

1:

There are various theories about the origin of the term “doping”. The view that the term derives from the Boer dialect of South Africa has met with wide acceptance. In the lexicon the term “doping” does not appear before the 20th century. Today the term “doping” refers to any kind of manipulation in the field of sport, but it is also used in other areas.

2:

Doping can be taken to be the English form of the present continuous, that is, to be in a state of “dope”. In the language lexicon “to dope” is also translated as “to give a box on the ear”.

It was thanks to the International Olympic Committee that the term caught on in sport. This body published a list, for the first time in 1967, stating which substances or substance groups were prohibited in a sporting context, either because they actually facilitated an illicit enhancement of performance or because they were being used in the supposition that this would be the case.

This list of prohibited substances and methods is still today the most practical guide to the understanding of the term “doping”.

3:

As has been mentioned previously, the term “doping” is not just used in sport or in a competitive context. Anyone who is found, either in preparing for a competition or in the competition itself, to have prohibited agents in his/her body, or is shown to have used a prohibited method, must be suspected of doping.

Because of their effectiveness, effective agents that are prohibited in the field of competitive sport are also used in leisure sports. As here we do not have to do with misconduct in the sporting sense, seeing that persons who practise leisure sports do not as a rule enter competitions in order to win, but rather are concerned to attain other goals, like the athletic ideal of the ancient Greeks for instance, “drug abuse” can be taken as the most appropriate label for the misconduct that is here involved.

4:

There are many definitions of doping. None of the general definitions on its own is suitable as a means of combating doping. Consequently the list of prohibited substances remains the best working tool for the purpose. Nonetheless, the WADA has taken care to ensure that the general definition and the specific criteria referred to in drawing up the list agree with one another.

The following criteria for doping are highlighted, in the general definitions as well:

1. Artificial enhancement of performance
2. Risk to the health of the athlete
3. Contravention of the rules of ethics.

5:

Concern for the health of the sportsman or sportswoman is one of the criteria on the basis of which doping is prohibited.

Effective agents are ingested, so long as they are not supplied by the black market or other shady sources, in the form of pharmaceuticals. Effective agents in

pharmaceuticals are given to the patient in order to bring about the recovery of the sick person or to reduce pain.

Sportsmen and sportswomen as well may have need of pharmaceuticals, if they are suffering from an illness, or if their body suffers damage as a result of physical overexertion or accident. But the intake of pharmaceuticals must be shown to be necessary on the basis of medical examination, seeing that the effective agents in the pharmaceuticals have side-effects as well, which have to be taken on board as part of the treatment of the individual's condition.

The effects and side-effects of pharmaceuticals may be dangerous to health if they are taken without having been prescribed by a doctor. All the organ systems of the sportsman or sportswoman may be affected here.

6:

Even as early as the Olympic Games of Ancient Greece, historians have described attempts to enhance athletic performance through the use of all kinds of foodstuffs.

In the first Olympic Games of modern times, as well, there is proof that wine or strychnine, for instance, was taken by athletes to give them increased endurance. In 1960 there was a death at the Olympic Games which was associated with the proven intake of stimulants.

At this point the International Olympic Committee focussed with increasing attention on this phenomenon, and established a Medical Commission, which in 1964 formulated a first definition of doping. After that, the groups of effective agents were summarised in a list as long ago as 1967, being defined as prohibited substances.

Samples were taken from athletes for the first time at the Olympic Games of 1968 in Mexico and Grenoble, in order to discover whether they had prohibited substances in their bodies.

If in 1968 a total of 754 checks produced one positive result (owing to alcohol), at the summer Olympics of 1972, in Munich, 2079 checks registered a total of seven positive results. At the Winter Olympic Games in Sapporo, out of 211 checks there was one positive result (owing to ephedrine).

7:

At the time of the reunification of Germany it became evident that doping was a secret political plan in the GDR.

As early as the year 1974, those substances that went by the name of anabolic steroids were put on the list of prohibited agents. The taking of urine samples came to be an established practice, and was accepted as a means of proving the presence of the prohibited agents.

