

## Doping



## Doping

- Dop, an alcoholic drink used as a stimulant in ceremonial dances in 18th century Southern Africa.
- Dutch word doop (a thick dipping sauce): American slang to describe how robbers stupefied victims by mixing tobacco with the seeds of *Datura stramonium* (jimsonweed) which contains a number of tropane alkaloids, causing sedation, hallucinations and confusion.
- 1889 "dope" was used in connection with the preparation of a thick viscous preparation of opium for smoking,
- 900, dope was also defined as "a preparation of drugs designed to influence" the performance of a racehorse

## DOPING:

Long and short term

In- and out-of-competition

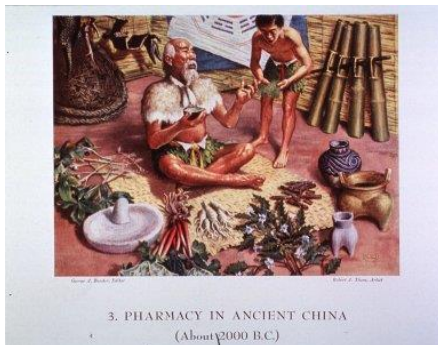
PHARMACOLOGICAL – chemical material (drugs, hormones)

PHYSIOLOGICAL – blood transfusion, EPO, early pregnancy

GENETIC – gene expression control

## History

3000-2000 B.C. China – *Ephedra plant*



*Ephedra sinica*

**1500 B.C.** (Philostrat, Galen) vine during Olympic games

**100 B.C.** (Pliniusz Younger) – long distance runners

South America: Inka: coca leaves, peyote

**Berserkers, warriors** – animal testicles

**1935 r.** synthesis of testosterone

**1942 r.** application of testosterone in German special troops

**1945 r. first application of testosterone in horse racing**

**1967 r.** Medical commission of MKOI.

**1999r.** World Anti-Doping Agency (WADA)



**P1 ALCOHOL**

Alcohol (ethanol) is prohibited *In-Competition* only, in the following sports. Detection will be conducted by analysis of breath and/or blood. The doping violation threshold is equivalent to a blood alcohol concentration of 0.10 g/L.

- Air Sports (FAI)
- Archery (WA)
- Automobile (FIA)
- Powerboating (UIM)

**P2 BETA-BLOCKERS**

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)\*
- Skiing/Snowboarding (FIS) in ski jumping, freestyle aeriels/halfpipe and snowboard halfpipe/big air
- 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.

\*Also prohibited *Out-of-Competition*

Including, but not limited to:

Acebutolol;	Labetalol;
Alprenolol;	Levobunolol;
Atenolol;	Metipranolol;
Betaxolol;	Metoprolol;
Bisoprolol;	Nadolol;
Bunolol;	Oxprenolol;
Carteolol;	Pindolol;
Carvedilol;	Propranolol;
Celiprolol;	Sotalol;
Esmolol;	Timolol.

**Since January 1, 2015 r – excluded for 4 years from competing**

Table 1: Total Samples Analyzed (All Sports)\*

## A Samples Analyzed

Sport	Analyzed	AAFs <sup>1</sup>	(%)	ATFs <sup>2</sup>	(%)	Total Findings <sup>3</sup>	
							(%)
Olympic Sports <sup>4</sup>	196,581	1,634	0.83%	1,585	0.81%	3,219	1.64%
Non-Olympic Sports <sup>5</sup>	32,831	888	2.70%	320	0.97%	1,208	3.68%
Non-ADAMS Data <sup>6</sup>	73,957	1,287	1.74%	198	0.27%	1,485	2.01%
<b>TOTAL</b>	<b>303,369</b>	<b>3,809</b>	<b>1.26%</b>	<b>2,103</b>	<b>0.69%</b>	<b>5,912</b>	<b>1.95%</b>

<sup>1</sup> The *Adverse Analytical Findings* (AAF) in this report are not to be confused with adjudicated or sanctioned Anti-Doping Rule Violations (ADRV). "Adverse Analytical Finding" is defined in the World Anti-Doping Code as "A report from a WADA -accredited laboratory or other WADA -approved laboratory that, consistent with the International Standard for Laboratories and related Technical Documents, identifies in a Sample the presence of a *Prohibited Substance* or its *Metabolites* or *Markers* (including elevated quantities of endogenous substances) or evidence of the use of a *Prohibited Method*." These figures may not be identical to sanctioned cases, as the figures given in this report may contain findings that underwent the Therapeutic Use Exemption (TUE) approval process.

