

BANNED DRUGS AND ATHLETE IN SPORTS -1



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FOP/MO (KHELO INDIA SCHOOL GAMES 2017)

TOURNAMNET I/C 5th Elite Women Boxing Championship

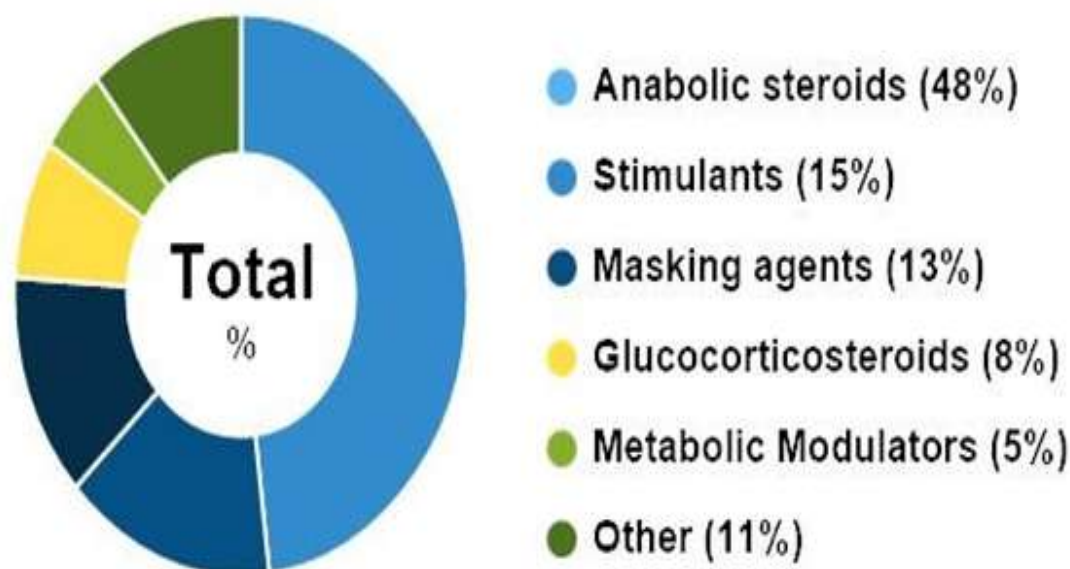
SCIENTIFIC COMMITTEE AT ISSEM

***SENIOR RESIDENT DOCOTR at SPORTS INJURY CENTRE, VMMC &
SJH , DELHI***

DOCTOR AT SPORTS AUTHORITY OF INDIA



Breakdown of banned substances



BBC SPORT

Skill

speed, reflexes,
limb-eye co-
ordination,
concentration

Skill sports
(driving/riding,
target shooting)

Out of competition
Training

In competition
Beta-blockers
Stimulants

- amphetamine
- alkaloids
- glucocorticoids

Strength

muscle mass

Power sports
(lifting, throwing,
boxing, sprinting)

Androgen doping

Direct

natural, synthetic,
designer, nutraceutical
& non-steroidal
androgens

Indirect

hCG, LH, anti-estrogens
GnRH analogs

Stamina

hemoglobin &
maximal O₂
transfer

Endurance sports
(long distance or
duration events)

Blood (Hb) doping

Direct

blood transfusion
• heterologous
• autologous

Indirect

erythropoietin,
biosimilars & analogs,
hypoxia-mimetics

Recovery

tissue repair after
injury & training

Contact sports &
intense physical
training

- GH
- GH releasing
peptides (GHRH,
Ghrelin analogs)
- Growth factors

HANS GUNNAR LILJENWALL



- Liljenwall was the first athlete disqualified at the Olympics by the International Olympic Committee in 1967.
- Liljenwall had "two beers" to calm his nerves before the pistol shooting event.
- Post Event Drug found him ----
+ for **COCAINE & ALCOHOL**

THOMAS HICHE



The cocktail of poison and brandy that led to Olympic gold

First case of **STRYCHNINE** doping dates back to the 1904 Olympics Games held in St. Louis

Hicks was given approximately 1mg of strychnine sulphate and some brandy, which appeared to revive him for mid exhaustion he was given a second dose of strychnine.

