SPORT
MEDICINE MANUAL

10

DOPING CONTROL

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10

Message from the President of the IOC

The International Olympic Committee has always endeavoured to adapt, as best it can, to the constantly changing conditions in the fight against doping. Alas, the tinkerers of sports performance are forever searching to find new methods, often assisted by specialists who attach little importance to the code of ethics they are supposed to respect.

Doping is not only a danger for the health of athletes; it also constitutes a form of cheating which we cannot accept.

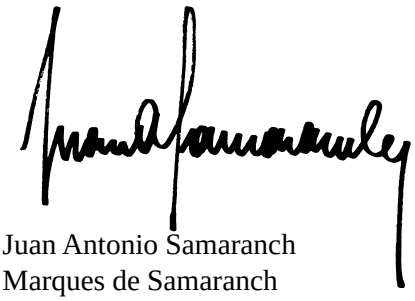
Apparently, the desire to win at all costs drives some to turn to illegal and totally unfair means in order to ensure that the athletes in their charge gain an advantage over their rivals. As means of detection have improved, they now attempt to cheat scientifically by artificially inducing natural physiological reactions, or by attempting with various tricks to hide evidence of these manipulations.

Such an attitude and such behaviour, constitute in and of themselves very serious violations of the sporting laws, prescribed in the first instance by the IOC and by a growing number of International Sports Federations, National Olympic Committees and indeed by governments themselves. Such behaviour makes a mockery of the very essence of sport, and of the soul of what our predecessors consider to be sacrosanct ideals: the inner desire to surpass one's own limits, the social need to compete with others, to find one's identity within society and to develop at all levels.

Several millions of players freely accept our principles and share our ideals, and we absolutely reject these attempts to cheat, which endanger the health and the very lives of those involved.

We were the first, starting in 1968, to assume responsibility for the fight against the use of doping substances and we intend to carry on, in close collaboration with the sports Federations, the National Olympic Committees and inter- and non-governmental organizations.

We know that this will be a long and constantly changing battle, necessitating close cooperation among those who bear responsibility for the education and well being of youth. We have already won several battles but not yet won the war.



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January 1999

A. Introduction

What is doping?

Doping is the deliberate or inadvertent use by an athlete of a substance or method banned by the IOC. Doping is also prohibited by International and National Sport Governing Bodies. Encouraging or assisting athletes to use such substances or methods is unethical and considered a doping related offence.

Doping is prohibited:

- because its presence undermines the fundamental joy of sport and the pursuit of human and sporting excellence
- in order to protect athletes from the unfair advantage which may be gained by athletes who use banned substances or methods
- to prevent possible harmful medical side effects

There are also potential legal implications concerning the distribution of many banned substances (eg. anabolic agents) that may be illegal in many countries.

Principles Applied to Formulating Doping Regulations

Three principles have been applied in making regulations about medical and pharmacological means of improving performance.

1. Athletes Welfare

The first principle is the welfare of the athlete. If the effect of using a drug or a medical technique seriously impairs the health or physique of an athlete - for instance, by causing disease, increasing the risk of disease or even distorting normal growth and development - then a ban on use has been considered justified. Some people have maintained that it is the right of athletes themselves to decide what they will do with their bodies. This view has not prevailed and it has not been considered compatible with Olympism.

2. Equity

The second principle is that of equity. If certain sophisticated scientific techniques or products do enhance performance, they obviously give an advantage to those who have access to them and penalize those who do not have access. This principle underlies the banning of certain medical techniques, even those which are not known to have any health hazards if properly carried out, such as auto-transfusion of ones own blood (blood doping).

3. The Games are for The Athletes

The third principle underlies the second. In dramatic terms, it is expressed in this way: “The Olympic Games are contests between athletes, not between medical scientists and manufacturing chemists.” The use of some techniques and some drugs could and does lead to a situation in which athletes cannot succeed however hard they try, however hard they train and however skillful they become, unless they use the technique or drug. This is contrary to the glorification of physical prowess which de Coubertin set as an aim of the Olympic Movement.

Human Rights

The intent of a doping control programme is to monitor the status of athletes with respect to the use of banned substances and banned methods in sport, thereby serving as a deterrent against the use of such substances or methods. The detection of a banned substance or banned method leads to the determination of a doping offence.

A doping offence results in national and/or international sport penalties which are normally limited to sport or competitive eligibility. For example, athletes are faced with the loss of eligibility to participate in sport for certain periods of time up to and including ineligibility for life, as well as the loss of financial support. It is essential that an athlete testing positive be protected from additional actions or in-actions by others which are considered unacceptable according to standards of natural justice and fundamental human rights. Given that the responsibility for the application of sanctions and disclosure of offences is primarily that of National and International Federations, those conducting the testing should discharge their obligations in a manner which respects the jurisdiction of such federations.

Should a situation arise where a positive case creates a concern for human rights, each case should be assessed on its own merit, which may require action or measures outside of the normal national and/ or international doping control procedures.

Words to Watch

Terms used to describe drug testing procedures can be confusing and ambiguous. The following is a reference guide describing some key words and terms.

Positive Test

The word "positive" is often used incorrectly to mean that a doping offence has occurred. A "positive finding" in the laboratory indicates the presence of a banned substance and does not in itself constitute a doping offence. Positive laboratory findings automatically lead to a review to determine whether or not a doping offence has occurred. It may be, for example, that a banned substance is present in a form, or purpose (such as acceptable medical treatment) which does not constitute a doping offence.

Doping Offence

Doping offences can be grouped into two categories, "doping" and "doping-related". A doping offence occurs when an athlete's urine sample confirms the presence of a banned substance, or other evidence, such as an admission which, upon review, is determined to be a doping offence as defined by the IOC. Doping-related offences, on the other hand, are offences other than the use of banned substances or practices, such as aiding, abetting or condoning their use (for example, a coach who has counselled an athlete to use a banned substance). Such an offence is normally identified through investigations conducted by the doping agency. Doping-related offences also apply to athletes who refuse to provide a urine sample upon request.