<sup>2</sup> The *Atypical Findings* (ATF) in this report are not to be confused with adjudicated or sanctioned Anti-Doping Rule Violations (ADRV). "Atypical Finding" is defined in the World Anti-Doping Code as "A report from a WADA -accredited laboratory or other WADA -approved laboratory which requires further investigation as provided by the International Standard for Laboratories or related Technical Documents prior to the determination of an *Adverse Analytical Finding*". *Atypical Findings* may correspond to multiple measurements performed on the same *Athlete*, such as in cases of longitudinal studies on testosterone.

Table 2: Comparison of Years 2011 to 2015 - Olympic and Non-Olympic Figures

	2011 A Samples Analyzed	2012 A Samples Analyzed	2013 A Samples Analyzed	2014 A Samples Analyzed	2015 A Samples Analyzed	2015 vs 2014 A Samples Analyzed (% change)
Olympic Sports*	167,820	184,955	176,502	186,739	196,581	+ 5.3%
Non-Olympic Sports**	75,373	82,690	93,376	96,565	106,788	+ 10.6%
<b>TOTAL</b>	<b>243,193</b>	<b>267,645</b>	<b>269,878</b>	<b>283,304</b>	<b>303,369</b>	<b>+ 7.1%</b>

	2011 AAFs <sup>1</sup>	2012 AAFs <sup>1</sup>	2013 AAFs <sup>1</sup>	2014 AAFs <sup>1</sup>	2015 AAFs <sup>1</sup>	2015 vs 2014 AAFs <sup>1</sup> (% change)
Olympic Sports*	1,762	1,831	1,710	1,440	1,634	+ 13.5%
Non-Olympic Sports**	1,123	1,359	1,819	1,713	2,175	+ 27.0%
<b>TOTAL</b>	<b>2,885</b>	<b>3,190</b>	<b>3,529</b>	<b>3,153</b>	<b>3,809</b>	<b>+ 20.8%</b>

	2011		2012		2013		2014		2015		2015 vs 2014
	% AAFs <sup>1</sup>	% Total Findings <sup>2</sup>	% AAFs <sup>1</sup>	% Total Findings <sup>2</sup>	% AAFs <sup>1</sup>	% Total Findings <sup>2</sup>	% AAFs <sup>1</sup>	% Total Findings <sup>2</sup>	% AAFs <sup>1</sup>	% Total Findings <sup>2</sup>	Total Findings <sup>2</sup>
Olympic Sports*	1.05	1.91	0.99	1.56	0.97	1.94	0.77	0.99	0.83	1.64	+ 0.65
Non-Olympic Sports**	1.49	2.19	1.64	2.21	1.95	2.72	1.77	2.09	2.04	2.52	+ 0.43
<b>Overall</b>	<b>1.19</b>	<b>2.00</b>	<b>1.19</b>	<b>1.76</b>	<b>1.31</b>	<b>2.21</b>	<b>1.11</b>	<b>1.36</b>	<b>1.26</b>	<b>1.49</b>	<b>+ 0.13</b>

Table 6: Total IC and OOC Samples Analyzed per Laboratory (as reported in ADAMS)