Anabolic Androgenic Steroid S1 .

1. Boldenone Undecylenate/ undecylenate (brand name EQUIPOISE & PARENABOL)

There is no therapeutic or medical use for boldenone in humans.

Not approved by the Food and Drug Administration (FDA) for use in humans for any reason.

Boldenone is used illegally in racehorses to enhance performance

ROBERT FARAH- CURIOUS CASE OF INADVERTENT DOPING



WORLD NO1 TENNIS DOUBLES was found positive for low concentrations of **Boldenova** in urine --An intentional doping violation can carry a four-year ban

He had eaten beef ('solomillo') the night before the test and that it had contained residue of boldenone injected into the cow as a growth promoter prior to slaughter.

APARNA POPAT- *D'Cold Total* leaves Popat in the cold



- The International Badminton Federation, banned Aparna Lalji Popat, India's No. 1 women's badminton player ranked 28th in the world, for three months, for contravening IBF anti-doping statutes.
- *D'ColdTotal* contains *PHENYLPROPANOLAMINE* at a concentration level above the International Olympic Committee's stipulations.

- The current IOC cut-off concentrations phenylpropanolamine are 25 mg

2. Metandienone

- **Metandienone**, also known as **methandienone** or **methandrostenolone** and sold under the brand name **Dianabol (D-Bol)**
- .

Arnold Schwarzenegger



- The standard protocol going around then was 3 **Dianabol** a day, and 1 shot of Primobolan per week.

Narsingh Yadav Doping Scandal



- Wrestler Narsingh Yadav has been suspended for the Rio Olympics
- Effect may fade away but may persist for six-12 weeks in urine i.e last longer.

ANABOLIC AND ANDROGENIC EFFECTS ON A PERSON

- The ANABOLIC nature increases nitrogen retention.... MUSCLE PRODUCTION.
- while the ratio of ANABOLIC to ANDROGENIC activity of metandienone is improved relative to that of TESTOSTERONE , the drug does still possess moderate androgenic activity and is capable of producing severe VIRILIZATION in women and children

- Metandienone binds to and activates the ANDROGEN R (AR) in order to exert its effects.
- Increases in PROTEIN SYNTHESIS, GLYCOGENOLYSIS

3. Metanelone Esters

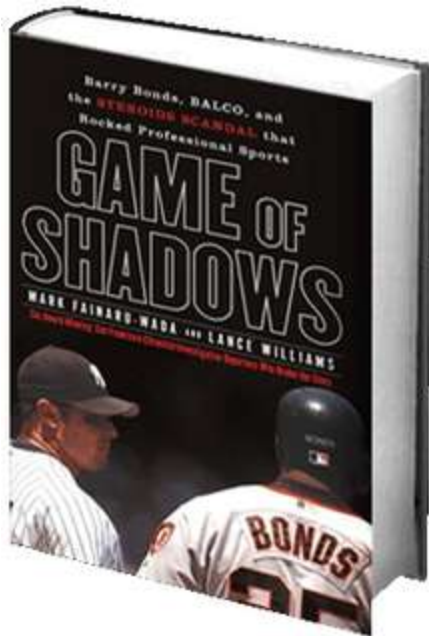


- BALCO SCANDAL
- BARRY BOND

BALCO SCANDAL & MARION JONES

- The **BALCO scandal** was a scandal involving the use of banned, performance enhancing substance by professional athletes. The BAY AREA LABORATORY COOPERATIVE (BALCO) used to supply ANABOLIC STEROIDS to professional athletes.