Announced Testing

This term refers to pre-scheduled tests conducted primarily at competitions and occasionally at training camps. Athletes are randomly selected, often based on finishing positions.

Unannounced Testing

This term refers to randomized, unscheduled tests that can be carried out at any time with little or no notice. Tests are primarily focused on athletes or sports where there is a "high probability of use", normally outside of competition. Unannounced testing also enables the federation or doping agency to target certain athletes based on evidence of use.

Control Samples

Control samples are urine specimens artificially prepared to contain banned substances which are routinely included among other samples sent to laboratories for analysis. These samples are not identified or known to the laboratories, and act as a self-monitoring quality-control check of the laboratory's analytical procedures.

Doping Control

Doping control is the term used to describe all elements, including sample collection and laboratory analysis, of the system designed to detect the presence of banned and restricted substances, practices and methods. Doping control also includes a review process and appeal mechanism to protect the rights of athletes charged with an offence, and individuals charged with doping-related offences.

Controlled Doping

Controlled doping is the term used to describe the unethical mass testing of athletes to screen out those whose laboratory results indicate the presence of a banned substance. It was designed to prevent drug users from being caught.

B. Chronology of Anti-doping Activities

1960 Danish cyclist Knut Jensen dies at the 1960 Olympic Games in Rome. Amphetamines were found at autopsy.

1967 The IOC issues a resolution prohibiting the use of pharmaceutical agents intended to improve athletic performance and establishes the IOC Medical Commission.

1968 Doping controls are initiated at the 1968 Olympic Games and involves testing for central nervous system stimulants and narcotics.

1972 The Munich Olympic Games are the first to undertake full-scale testing (>2000 tests) resulting in seven athletes, including four medallists, being disqualified.

1975 Androgenic anabolic steroids are prohibited.

1976 At the Montreal Olympic Games, 11 athletes test positive and are disqualified. Eight had taken anabolic steroids.

1983 Caffeine and Testosterone are added to the list of banned substances.

1985 Beta-blockers, diuretics and corticosteroids are added to the list of prohibited substances.

1986 The practice of blood doping is prohibited. Out-of-competition, unannounced testing was introduced.

1987 The first Permanent World Conference on Anti-Doping in Sport is held in Ottawa, under the auspices of the IOC and the Government of Canada. An International Antidoping Charter is endorsed, as a model national programme.

1988 Peptide hormones including growth hormone are prohibited.

1990 Erythropoietin is prohibited.

1992 Beta 2 agonists are prohibited as anabolic agents; Beta blockers are prohibited only in those sports in which performance may be enhanced.

1992 Blood testing to detect non-autologous blood transfusion is undertaken at the Lillehammer Olympic Winter Games in cross-country skiing events only.

1998 Insulin is prohibited except for insulin dependent diabetic athletes. Insulin growth factor (IGF1) is prohibited.

1999 The Lausanne World Anti-Doping conference is conducted and the Lausanne Declaration published. The World Anti-Doping Agency (WADA) is established with an initial contribution of US $25 million by the IOC; The Olympic Movement Anti-Doping Code is released.

2000 Clomiphene, cyclofenil and tamoxifen are prohibited in males. Cut-off levels for Salbutamol as a stimulant and as an anabolic agent are introduced. Blood testing approved by the IOC Executive Board on the recommendation of the Foundation Board of WADA.

C. Olympic Movement and Anti-doping

The Olympic Movement Anti-Doping Code

The IOC Medical Code was replaced in 1999 by the Olympic Movement Anti-doping Code. This was supplemented by Explanatory Notes and became effective on January 1, 2000. The Code contains information concerning the offence of doping and its punishment, appeals, accredited laboratories, testing procedures, classes of prohibitive substance and methods, and a number of annexes.

The Anti-doping Code contains the framework of basic elements that the entire Olympic Movement must respect. This new Code:

- considers that the complete elimination of doping from sport is one of the fundamental objectives of the Olympic Movement
- applies to the Olympic Games, the various championships and all competitions to which the International Olympic Committee grants its patronage or support
- intends to ensure respect for sport ethics and to protect the health of the athletes
- shall include provisions to enable appeals to be lodged with the Court of Arbitration for Sport against certain decisions rendered in the application of such Code

Participation and Sanctions

Participation by athletes in the Olympic Games is governed by the Eligibility Code which provides that "all competitors in the Olympic Games shall respect and comply in all aspects with the IOC Medical Code".

- Any competitor refusing to submit to a medical control or who is found guilty of doping shall be excluded from the current and/or future Olympic Games.
- If a competitor is a member of a team, the competition, event or match during which the infringement took place may be considered as forfeited by that team.
- Following an infringement of the Anti-doping Code, a medal and/or diploma may be withdrawn.

All sanctions are proposed by the IOC Medical Commission, which meets continuously during the Olympic Games, to the IOC Executive Board which has the final authority to decide on the adoption and implementation of sanctions.

The IOC rules do not prejudice any sanctions which the International Federations or the NOCs concerned may take, in conformity with their own rules.

For information on the IOC Medical Commission and its programmes, contact the web address http://www.olympic.org/ioc/e/medcom/medcom_antidopage_e.html.

IOC Accredited Laboratories and Procedure

Faced with the growing number of doping controls performed by the IOC at the Olympic Games, the International Federations at their competitions and the developments of out-of-competition testing, the Medical Commission formulated the "Requirements for Accreditation and Good Laboratory Practice" in order to harmonize and standardize the analytical procedures. To ensure the quality of the

laboratories' work, re-accreditation process takes place annually, and proficiency tests are carried out at four-month intervals.