Laboratory	Urine						Blood <sup>1</sup>						Total Samples
	IC Samples	IC ATF	IC AAF	OOC Samples	OOC ATF	OOC AAF	IC Samples	IC ATF	IC AAF	OOC Samples	OOC ATF	OOC AAF	
Almaty, Kazakhstan	1915	-	20	1250	-	5	74	-	-	74	-	-	3313
Ankara, Turkey	897	-	4	240	-	5	-	-	-	-	-	-	1137
Athens, Greece	3334	7	70	588	-	2	-	-	-	-	-	-	3922
Bangkok, Thailand	1785	30	39	1224	35	10	23	-	-	-	-	-	3032
Barcelona, Spain	2222	38	33	1097	9	31	138	-	-	280	-	-	3737
Beijing, China	6478	262	19	9059	383	38	177	1	-	665	2	-	16379
Bloemfontein, South Africa	2463	1	67	1121	-	12	14	-	-	107	-	-	3705
Bogota, Colombia	5341	9	37	362	3	-	80	-	-	84	-	-	5867
Bucharest, Romania	2043	-	12	1646	1	8	60	-	-	184	-	-	3933
Cologne, Germany	9615	9	158	10104	1	65	503	-	-	2067	-	1	22289
Doha, Qatar	5785	1	133	2659	-	16	191	-	-	254	-	-	8889
New Delhi, India	811	4	12	317	2	3	6	-	-	37	-	-	1171
Dresden, Germany	5036	2	55	4655	1	5	44	-	-	757	-	-	10492
Ghent, Belgium	4501	-	85	1538	-	27	20	-	-	14	-	-	6073
Havana, Cuba	1156	-	20	2151	-	13	-	-	-	191	-	-	3498
Helsinki, Finland	1218	-	10	1241	-	3	67	-	-	223	-	-	2749
Lausanne, Switzerland	4141	125	49	4404	217	16	126	-	-	502	-	-	9173
Lisbon, Portugal	2268	2	26	735	3	-	-	-	-	67	-	-	3070
London, UK	4470	4	41	2739	1	19	326	-	-	566	-	-	8101
Los Angeles, USA	5088	1	46	2661	3	16	-	-	-	-	-	-	7749
Madrid, Spain	3782	36	51	1232	8	11	109	-	-	266	-	1	5389
Montreal, Canada	6979	74	171	3497	11	44	466	1	-	270	-	-	11212
Moscow, Russia	7618	19	131	6368	-	53	473	2	-	891	-	1	15350
Oslo, Norway	1946	-	28	1847	-	7	25	-	-	530	-	-	4348
Paris, France	6614	41	154	2639	1	7	450	-	-	237	-	-	9940
Rio de Janeiro, Brazil	1400	4	25	239	-	3	50	-	-	148	-	-	1837
Rome, Italy	5540	3	74	1445	1	2	179	-	1	229	-	-	7393
Seibersdorf, Austria	5194	-	69	3079	-	8	221	-	-	326	-	-	8820
Seoul, Korea	3586	7	29	1418	6	37	114	-	1	21	-	-	5139
Stockholm, Sweden	1558	-	32	2347	2	25	73	-	-	99	-	-	4077
Sydney, Australia	2679	64	32	3212	133	9	81	-	-	640	-	-	6612
Mexico City, Mexico	1795	1	102	1729	1	44	35	-	-	-	-	-	3559
Tokyo, Japan	4552	191	23	1554	59	3	37	-	-	89	-	-	6232
Salt Lake City, USA	2949	-	48	3392	-	18	208	-	-	903	-	-	7452
Warsaw, Poland	2084	39	41	1334	42	6	90	-	-	265	2	-	3773
<b>Totals</b>	<b>128,843</b>	<b>974</b>	<b>1,946</b>	<b>85,123</b>	<b>923</b>	<b>571</b>	<b>4,460</b>	<b>4</b>	<b>2</b>	<b>10,986</b>	<b>4</b>	<b>3</b>	<b>229,412</b>

Table 16: Summary - Substances Identified as AAFs in Each Drug Class in ADAMS (All Sports)

Substance Group	Occurrences	% of all ADAMS reported findings
S1. Anabolic Agents	1728	50%
S6. Stimulants	528	15%
S5. Diuretics and Other Masking Agents	428	12%
S9. Glucocorticosteroids	215	6%
S4. Hormone and Metabolic Modulators	152	4%
S8. Cannabinoids	127	4%
S3. Beta-2 Agonists	115	3%
S2. Peptide Hormones, Growth Factors and Related Substances	98	3%
S7. Narcotics	21	1%
P2. Beta-Blockers	19	1%
M2. Chemical and Physical Manipulation	1	0.03%
P1. Alcohol	0	0%
M1. Enhancement of Oxygen Transfer	0	0%
<b>TOTAL*</b>	<b>3432</b>	

Table 17: Summary - Substances Identified as ATFs in Each Drug Class in ADAMS (All Sports)

Substance Group	Occurrences	% of all ADAMS reported findings
S2. Peptide Hormones, Growth Factors and Related Substances	1778	93%
S1. Anabolic Agents	117	6%
S7. Narcotics	6	0.3%
S.4 Hormone and Metabolic Modulators	3	0.2%
S.6 Stimulants	3	0.2%
Other	3	0.2%
<b>TOTAL*</b>	<b>1910</b>	