DRUGS IN BALCO



1. Erythropoietin (EPO)
2. Human growth hormone (HGH)
3. Modafinil
4. Testosterone Cream
5. Tetrahydrogestrinone, THG

MODAFINIL

- ❖ Daytime sleepiness associated with narcolepsy,
- ❖ Sleep apnoea/hypopnoea syndrome, and shift work sleep disorder.
- ❖ Treatment of sedation and fatigue in depression,
- ❖ Multiple sclerosis,
- ❖ Myotonic dystrophy,
- ❖ Opioid induced sleepiness
- ❖ Parkinson's disease.
- ❖ To treat spastic cerebral palsy, attention deficit hyperactivity disorder, and depression in monotherapy

Modafinil

- **Modafinil, falls under the “Stimulants (S6)” category on WADA's Prohibited List for in-competition use across all sporting events.**
- Central nervous system (CNS) Stimulants have marked effect on mental function and behaviour, producing excitement and euphoria, reduced sensation of fatigue, and an increase in motor activity.”

HOW IT BECAME BANNED SUBSTANCE

- Modafinil's rise towards being a banned substance came about in the 2003 US Track and Field Championship when six athletes tested positive for Modafinil.
- The International Association of Athletics Federation (IAAF) had a hard time believing all these athletes suffered from narcolepsy, which affects 0.02-0.05% of the American population.
- Therefore, as of 2004, Modafinil was added to WADA's list of prohibited substances

How Modafinil *Can* Benefit Athletes

- Increase heart rate and blood flow
- Improved endurance
- Suppressed appetite
- A heightened sense of focus and alertness...Dec reaction time
- Greater energy levels
- Promote wakefulness
- Improve cognitive performance during sustained periods of sleep deprivation
- Dec mental fatigue

High-Profile Athletes Taking Modafinil

- **Kelli White...** American sprinter 2-year ban
- **Barry Bonds...** Major League Baseball (MLB) legend also a/w BALCO SCANDAL
- **Dwain Chambers...**sprinter was banned for LIFE from competing in the Olympics.

TESTOSTERONE GEL

- According to the WADA-list of prohibited substances, the use of testosterone is prohibited in sports.
- In 2000 a new testosterone preparation, a **TESTOSTERONE GEL**, was approved by the Food and Drug Administration of the USA for the **TESTOSTERONE REPLACEMENT THERAPY** in men for conditions associated with low testosterone.

DETECTION OF THE MISUSE OF T-GEL



1. Ratios
testosterone/epitestosterone,
2. 5α -androstane-
 $3\alpha,17\beta$ diol/epitestosterone
3. androsterone/epitestosterone

For GC/C/IRMS analysis-
testosterone and 5α -androstane-
 $3\alpha.17\beta$ -diol.

4. NANDROLONE ESTERS

- **Nandrolone**, also known as **19-Nortestosterone**, is an ANDROGEN and ANABOLIC STEROID (AAS) which is used in the form of esters such as nandrolone decanoate (**Deca-Durabolin**) and nandrolone phenylpropionate **(**DURABOLIN**).
- Nandrolone use is directly detectable in hair or indirectly detectable in urine by testing for the presence of **19-norandrosterone**, a metabolite. The IOC has set a limit of **2.0 µg/L** of 19-norandrosterone in urine as the upper limit.

Shoaib Akhtar- World's fastest bowler disgraced in drug scandal

- In 2006 Shoaib Akhtar has been banned from cricket for two years and Mohammad Asif for one, after being found guilty by the Pakistan Cricket Board of using the banned substance, anabolic steroid **NANDROLONE**



Indian athlete Rani Yadav tests positive for Nandrolone

- India's 20-km road race walker Rani Yadav tested positive and been provisionally suspended from the **Commonwealth Games**



5.OXANDROLONE

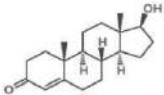
- **Oxandrolone**, sold under the brand names **Oxandrin** and **Anavar**, (AAS) medication which is used
 - ✓ to help promote weight gain ,
 - ✓ to help offset protein catabolism caused by long-term corticosteroid therapy,
 - ✓ to support recovery from severe burns,
 - ✓ to treat bone pain a/w osteoporosis,
 - ✓ to aid in the development of girls with turner syndrome.

