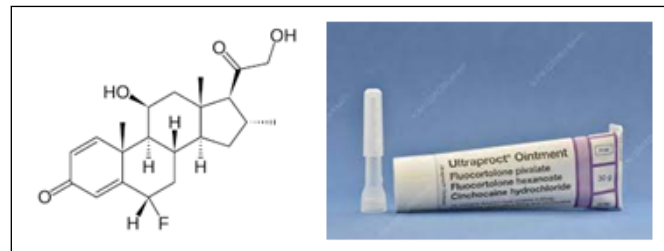
Dexamethasone (8S,9R,10S,11S,13S,14S,16R,17R)-9-Fluoro-11,17-dihydroxy-17-(2-hydroxyacetyl)-10,13,16-trimethyl-6,7,8,9,10,11,12,13,14,15,16,17-dodecahydro-3H-cyclopenta[a]phenanthren-3-one)



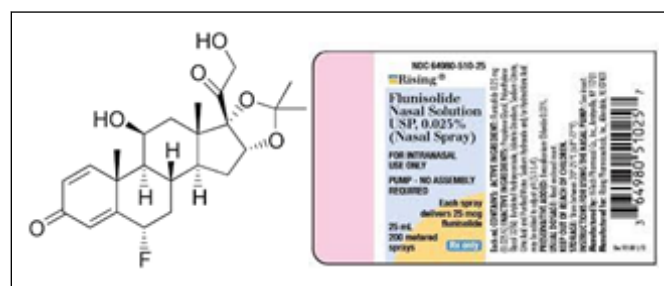
Flucortolone(6S,8S,9R,10S,11S,13S,14S,16R,17S)-6-fluoro-11-hydroxy-17-(2-hydroxyacetyl)-10,13,16-trimethyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-one)



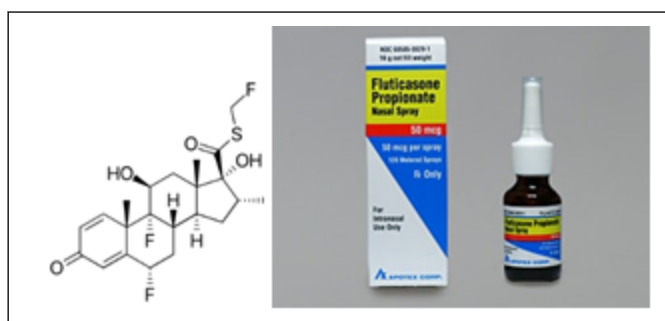
Flunisolide(6 α -Fluoro-11 β ,16 α ,17,21-tetrahydroxypregna-1,4-diene-3,20-dione acetone cyclic 16,17-acetal)



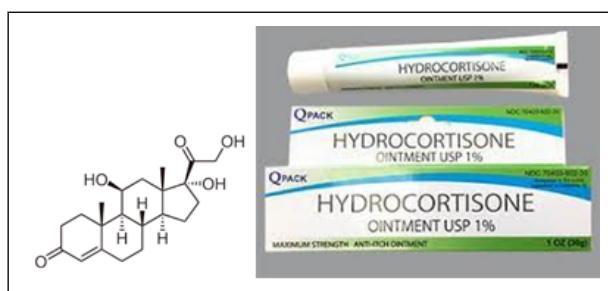
Fluticasone(6 α ,9 α -Difluoro-11 β ,17 α -dihydroxy-16 α -methyl-21-thia-21-fluoromethylpregna-1,4-dien-3,20-dione)



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



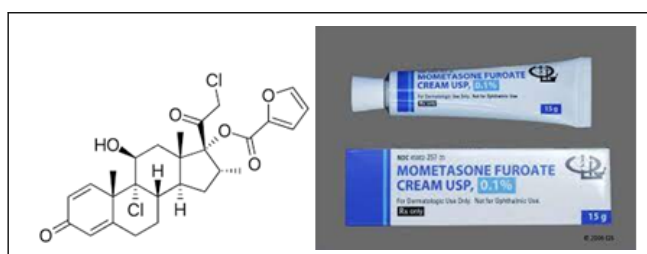
Methylprednisolone ((11 β ,17,21-Trihydroxy-6 α -methylpregna-1,4-diene-3,20-dione)



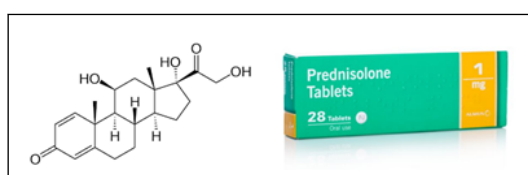
Mometasone (9 α ,21-Dichloro-11 β ,17 α -dihydroxy-16 α -methylpregna-1,4-diene-3,20-dione 17 α -(2-furoate))



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



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



Triamcinoloneacetonide(4 α S,4 β R,5S,6 α S,6 β S,9 α R,10 α S,10 β S)-4 β -fluoro-6 β -glycoloyl-5-hydroxy-4 α ,6 α ,8,8-

tetramethyl-4 α ,4 β ,5,6,6 α ,6 β ,9 α ,10,10 α ,10 β ,11,12-dodecahydro-2H-naphtho[2',1':4,5]indeno[1,2-d][1,3]dioxol-2-one)

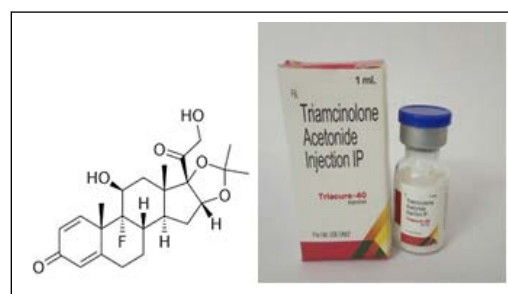


Figure 15: Glucocorticoids.

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 16: Dope & Race.

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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