The location of the 27 IOC accredited laboratories(2000) are:
•Athens •Bangkok •Barcelona •Beijing •Bloemfontein •Cologne •Copenhagen •Ghent •Helsinki •Huddinge •Indianapolis •Kreischa •Lausanne •Lisbon •London •Los Angeles •Madrid •Montreal •Moscow •Oslo •Paris •Penang •Prague •Rome •Seoul •Sydney •Tokyo

Lausanne Declaration on Doping in Sport

Considering that doping practices contravene sport and medical ethics, and that they constitute violations of the rules established by the Olympic Movement, and concerned by the threat that doping poses to the health of athletes and youth in general;

Recognizing that the fight against doping in sport is the concern of all: the Olympic Movement and other sports organizations, governments, inter-governmental and non-governmental organizations, sportsmen and sportswomen throughout the world, and their entourage;

The World Conference on Doping in Sport, with the participation of representatives of governments, of inter-governmental and non-governmental organizations, of the International Olympic Committee (IOC), the International sports Federations (IFs), the National Olympic Committees (NOCs), and of the athletes, declares:

1. Education, prevention and athletes' rights
The Olympic oath shall be extended to coaches and other officials, and shall include the respect of integrity, ethics and fair play in sport. Educational and preventive campaigns will be intensified, focusing principally on youth, and athletes and their entourage. Complete transparency shall be assured in all activities to fight doping, except for preserving the confidentiality necessary to protect the fundamental rights of athletes. Partnership with the media shall be sought in anti-doping campaigns.

2. Olympic Movement Anti-Doping Code
The Olympic Movement Anti-Doping Code is accepted as the basis for the fight against doping, which is defined as the use of an artifice, whether substance or method, potentially dangerous to athletes' health and/or capable of enhancing their performances, or the presence in the athlete's body of a substance, or the ascertainment of the use of a method on the list annexed to the Olympic Movement Anti-Doping Code.

The Olympic Movement Anti-Doping Code applies to all athletes, coaches, instructors, officials, and to all medical and paramedical staff working with athletes or treating athletes participating in or training for sports competitions organized within the framework of the Olympic Movement.

3. Sanctions
The sanctions which apply to doping violations will be imposed in the framework of controls both during and out of competition.

In accordance with the wishes of the athletes, the NOCs and a large majority of the IFs, the minimum required sanction for major doping substances or prohibited methods shall be a suspension of the athlete from all competition for a period of two years, for a first offence. However, based on specific, exceptional circumstances to be evaluated in the first instance by the competent IF bodies, there may

be a provision for a possible modification of the two-year sanction. Additional sanctions or measures may be applied. More severe sanctions shall apply to coaches and officials guilty of violations of the Olympic Movement Anti-Doping Code.

4. International Anti-Doping Agency

An independent International Anti-Doping Agency shall be established so as to be fully operational for the Games of the XXVII Olympiad in Sydney in 2000. This institution will have as its mandate, notably, to coordinate the various programmes necessary to realize the objectives that shall be defined jointly by all the parties concerned. Among these programmes, consideration should be given in particular to expanding out-of-competition testing, coordinating research, promoting preventive and educational actions and harmonizing scientific and technical standards and procedures for analyses and equipment. A working group representing the Olympic Movement, including the athletes, as well as the governments and inter-governmental organizations concerned, will meet, on the initiative of the IOC, within three months, to define the structure, mission and financing of the Agency. The Olympic Movement commits to allocate a capital of US $25 million to the Agency.

5. Responsibilities of the IOC, the IFs, the NOCs and the CAS

The IOC, the IFs and the NOCs will maintain their respective competence and responsibility to apply doping rules in accordance with their own procedures, and in cooperation with the International Anti-Doping Agency. Consequently, decisions handed down in the first instance will be under the exclusive responsibility of the IFs, the NOCs or, during the Olympic Games, the IOC. With regard to last instance appeals, the IOC, the IFs and the NOCs recognize the authority of the Court of Arbitration for Sport (CAS), after their own procedures have been exhausted.

In order to protect athletes and their rights in the area of disciplinary procedure, the general principles of law, such as the right to a hearing, the right to legal assistance, and the right to present evidence and call witnesses, will be confirmed and incorporated into all applicable procedures.

6. Collaboration between the Olympic Movement and public authorities

The collaboration in the fight against doping between sports organizations and public authorities shall be reinforced according to the responsibilities of each party. Together, they will also take action in the areas of education, scientific research, social and health measures to protect athletes, and coordination of legislation relative to doping.

Adopted by the World Conference on Doping in Sport
4 February 1999, Lausanne, Switzerland

The World Anti-Doping Agency (WADA)

WADA was established on November 10, 1999 in Lausanne to promote and coordinate the fight against doping in sport in all its forms at the international level.

WADA will cooperate with intergovernmental organizations, governments, public authorities, the International Olympic Committee (IOC), International Sports Federations (IF), National Olympic Committees (NOC) and the athletes. It will seek and obtain from all of the above the moral and political commitment to follow its recommendations.

The Board of WADA will be composed of at least ten members and no more than 35. The Olympic Movement and the public authorities will each be able to appoint a maximum of 16 members. Other members may be appointed by a consensus of the Board. The Board will see to it that, when appointing new members, the parity between the public authorities and the Olympic Movement is maintained. Members are appointed to a three year term, which is renewable twice.

WADA has also invited intergovernmental organizations to participate as observers, such as the International Criminal Police Organization, the United Nations International Drug Control Program, and the World Health Organization.

The principles guiding its establishment include the following:

- WADA activities will be guided by the highest ethical principles
- no single organization will be in a position to control WADA
- the Agency will further operate on the basis of equal representation of the Olympic Movement and the public authorities
- athletes are represented in the governance of the WADA, along with the other participating organizations
- the approach to the problem of doping in sport will be international in scope and designed to achieve uniformity both in the development of the rules and their implementation
- its activities will include research, as well as education and prevention

D. Prohibited Classes of Substances, Prohibited Methods, and Exceptions

The following explanations on doping substances and methods has derived much of its information from an IOC White Paper on Doping written by Professor D H Catlin and published in 1999.