DUCHES COCKTAIL

Periodic Graphics
A collaboration between C&EN and Andy Brunning,
author of the popular graphics blog Compound Interest

THE RUSSIAN DOPING SCANDAL

Months before the Rio Olympics, Russia's former antidoping lab director told the *New York Times* he covered up doping at the 2014 Sochi Games. Here, we look at the drugs allegedly used.



TESTOSTERONE

ANABOLIC STEROIDS

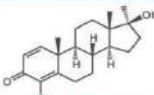
Anabolic (or anabolic-androgenic) steroids are drugs that have similar structures to testosterone and mimic its effects in the body. They help athletes increase muscle mass. And although they are banned by all major sports bodies, they are the most frequently detected doping substances in sports.

FAILED TESTS IN 2014

148 REPORTED
BY THE WORLD ANTI-DOPING AGENCY

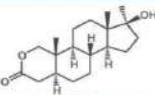
If a Russian sample-swapping operation had not replaced tainted urine samples with clean ones, then this figure would likely be higher.

"THE DUCHESS": A COCKTAIL OF THREE ANABOLIC STEROIDS

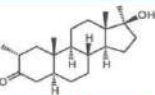


ORAL TURINABOL


Switched to trenbolone (below) after the 2012 London Games



OXANDROLONE



METHASTERONE



Russia's former antidoping lab director says he mixed the steroids with alcohol so they'd dissolve more readily. Athletes swished the mixture in their mouths then spit it out. Absorption through the cheek lining shortened the window during which the steroids could be detected.

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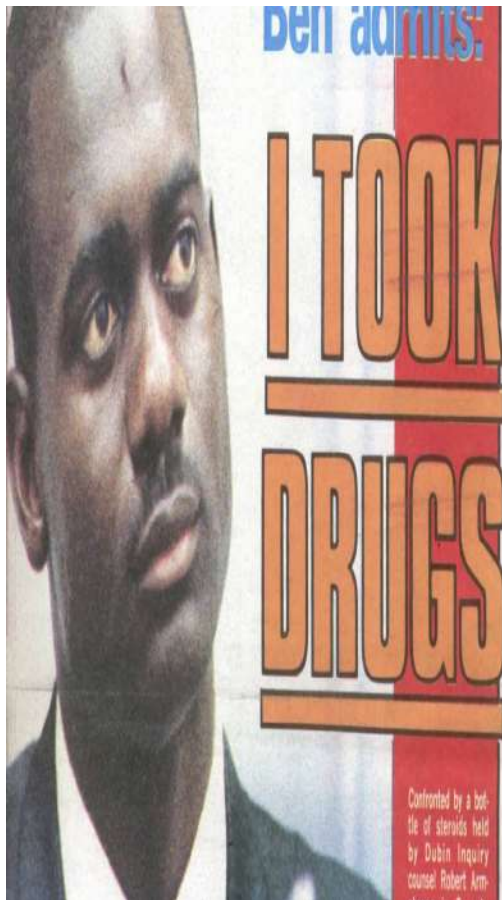
1. OXANDROLONE
2. METENOLONE
ESTER
3. TRENBOLONE
ESTER

STANOZOLOL

- Greater ratio of ANABOLIC to ANDROGENIC activity compared to TESTOSTERONE.
- Non-AROMATIZABLE, and doesnot produce ESTROGENIC effects such as GYNAECOMASTIA & FLUID RETENTION
- Detectable in the urine for up to 10 days after a single 5–10 mg oral dose.

Ben Johnson (Canadian sprinter)-

The Dubin Inquiry



- In Canada, the federal government established the Commission of Inquiry Into the Use of Drugs and Banned Practices Intended to Increase Athletic Performance, headed by Ontario Appeal Court Chief Justice CHARLES DUBIN.