## S1.1 Anabolic Agents

	Occurrences	drug class
stanozolol	296	22%
nandrolone	176	13%
metandienone	143	10%
drostanolone	124	9%
the GC/C/IRMS results are consistent with the exogenous origin of the Steroid Profile target compound(s)	124	9%
dehydrochloromethyl-testosterone	91	7%
metenolone	82	6%
trenbolone	74	5%
boldenone	60	4%
oxandrolone	47	3%
the GC/C/IRMS result for 19-Norandrosterone is consistent with an exogenous origin	34	2%
mesterolone	29	2%
the GC/C/IRMS result for Boldenone and/or boldenone metabolite(s) is consistent with an exogenous origin	19	1%
clostebol	14	1%
1-androstendione	9	1%
1-testosterone	9	1%
methyltestosterone	8	1%
methasterone	7	1%
oxymetholone	7	1%
boldione	4	0%
fluoxymesterone	3	0%
gestrinone	2	0%
methylstenbolone	2	0.1%
oxabolone	2	0.1%
testosterone	2	0.1%
19-norandrostenedione	1	0.1%
7-keto-DHEA	1	0.1%
danazol	1	0.1%
methyl-1-testosterone	1	0.1%
oxymesterone	1	0.1%
stenbolone	1	0.1%
<b>TOTAL*</b>	<b>1374</b>	



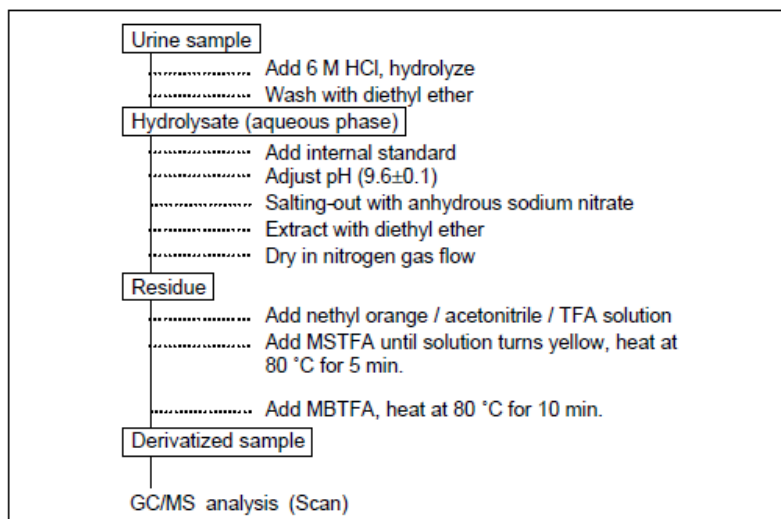
Table 1 Classification of Screening Methods in Sport Doping Analysis

Screening No.	Classification	Drug Example	Analytical Instrument
1	Volatile drugs	Amphetamine	GC-NPD
2	Difficult to volatilize drugs	Cocaine metabolites	GC/MS (Scan)
3	Thermally decomposed substances	Dexamethasone	Q-TOF LC/MS
4	Designer steroids	Testosterone	GC/MS (SIM)
	Anabolic steroids	Stanozolol	GC/HRMS (SIM)
5	Diuretics	Furosemide	GC/MS (SIM)
6	Steroid hormones	Androstenedione	GC/C/IRMS
7	$\beta$ -blocker agents	Metoprolol	GC/MS (Scan)
8	Peptide hormones	EPO, hCG	EIA, immunoblotting