1. Prohibited Classes of Substances

Since 1968, the IOC has prohibited substances in classes of drugs. It has also used the term ***and related substances***, thus including any substance having pharmacological action and/or chemical structure similar to a prohibited substance.

I. Classes of Doping Substances
- a. Stimulants
- b. Narcotics
- c. Anabolic Agents
- d. Diuretics
- e. Peptide Hormones, Mimetics and Analogues

II. Prohibited Methods
- a. Blood Doping
- b. Administering artificial oxygen carriers or plasma expanders
- c. Pharmacological, Chemical and Physical Manipulation

III. Classes of Prohibited Substances in Certain Circumstances
- a. Alcohol
- b. Cannabinoids
- c. Local Anesthetics
- d. Glucocorticosteroids
- e. Beta-blockers

IV. Out-of-competition testing

Unless specifically requested by the responsible authority, out-of-competition testing is directed solely at prohibited substances in class I.c. (Anabolic Agents), I.d. (Diuretics), I.e. (Peptide Hormones, Mimetics and Analogues), and II (Prohibited Methods).

a. Stimulants

Mankind has used stimulants for thousands of years for their energizing properties. The early history of doping is dominated by reports of amphetamine, cocaine and strychnine incidents. When the IOC introduced testing in 1968, doping with potent stimulants was effectively curtailed but led to doping with large amounts of less potent stimulants such as pseudoephedrine, ephedrine, phenylpropanolamine and caffeine These drugs are available either in foods and drinks or in over-the-counter (OTC) preparations.

The common feature of this mixed class is stimulation of the brain and all the nerves of the body. Amphetamine, the best example of a stimulant, acts by releasing small, naturally occurring molecules (sympathetic transmitters) from cells of the nervous system. It causes a sense of well being (euphoria), increased alertness loss of appetite (anorexia), heightened tone of confidence and self-satisfaction, and relieves fatigue. In high doses, amphetamine disrupts co-ordination and produces aggressive behaviour, hallucinations, seizures, hypertension and cardiac arrhythmias. Long term use results in tolerance and physical dependence that leads to its reputation as a drug of abuse.

In 1983, the IOC added caffeine to its list of prohibited substances following reports of high dose caffeine misuse. The intent was to prevent the use of excessive amounts but not normal consumption of caffeine in coffee, tea, soft drinks and chocolate. This was accomplished by setting an upper limit on the amount of caffeine (12 micrograms/millilitre) that could be present in the urine. This level could be achieved by drinking 4-5 cups of strong coffee (400-600 mg of caffeine) in 2-3 hours especially in persons who are not accustomed to drinking coffee and are small in stature and weight. The approximate caffeine content of customary drinks are outlined in Table 10.1.

Table 10.1 Caffeine content.

Beverage	Amount of Caffeine
Coffee	100-150 mg/cup
Tea	30-45 mg/cup
Cola	45-65 mg/cup

Adverse effects of stimulants include addiction, drug dependence, agitation, nervousness, tremor, delirium, sleeplessness, loss of coordination, aggressive behaviour, psychosis, hypertension, seizures and cardiac arrhythmias.

Pseudoephedrine, ephedrine and phenylpropanolamine are present in many cold, cough, hay fever and decongestant remedies that can be purchased without a doctor's prescription. **Prior to administration to an athlete, all such products must be checked with a doctor or pharmacist familiar with anti -doping regulations to confirm that no prohibited substance is present.**

b. Narcotics

Morphine is a natural ingredient of opium. After processing in a clandestine laboratory, morphine can be converted to heroin, a highly addictive substance and a leading drug of abuse. Narcotics are widely used as analgesics (painkillers). The IOC prohibits the use of all potent narcotics. This includes morphine, heroin, methadone, pethidine and others. Several weaker narcotics are permitted including codeine, dextropropoxyphene, dextromethorphan, diphenoxylate, pholcodine and tramadol. These drugs are much less powerful than morphine, rarely lead to addiction and provide an adequate supply of painkillers for physicians to treat athletes with very painful conditions.

The most serious side effects of powerful narcotics are due to physical dependence and the development of withdrawal symptoms. Of all the narcotics, heroin is the most addictive. It is also produces the most euphoria. This is why heroin is the preferred drug of abuse for addicts. Drugs in the narcotics class differ from one another in the degree of their effects. The drugs can be rated on scales for producing addiction, relieving pain etc. Viewed this way, codeine is the least harmful narcotic. Heroin is the most likely to produce addiction and morphine is the best analgesic. Adverse effects of narcotics include addiction, physical dependence, withdrawal symptoms, mental clouding, breathing problems, fall in blood pressure and constipation.

c. Anabolic Agents

i) Anabolic steroids

Testosterone is a naturally occurring steroid hormone present in the body tissues of both males and females. It has both growth promoting (anabolic) and masculinizing (androgenic) properties. Thus it is classified as an androgenic anabolic steroid (AAS). Testosterone is also available as a pharmaceutical

drug for the treatment of certain medical conditions, notably hypogonadism. Other naturally occurring AAS that are available commercially include DHEA (dehydroepiandrosterone), androstenedione and others. Drugs such as oxandrolone, methyltestosterone, stanozolol and others are chemically similar to testosterone but are not naturally produced in the body. These are termed synthetic AAS. The IOC list of prohibited drugs includes all AAS irrespective of whether they occur naturally or are totally synthetic.

Until recently, laboratories have been dependent on identifying an elevated ratio between testosterone (T) and epitestosterone (E), a largely inert hormone, to detect exogenous administration of testosterone. This ratio is normally around 1:1 but the cutoff ratio has been set at 6:1. This must be shown to be an abnormal ratio for that athlete by comparing urinary analyses undertaken either prior or subsequent to the doping test. Recently, a carbon isotope mass ratio test has become available to distinguish naturally occurring from synthetic (administered) testosterone.