Pradeep Sangwan



- In 2013, Pacer Pradeep Sangwan was found guilty of using Stanozolol, an anabolic steroid, while playing for Kolkata Knight Riders.
- He was slapped with an 18-month ban from cricket

Dwain Chambers



- The British sprinter was banned for **TWO YEARS** after he had taken anabolic steroid THG... **TETRAHYDROGESTRINONE**
- Any medals he had won since mid-2002, when he first admitted using THG, were taken from him.
- He was also asked to pay back any earnings he had made in his athletic career during the time he was taking the drugs.

Marion Jones



- The American track and field.
- She was given a **TWO-YEAR** ban from track and field competitions by the United States Anti-Doping Agency.

TYSON GAY



- In July 2013, Tyson Gay was meant to make Usain Bolt sweat in the 100-metre dash at the Moscow World Championships. Instead, Gay pulled out from the tournament for testing positive for a banned **ANABOLIC STEROID**.
- By May 2014, the American was banned for a year and forfeited the Olympic silver medal he won as part of the United States 4x100 metres team in London.

LANCE ARMSTRONG- CYCLES OF ABUSE



1. **EPO and blood transfusions: Injected**
 - a) Saline solution was used to lower hematocrit levels and evade detection, while Ferrari instructed George Hincapie to inject it directly into the vein, so reducing the window of detection to 12 hours. At one stage, makeup was applied to Armstrong's upper arm to hide bruising from an injection.
 - b) Half-litres of blood were extracted, stored in fridges, then rigged up as drips on coat hangers and reinfused into riders, so replicating the effect of EPO.

Testosterone Patches

Purpose

They contain **exogenous testosterone** and are applied to the skin to relieve hormonal imbalance symptoms.



Benefits

Primarily used to manage **symptoms** associated with sexual desire disorders:

- Lack of well-being
- Low libido
- Anxiety
- Depressed moods
- Headaches



How and When to Use

- Applied to **clean, dry areas** of the skin
- Administered **bi-weekly** depending on specific case and symptom relief



Side Effects

- **Mild:** redness, itching, or swelling at patch site; nausea
- **Serious:** heart attacks, strokes, severe allergic reactions



2. Andriol: Taken orally/through patches

mixture of liquid testosterone, and olive oil ... orally

3. Cortisone: Injected or swallowed
4. Human growth hormone: Injected
5. Actovegin: Injected night before race
improve oxygen delivery to the muscles

LANCE ARMSTRONG -*the most sophisticated, professionalized and successful doping program that sport has ever seen.*"

ACTOVEGIN: THE NEW PERFORMANCE ENHANCER ON THE BLOCK?

Actovegin is a physiological amino acid mixture made up from the extract of calve's blood, ultra filtered calf serum sourced from calves below 8 months old.

This blood goes through many repetitions of ultrafiltration processing which removes all the protein from the blood and leaves a concoction of **unknown molecules including protein fragments, intermediaries of steroid hormones, amino acids and sugars.**

Actoveginacceleration of muscle fibre synthesis in damaged muscle aiding muscle recovery for athletes

❑ Actovegin is currently not on the World Anti-doping Agency's (WADA) prohibited substance list, WADA does ban injections of any substance that exceeds the dose of **50ml every six hours**

AMPHETAMINES

- S 6 STIMULANTS
- **IN COMPETITION**
- All prohibited substances in this class are Specified Substances except those in S6.A, which are non-Specified Substances.
- Substances of Abuse in this section:
cocaine and
methylenedioxymethamphetamine
(MDMA / “ecstasy”)

- All stimulants, including all optical isomers, e.g. *d*- and *l*- where relevant, are prohibited.