GC-MS, GC-MS/MS

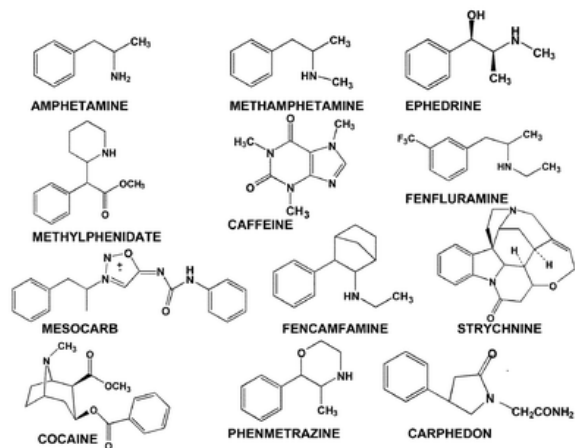
LC-MS, LC-MS/MS,

GC-C-IRMS



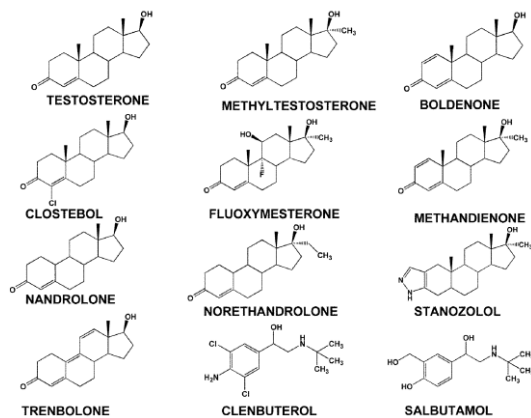


## Stimulants

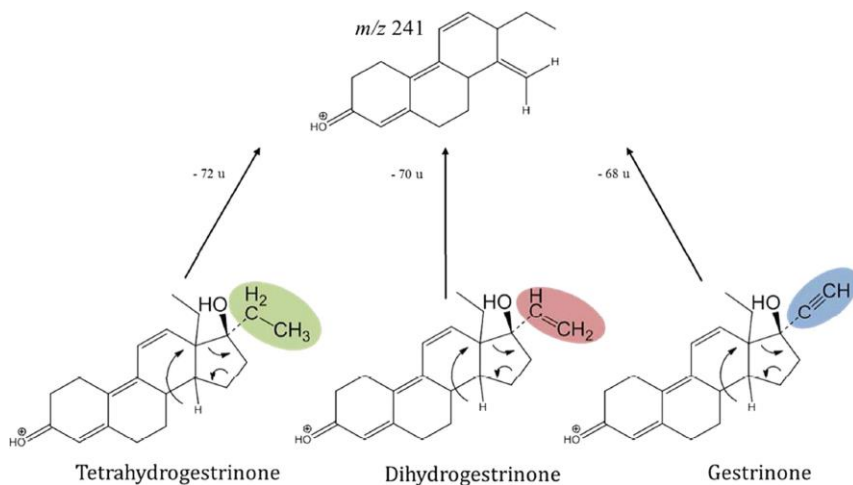


## Steroids (SAA)

- Testosteron
- Nandrolon
- Stanazonol
- Metanabol
- Sustanol
- Omnadren



## LC-MS/MS



## A BRIEF GUIDE TO DOPING IN SPORTS

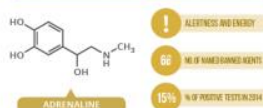
Doping in sports has been in the news in the run up to the Olympics. What drugs will doping tests at the Olympics be looking for? This graphic looks at some of the major groups of drugs used in doping, their effects, and why athletes might take them.

## ANABOLIC AGENTS



The largest class of prohibited drugs, and the most commonly detected. Anabolic steroids mimic the hormone testosterone, increasing muscle mass and physical strength. This class also includes some non-steroidal drugs. They have a range of side effects.

## STIMULANTS



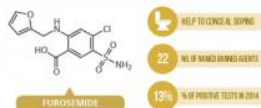
Stimulants are used to improve alertness, attention, and energy. Many behave similarly to the hormones adrenaline and noradrenaline. They include amphetamines. Taking them can increase blood pressure and cause cardiac problems.

## HORMONES AND MODULATORS



A range of drugs which generally interfere with human hormones. They can be used with anabolic steroids, to suppress some of the undesirable effects of these drugs. Some affect oestrogen levels in the body, whereas others affect human metabolism.

## DIURETICS AND MASKING AGENTS



Diuretics remove fluids from the body and can be used by athletes to regulate their body mass, as well as diluting urine so lower levels of banned substances are registered in tests. Masking agents are drugs taken to conceal the presence of illegal drugs in urine samples.

## NARCOTICS



This class includes narcotic analgesics such as morphine and codeine which can be enhance performance by increasing a competitor's tolerance to pain. They can also reduce anxiety which can be advantageous in some sports.

## OTHER BANNED SUBSTANCES



Many more substances are banned, including EPO, which promotes red blood cell production, getting oxygen to muscles more effectively. Some substances, such as alcohol and beta-blockers, are only prohibited in-competition for some sports.



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