The testes of adult males synthesize about 10 mg of testosterone per day, which is transported by the blood stream to all the organs of the body. At target organs, it is converted to dihydrotestosterone (DHT) that, inside cells, reacts with receptors and ensures the development and maintenance of the male sex organs. This system is under the control of the hypothalamus and pituitary gland that produce FSH (follicle stimulating hormone) and LH (luteinizing hormone). The levels of FSH and LH increase if testosterone levels are low and fall when they are high. This finely tuned “thermostat” mechanism regulates the levels of testosterone in the body. Small doses of AAS simply shut down the production of testosterone and have little or no effect on performance. However, large doses promote muscle growth and strength.

Women also produce testosterone but only one-tenth of the amount produced by men and most of it is converted to estrogens, the primary female sex hormone. Although less is known of the effects of testosterone on the performance of women athletes, it is clear that women are more sensitive to testosterone than men and smaller doses are needed to enhance a woman’s performance.

AAS have adverse effects on virtually every organ in the body. Some of these effects are the same in men and women, but others are gender specific. The magnitude of the side effects are usually related to the how much and how long AAS are taken. Most, but not all, are reversible if AAS are discontinued.

Adverse effects of AAS include hair loss, oily skin, acne, deep voice, enlarged (males) or shrunken (females) breasts, psychiatric disturbances from mild to serious increases in aggressiveness (“roid rage”), biochemical disorders (elevated LDL-cholesterol that leads to heart disease and reduced HDL-cholesterol that protects against heart disease; reduced FSH and LH), liver inflammation and tumours, decreased sperm count (males), abnormal or absence of menstruation, reduced fertility and clitoral enlargement, (females), enlarged prostate (males) hypertension, fluid accumulation and stunting of growth (teenagers due to premature closure of epiphyses).

ii) Beta 2 agonists

This class of drugs which includes Clenbuterol, Salbutamol, Salmeterol and Terbutaline has both stimulant and anabolic properties. These drugs are essential for athletes with asthma to inhale pre-exercise to prevent the development of exercise-induced asthma. They are also valuable to treat asthma whether induced by exercise or other factors.

Salbutamol and Terbutaline have been permitted by the IOC, only by inhalation, since 1975. However, it has always and continues to be necessary to notify the relevant medical authority in writing prior to a competition. In 1995, the IOC permitted athletes to inhale Salmeterol, a long acting beta 2 agonist, again subject to prior written notification. The reason for the need to notify is that these substances do have a mild stimulant action.

During the 1980's, some body builders began to use oral Clenbuterol because it was known to be anabolic in animals. Clenbuterol was prohibited in 1992 and two athletes were disqualified at the Barcelona Olympic Games for using the drug. In the same year, long acting oral Salbutamol was demonstrated to possess anabolic properties. As a consequence, the IOC was compelled to classify beta 2 agonists as anabolic (but not androgenic) agents when administered by mouth or by injection. In 2000, the IOC introduced a cut-off level of 1,000 nanograms/millilitre for Salbutamol above which laboratories must investigate a possible breach of anti-doping rules. This level is indicative that Salbutamol has been taken by mouth or by injection. Urinary levels of Salbutamol <100 nanograms/millilitre are not reported by the laboratory.

Adverse effects of beta 2 agonists include tremor, nervousness, palpitations, hypertension, headache and muscle cramps.

d. Diuretics

Diuretics increase the excretion of water and electrolytes (especially sodium and potassium) from the body via the kidneys. They are important therapeutic indicators for the elimination of fluids from the tissues in certain pathological conditions. However, strict medical control is required. Diuretics may be used by competitors for two main reasons. Firstly, in weight classified sports, athletes may need to reduce weight rapidly to "make weight". Diuretics are taken usually in association with water restriction and exercise-induced water loss through perspiration. This is dangerous and has caused serious illness and death. Secondly, athletes attempt to dilute urine, making it more difficult for the laboratory to detect some prohibited substances that they have been using. To control this problem, the IOC measures the specific gravity of the urine and will detain the athlete at the collection site in order to obtain urine of acceptable dilution if the specific gravity of the first sample is too low.

Adverse effects of diuretics include excessive weight loss, hypotension, low or high serum potassium, cardiac arrhythmias, muscle cramps, increased uric acid and possibly an attack of gout, reduced capacity for muscle function and death.

e. Peptide Hormones, Mimetics and Analogues

i) Chorionic Gonadotrophin (hCG – human chorionic gonadotrophin)
hCG is a glycoprotein that is produced in large quantities in normal women soon after conception. It plays a vital role in maintaining a normal pregnancy. Rarely, hCG can be produced by tumours. The biological actions of hCG are identical to those of luteinizing hormone (LH), which is involved in the regulation of testosterone production in men. hCG has been used by males to stimulate testosterone production and to prevent the shutdown of testosterone and sperm production that accompanies long term use of AAS. Thus hCG and LH are prohibited in males only.

ii) Corticotrophins (ACTH, tetracosactide)
Corticotrophins have been misused to increase the blood levels of endogenous glucocorticosteroids, notably to obtain the euphoric effect of these drugs. The administration of ACTH or tetracosactide is considered equivalent to the oral, intramuscular or intravenous application of glucocorticosteroids.

iii) Growth Hormone (hGH)
hGH is a natural hormone that stimulates growth, promotes protein synthesis and breaks down fat (lipolysis). hGH is prescribed for children or adults with a growth hormone deficiency. Should excessive levels be naturally produced, children become very tall and heavy (gigantism) and adults suffer from acromegaly, characterized by large hands and feet a pronounced jaw, enlarged heart, weak muscles and diabetes. Athletes are believed to have commenced to use hGH when synthetic rhGH (recombitant human growth hormone) became available in the 1980's. Accordingly, the IOC prohibited its use in 1988 even though a test was not available. The IOC has supported an extensive research effort to develop a test for rhGH. The research is designed to identify indirect markers in blood which specifically indicate the use of rhGH.