A: NON-SPECIFIED STIMULANTS INCLUDING, BUT NOT LIMITED TO:

- Adrafinil
- Amfepramone
- **AMFETAMINE**
- Amfetaminil
- Amiphenazole
- Benfluorex
- Benzylpiperazine
- Bromantan
- Clobenzorex
- **COCAINE**
- Cropropamide
- Crotetamide
- Fencamine
- Fenetylline
- Fenfluramine
- Fenproporex
- Fonturacetam [4-phenylpiracetam (carphedon)]
- Furfenorex
- Lisdexamfetamine
- Mefenorex
- Mephentermine
- Mesocarb
- Metamfetamine(d-)
- p-methylamfetamine
- **MODAFINIL**
- Norfenfluramine
- Phendimetrazine
- Phentermine
- Prenylamine
- Prolintane

B: SPECIFIED STIMULANTS

- **INCLUDING, BUT NOT LIMITED TO:**
- 3-Methylhexan-2-amine (1,2-dimethylpentylamine)
- 4-fluoromethylphenidate
- 4-Methylhexan-2-amine (methylhexaneamine)
- 4-Methylpentan-2-amine (1,3-dimethylbutylamine)
- 5-Methylhexan-2-amine (1,4-dimethylpentylamine)
- Benzfetamine
- **CATHINE****
- Cathinone and its analogues, e.g. mephedrone, methedrone, and α - pyrrolidinovalerophenone
- Dimetamfetamine (dimethylamphetamine)
- **EPHEDRINE*****
- **EPINEPHRINE**** (ADRENALINE)**
- Etamivan
- Etilamfetamine
- Etilefrine
- Famprofazone
- Fenbutrazate
- Fencamfamin

SPECIFIED STIMULANTS

- Heptaminol
- Hydrafenil (fluorenol)
- Hydroxyamfetamine (parahydroxyamphetamine)
- Isometheptene
- Levmetamfetamine
- Meclofenoxate
- Methylenedioxyamfetamine
- **Methylephedrine*****
- Methylphenidate
- Nikethamide
- Norfenefrine
- Octodrine (1,5-dimethylhexylamine)
- Octopamine
- Oxilofrine (methylsynephrine)
- Pemoline
- Pentetrazol
- Phenethylamine and its derivatives
- Phenmetrazine
- Phenpromethamine
- Propylhexedrine
- **PSEUDOEPHEDRINE*******
- Selegiline
- Sibutramine
- **STRYCHNINE**
- Tenamfetamine (methylenedioxyamphet-amine)
- Tuaminoheptane
- and other substances with a similar chemical structure or similar biological effect(s)

EXCEPTIONS

- Clonidine
- Imidazole derivatives for dermatological, nasal or ophthalmic use (e.g.
 - BRIMONIDINE,
 - FENOXAZOLINE,
 - INDANAZOLINE,
 - NAPHAZOLINE
 - CLONAZOLINE,
 - OXYMETAZOLINE,
 - XYLOMETAZOLINE)
- and those stimulants included in the 2022 Monitoring Program* are not considered Prohibited Substances.

EXCEPTIONS

- **Bupropion, Caffeine, Nicotine, Phenylephrine, Phenylpropanolamine, Pipradrol, And Synephrine:** These substances are included in the 2022 Monitoring Program and are not considered Prohibited Substances.
- * Cathine (d-norpseudoephedrine) and its l-isomer: Prohibited when its concentration in urine is greater than 5 micrograms per millilitre.

EXCEPTIONS

- Ephedrine and methylephedrine: Prohibited when the concentration of either in urine is greater than **10 micrograms** per millilitre.
- *****Epinephrine (adrenaline):** Not prohibited in local administration, e.g. nasal, ophthalmologic, or co-administration with local anaesthetic agents.
- ****Pseudoephedrine:** Prohibited when its concentration in urine is greater than **150 micrograms** per millilitre.

Maria Sharapova



- Maria Sharapova was given a **TWO-YEAR** ban by the International Tennis Federation (ITF) following her positive test for the banned drug **MELDONIUM**.
- Meldonium only came to the World Anti-Doping Agency's attention a few years ago and was banned in January 2016.

MELDONIUM



- Meldonium, sold under the brand name Mildronate

It is also known as Quaterine, MET-88, THP [trimethylhydrazinium propionate].