Adverse effects of human growth hormone include glucose intolerance, fluid accumulation, heart disease, joint and ligament problems, high levels of blood lipids, muscle weakness, hypothyroidism and disfigurement associated with excessive growth of bones.

All the respective releasing factors and their analogues of the above mentioned substances are also prohibited.

iv) Erythropoietin (EPO)
EPO is a glycoprotein produced by the kidney to regulate the production of red blood cells in the bone marrow. Red cells comprise around 42% of the blood, (haematocrit), the remainder being plasma. Should the haematocrit fall such as following haemorrhage, the kidney receives a signal to produce more EPO, If the haematocrit is high, EPO production is reduced. Recombinant EPO was produced in the late 1980's primarily to treat the anaemia of renal failure. Almost immediately, report of misuse by athletes surfaced including rumours of the sudden and unexplained death of a number of cyclists, often while asleep. Although overdose with EPO was suggested, no authoritative proof has been obtained. Nevertheless the 1998 Tour de France was notable for seizures of large quantities of EPO from several teams. EPO enhances endurance performance in the same manner as blood doping. Despite the absence of a test, the IOC prohibited EPO in 1990. Currently, the IOC is supporting an intense research effort to identify a blood test to confirm that an athlete has been using EPO.

Adverse effects of erythropoietin include hypertension, thrombosis, iron deficiency, skin rash, a "flu-like" condition, palpitation, hypertensive encephalopathy and nausea.

v) Insulin
Insulin was reported as being misused by athletes to reduce fat and increase muscle mass. It was also known to have caused brain damage and even death because of profound hypoglycemia in athletes. In 1998, the IOC prohibited Insulin except in insulin dependent diabetic athletes who must obtain and provide written certification from an endocrinologist or team physician.

Clomiphene and cyclofenil are drugs that are prescribed for women for infertility. They have been used by male athletes to stimulate testosterone production after taking AAS (as with hCG and LH). In 2000, both were prohibited in males only.

Tamoxifen is an anti-estrogen used to treat breast cancer. For many years, males, especially bodybuilders, have taken Tamoxifen to prevent gynaecomastia, a side-effect of taking AAS. It was prohibited in males only in 2000.

2. Prohibited Doping Methods

a. Blood Doping

Blood transfusion is the intravenous administration of red blood cells or related blood products that contain red blood cells. Such products can be obtained from blood drawn from the same (autologous) or from a different (non-autologous) individual. The most common indications for red blood cell transfusion in conventional medical practice are acute blood loss and severe anemia.

Blood doping is the administration of blood or related red blood products to an athlete other than for legitimate medical treatment. This procedure may be preceded by withdrawal of blood from the athlete who continues to train in this blood depleted state.

These procedures contravene the ethics of medicine and of sport. There are also risks involved in the transfusion of blood and related blood products. These include the development of allergic reactions (rash, fever, etc) and acute haemolytic reaction with kidney damage if incorrectly typed blood is used, as well as delayed transfusion reaction resulting in fever and jaundice, transmission of infectious diseases (viral hepatitis and AIDS), overload of the circulation and metabolic shock. The practice of blood doping was prohibited by the IOC in 1986.

b. Artificial oxygen carriers or plasma expanders

In 1999, the IOC prohibited the administration of these products to athletes.

c. Pharmacological, Chemical and Physical Manipulation

The IOC prohibits the use of substances that alter the integrity and validity of urine samples used in doping controls. For example, probenecid is prohibited because it temporarily blocks the ability of the kidney to excrete AAS in the urine. Diuretics produce a more dilute urine resulting in greater difficulty in detecting prohibited drugs. Attempts to lower the T:E ratio by taking epitestosterone are prohibited and enforced by measuring epitestosterone levels in urine. Bromantan is prohibited as a chemical manipulation because it may interfere with the measurement of the T:E ratio. Physical manipulations such as catheterization, urine substitution or other forms of tampering with the integrity or source of the urine are prohibited.

3. Classes of Prohibited Substances in Certain Circumstances.

a. Alcohol may be restricted by an International Federation.

b. Cannabinoids include both Marijuana, the dried leaves and flowers of the *Cannabis sativa* plant, and Hashish, the dried resin extracted from the leaves. The active ingredient in both is 9-delta-tetrahydrocannabinol (THC). The IOC prohibited Cannabinoids in 1998. International Federations may undertake tests for cannabinoids and institute sanctions. A concentration of THC greater than 15 nanograms per millilitre constitutes a doping offence at the Olympic Games.

c. Local anaesthetics that are permitted include bupivacaine, lidocaine, mepivacaine and procaine but not cocaine.

Only local or intraarticular but not intravenous injections may be administered.

Vasoconstrictors such as adrenaline (epinephrine) may be used in conjunction with local anaesthetic agents. Administration should be only when medically justified.

Since 1998, the IOC has no longer required notification of the administration of local anaesthetics but has made provision for International Federations to continue this practice if they request it.

d. Glucocorticosteroids are a class of drugs best known for their anti-inflammatory effects. They are widely used in medicine to reduce pain and inflammation associated with various joint and skin conditions. Glucocorticosteroids are invaluable to manage asthma and allergic disorders and diseases of the immune system. They should not be confused with anabolic steroids. Administration is permitted by a variety of routes including topical, inhalational and by local or intra-articular injection. In recent years, the IOC has ceased the practice of requiring doctors to notify the use of glucocorticosteroids by inhalation or intra-articular or local injection.

Systemic (oral, intra-muscular, intravenous or rectal) administration of glucocorticosteroids is prohibited because euphoria and stimulation are produced.

e. Beta blockers act by blocking the effect of natural stimulants (catecholamine) on the beta adrenergic receptors. These receptors are located in the heart, lungs and blood vessels. Beta blockers were prohibited in 1985 because athletes used them for alleged medical reasons to enhance performance in shooting and modern pentathlon (shooting) events at the 1984 Olympic Games. It is considered that beta blockers enhance performance by reducing tremulousness, anxiety and tachycardia that athletes experience just before a competition. Conversely, beta blockers impair performance in endurance events because they block the increase in heart rate and thus cardiac output necessary to perform to one's maximum.

The sports that currently test for beta blockers are archery, modern pentathlon, shooting, soccer and the helm in Soling match racing.

Adverse effects of beta blockers include bradycardia, inability to increase cardiac output when exercising, heart failure, sleeplessness, nightmares, fatigue, depression and asthma.

Table 10.2 provides a summary of urinary concentrations above which IOC accredited laboratories must report findings for specific substances.

Substance	Urinary Concentrations
caffeine	>12 micrograms/ml
carboxy-THC	>15 nanograms/ml
cathine	>5 micrograms/ml
ephedrine	>10 micrograms/ml
epitestosterone	>200 nanograms/ml
methylephedrine	>10 micrograms/ml
morphine	>1 microgram/ml
19-norandrosterone	>2 nanograms/ml (males)
	>5 nanograms/ml (females)
phenylpropanolamine	>25 micrograms/ml
pseudoephedrine	>25 micrograms/ml
salbutamol (as an anabolic agent)	>1000 nanograms/ml
salbutamol (as a stimulant)	>100 nanograms/ml
T/E ratio	>6

4. Permitted Substances in Sport

The only legitimate use of drugs in sports is under the supervision of a physician for a clinically justified purpose. The IOC and International Sports Federations initiated drug testing to protect athletes from the potential unfair advantage that might be gained by those athletes who take drugs in an attempt to increase performance. Drug testing is also a deterrent to protect athletes from the potential harmful side effects which some drugs can produce.

The list of banned drugs contains a very small percentage of the currently available pharmacological arsenal and rarely hinders the correct treatment of athletes for justifiable therapeutic reasons. The following summary of permitted classes of drugs is offered to the international sports community as a guide only:

- all drugs for gastro-intestinal disorders except systemic glucocorticosteroid preparations (including rectal administration)
- all drugs for cardiovascular disorders **except diuretics, vasopressor agents, beta blockers** (some sports) **and Indapamide** (an antihypertensive diuretic)
- all drugs for diseases of the central nervous system except stimulants (including dexamphetamine and methylphenidate)
- all antibiotics and anti-infective agents
- all genito-urinary preparations including alkalinizers
- all topical preparations for the ear, nose and oropharynx
- all drugs for eye disorders except beta blockers (some sports) and diuretics to treat glaucoma
- all preparations for skin conditions
- all local anesthetics (**except cocaine**)

- all non steroidal anti-inflammatory drugs, muscle relaxants and agents used in gout and hyperuricemia **except Probenecid**
- mild and moderate analgesics; strong analgesics including dextromoramide, methadone, morphine, oxycodone, pethidine are prohibited
- all drugs for allergic conditions except systemic glucocorticosteroids

5. Difficulties Exist in the Following Categories

Respiratory disorders

- expectorants, antitussives, mucolytics and decongestants are permitted but a number contain mild stimulants **especially pseudoephedrine, phenylephrine or phenylpropanolamine**

- permitted asthma preparations include xanthines, khellins, inhaled glucocorticosteroids and ipratropium, and inhaled salbutamol, salmeterol and terbutaline provided written notification is provided to the relevant medical authority. Oral and injectable preparations of Salbutamol, Salmeterol and Terbutaline are prohibited, All other beta 2 agonists whether inhaled or administered by any other route are prohibited. Adrenaline (epinephrine) is prohibited

Endocrine and metabolic disorders

- gonadal hormones for females (estrogen and progestogens) are permitted. **Danazol is prohibited**
- all male gonadal hormones including testosterone and related drugs and synthetic androgenic agents are prohibited
- drugs to treat diabetes mellitus are permitted. Insulin is prohibited except in athletes with insulin dependent diabetes subject to written notification from an endocrinologist or team physician
- haemopoietic agents are permitted **except erythropoietin**
- drugs to manage calcium and bone metabolism are permitted **except anabolic agents**
- pituitary hormones are permitted except **corticotrophins ACTH and testracosactide, human chorionic gonadotrophin (hCG)** and human growth hormone (hGH)
- thyroid and antithyroid agents are permitted
- vitamins, minerals and nutritional supplements are permitted but several contain prohibited stimulants. Caution must be exercised with herbal supplements as some contain impurities notably stimulants such as ephedrines
- many anorectics and weight reducing agents contain prohibited stimulants

6. Permitted Use of Prohibited Substances for Genuine Medical Reasons; "Therapeutic Use"

In 1992, the IOC established criteria for an athlete to be granted permission to use a prohibited substance and compete. These are:

- the athlete would experience significant impairment of health if the prohibited medication was withheld
- no enhancement of performance could result from the administration of the prohibited substance as medically prescribed
- the athlete would not be denied the prohibited substance if he or she was not a competing athlete
- no available permitted and practical alternative medication can be substituted for the prohibited substance
- post competition (retrospective) permission will not be granted

The IOC-MC has a Medications Advisory Committee (MAC) that examines and makes recommendations on all requests for "therapeutic use". Strict guidelines must be fulfilled to grant "therapeutic use". These include the submission of the complete medical and sporting details of the athlete. This must include the full medical history and examination together with the appropriate investigations that confirm the diagnosis and the necessity to administer the prohibited medication.

Support in writing from the Chief Medical Officer of the NOC or the Sport concerned is also required. A number of International Sports Federations (IF) approve "therapeutic use" and several countries have bodies established to grant national permission subject to the IF concerned accepting "therapeutic use". The explanatory notes to the Olympic movement anti-doping code acknowledge the concept of "therapeutic use" as does the October 1999 draft statement of WADA.

For information on the IOC Medical Commission and its programmes, contact the web address http://www.olympic.org/ioc/e/medcom/medcom_antidopage_e.html.