Meldonium is a fatty acid oxidation inhibitor, and it is now principally used for heart conditions, such as ANGINA, HEART FAILURE & HEART ATTACK.

The medication works by altering pathway for CARNITINE, a nutrient involved in fat metabolism.

MELDONIUM

- Meldonium is a non-specified substance prohibited at all times (in- and out-of-competition) since 1 January 2016.
- The mere presence of meldonium in an athlete's sample collected on or after 1 January 2016 constitutes an anti-doping rule violation under article 2.1 of the Code.

MELDONIUM

- If the concentration is above $15 \mu\text{g/mL}$, representing recent intake of meldonium.

EPHEDRINE- Ma huang

- Ephedrine and methylephedrine: Prohibited when the concentration of either in urine is greater than 10 micrograms per millilitre.
- Ephedrine is a drug derived from the plant *Ephedra equisetina*. It has been used for as both a stimulant and decongestant.
- Sympathomimetic and a central nervous system stimulant, used as an energy enhancer.
- -containing products are marketed and used to improve aerobic performance and endurance, reduce fatigue, increase alertness, improve reaction time, and even increase strength.

MARIA SHARAPOVA

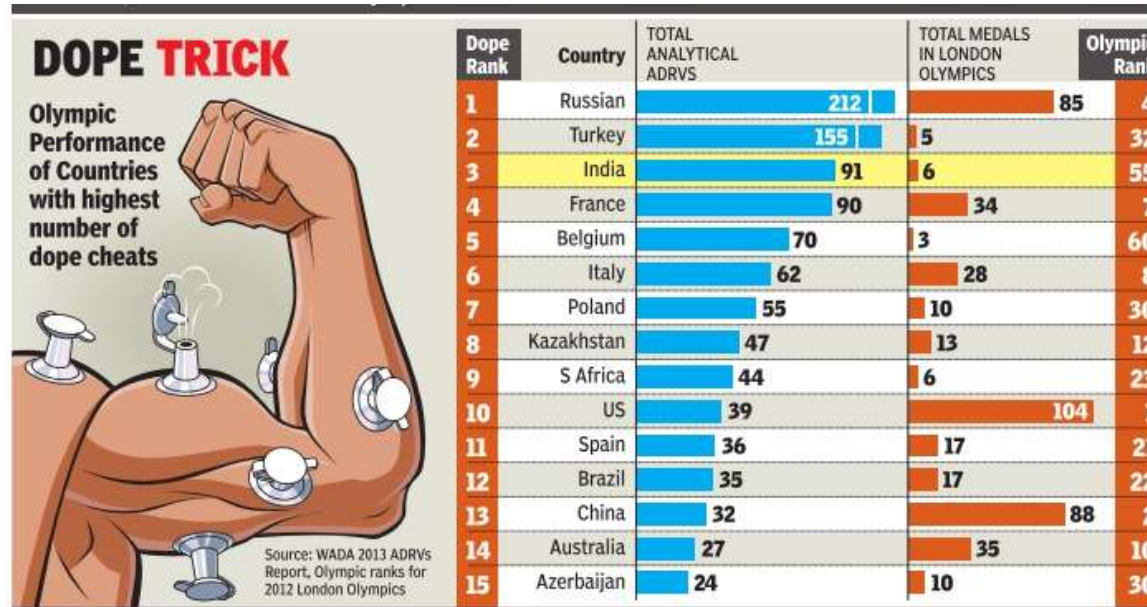


- Maria Sharapova is prescribed Meldonium to help protect heart tissue by regulating metabolism.
- But the drug also helps with an increase in endurance performance of athletes, improved rehabilitation after exercise, protection against stress, and enhanced activations of central nervous system functions. Meldonium only came to the World Anti-Doping Agency's attention a few years ago and was banned in January 2016.

DIEGO MARADONA



- ARGENTINA SOCCER PLAYER
- Had tested positive for five variants of **EPHEDRINE**, a drug used to increase energy and alertness and to lose weight by speeding up metabolism.



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