E. The National Olympic Committee and Doping Issues

Responsibilities of the Team Physician in Relation to Doping

At the Olympic Games and well before the commencement of competition, the team physician should check on all medication, including nutritional supplements, used by members of the team to confirm that none are prohibited in the current list of prohibited classes of substances. Should the team physician have any uncertainty as to the status of a medication, he or she should seek the advice of the IOC-MC from their office in the Polyclinic within the Olympic village. At competitions where doping controls will be conducted, the team physician should conduct a team meeting to discuss:

- classes of drugs and procedures on the banned list
- over-the-counter preparations which may contain banned substances
- the need to report the use of any substances to the team physician and subsequent reporting to doping control
- the method of selection of random test subjects
- doping control station standard procedures and the need for personnel to accompany the athlete

Thus, the team physician must fully understand all these matters. Other responsibilities include the notification to the IOC Medical Commission or the Games Medical Commission of the use of restricted substances such as beta 2 agonists.

What can a NOC do to Prepare for a Doping Offence During a Games Mission?

- Plan how you will track drug tests of your athletes during the competition.
- Be familiar with your own doping control regulations. Have an up-to-date copy at the games.
- Be familiar with your International Federation's Regulations. Have an up-to-date copy at the games.
- Know how to contact the NOC medical, media and legal advisors immediately.
- If your rules say an athlete may be suspended after the "A" sample is positive, ensure your governing body has addressed this and put in place a procedure or person to decide this quickly and to inform the athlete.
- If the athlete is not suspended after a positive "A" sample, establish at what stage he might be suspended and by whom. The rules of some governing bodies will allow such athletes to continue competing after a positive "A" sample.

- Have a media plan ready in advance.
- Ensure an adequate education and guidance programme for the athletes, coaches and team managers is in place and reviewed with your athletes prior to going on the games mission. Have your Chief Medical Officer interview each athlete to determine what substances they might be using.

Managing after a positive result

What does a team manager (or NOC Chef de Mission) do when informed of a possible doping offence?

Consult the rules

- be absolutely sure you are familiar with the various rules and procedures
- know the rights of the athlete as they have the right of redress in a court of law
- establish clear communication to your governing body
- be clear when any suspension begins
- the NOC does not take on the responsibilities that are the remit of the sport governing body. Out of competition and off-site testing may be the responsibility of the governing body
- seek legal help if available
- involve the Chief Medical Officer (CMO)

Inform the athlete

- the athlete has to know what has happened
- advise the athlete of the rules and procedures, his/her rights, the issue of the media and the options now open to him/her

Inform the NOC

- so that the issue of what happens next to the athlete can be agreed
- the media can be informed appropriately

Inform your governing body

- ensure all that need to know are advised
- ensure that everyone follows correct procedure
- ensure that the media is addressed with one voice

Remember the rest of the squad and why you are there

- a positive test can have a devastating effect on the rest of the team
- ensure you have planned how to help the team carry on in the competition
- advise them how delicate the situation is and the need for confidentiality

There is a need to keep an accurate diary of events, even noting times. This could prove invaluable if asked to recall incidents at a later date.

Hearing of the IOC Medical Commission

This meeting would be attended by a NOC representative, the athlete, the NOC legal adviser or the legal adviser chosen by the athlete, the Chief Medical Officer and/or the team medical officer.

Dealing with the Media

The media are trained to find out information, wherever or whomever the source and to report it. The NOC has a number of responsibilities, one of the most important being to protect the confidentiality of both the athlete and the issue until the IOC Medical Commission and the IOC Executive Board have determined the consequences of the situation and are about to report these publicly.

Legal and Procedural Issues

There are IOC rules, NOC rules, IF rules as well as your own sport rules governing the same issue - a doping incident. These are detailed procedures to be followed and very tight timelines. Therefore, it is imperative that the team manager, team medical officer and legal advisor (if available), at the least, are extremely clear on all these various rules and procedures.

The law of natural justice must prevail including having informed representation at proceedings and at appeals.

Court of Arbitration for Sport

An athlete, if found guilty of a drug offence at the IOC Medical Commission hearing, can file an appeal with the Court of Arbitration for Sport which will then designate a panel of arbitrators who are present on the site of the games in order to hear the case and to settle the dispute definitively. The panel shall give a decision within 24 hours of the lodging of the request.

This process raises a complication with regard to the legal defence of the athlete. In the past the athlete may have been sent home immediately, as the case would have been, in effect, over. With the Court of Arbitration appeal process, it could be wise for the athlete to appeal and stay at the games until a decision is made, with all the resulting media attention.

How Does an NOC Promote Drug-free Sport?

a. Test and develop the rationale for drug-free sport and the national anti-doping programme with the stakeholders concerned. The intention is to progressively refine the language and content of the drug-free sport consensus, and to build grass-roots and practitioner support for the positive messages about sport that are at the heart of the drug-free sport programme.

   Through involvement of stakeholders and partners, one can produce an anti-doping programme that is relevant to those who are most affected. The sport community's promotion of an ethical rationale for drug-free sport will pave the way for information tailored for particular needs; for instance, in coaching handbooks, athlete education, lesson plans for school use and so on.

b. In the drug-free sport promotional messages, the positive side of sport should be stressed, such as the mastery of skill and the joy of fair, and excellent competition. The task is to promote both an appreciation of the values of sport (probably the very things that motivated young athletes to start practising a sport in the first place) and its place in a life.

c. Promulgate clear supportive drug-free statements from sports leaders. Athletes need to know that, in their rejection of doping, they have the wholehearted support of those who care about sport.

d. Minimize the intrusion caused by testing.

e. Create, a widely publicized drug-free sport telephone hot-line that would provide athletes with timely, direct and personal information and advice.

f. Identify an athlete ombudsperson. This would provide an opportunity for athletes to get advice if they felt they were being pressured into doping by others.