As well as gas chromatography, mass spectrometry became a part of doping analysis. Doping analysis has continued to develop to the present day, by incorporating the latest results of scientific research and the technology of analytical procedures.

As further experience showed which effective agents were being used for doping purposes, the list of prohibited agents continued to be extended through the addition of new groups of agents and methods. The increasing number of checks and sanctions meant that doping could be monitored, even if it could not be done away with completely, and "doping swamps" were repeatedly discovered which needed to be drained.

The first world conference against doping took place in Ottawa in 1988. One result of this conference was the International Olympic Charter against Doping, at which, for

instance, the responsibility of sporting institutions and public administrative authorities in the fight against doping was formulated. As long ago as in the year 1989 the anti-doping convention of the European Council was drafted, and all countries urged to subscribe to it. In this convention as well the responsibilities of national governments and sporting institutions are set forth.

8:

In the period following on from this, the fight against doping came into the limelight. With ongoing pharmaceutical developments, in particular, complex substances intrinsic to the body came to be available on the market as effective agents tending to enhance performance, strength and endurance. Among these were such substances as the hormone erythropoietin (EPO), which stimulates the formation of the red blood corpuscles, as also the growth hormone and other hormones known as peptide hormones.

Prohibited substances can also bring about an effect of enhanced strength in the sphere of training. This made it necessary to monitor the abuse of such prohibited agents not just in a competitive context, but also in the phase leading up to competition, in the training phase.

Although training checks were called for at an early stage, it was some time before a system of training checks could be organised.

There is no unified system of training checks. International federations implement such training checks, as do national administrative authorities and sports organisations.

9:

In the nineties increasing attention was paid, in this connection, to the body-building scene and the rapidly growing fitness studio market.

The body-building movement has been around since the end of the 19th century: the first body-building "contests" were held in the USA in 1906.

Since the middle of the seventies fitness studios have become very popular. Body-builders as well made use of this new commercial opportunity. Fitness studios are concerned, however, to realise aspects of health by training specific parts of the musculature. All the same, it can be clearly seen that substance abuse (especially of substances that tend to develop body and muscle) has been practised by those who patronise fitness studios in their efforts to achieve a particular bodily tone.

Doping is a problem for sport and for society. For this reason the European Union approved an anti-doping code of behaviour as long ago as in the year 1993.

All the same doping goes on grabbing the headlines in a big way, as most recently in connection with the Tour de France in the year 1998. This doping scandal was the trigger for the World Conference against Doping in the year 1999, in which further proceedings to combat doping were resolved upon by national governments and international sports institutions.

10:

The list of prohibited agents and prohibited methods has now developed over a period of some decades. Today this list is based on a certain system. There are classes of substance that are prohibited generally, and other substances that are prohibited in certain types of sport.

For various reasons it was necessary to establish critical levels of concentration for some substances.

Other substances are required for therapeutic purposes, and these are allowable if the need for them is medically attested and if notice is given that they are being used. The methods prohibited include all those measures which could either lead to a manipulation of the urine sample, or could increase the capacity of the blood to carry oxygen or change the composition of the blood.

11:

With the ongoing development of the list of prohibited substances, the classes of prohibited agents have been extended. Today we can distinguish between five different classes of prohibited agents. For each of these classes of substances a few examples are listed, while the phrase “..... and related effective agents” makes it clear that the list of examples is not conclusive.

The group of anabolic effective agents is subdivided into the anabolic/androgenic effective agents on the one hand, and the β 2 agonists on the other. Anabolic steroids are related to steroids, while the β 2 agonists are drugs which have the side-effect of enhancing the buildup of the musculature.

The peptide hormone group shows great variations in the effect produced. Here we have to do with natural hormones, the effect of which can also be produced by similar substances. For this reason they are known as “mimetics”. Prohormones, which are transformed to a prohibited hormone within the body, are likewise prohibited.

These prohormones are not subject to prescription in all countries, so that they can be freely purchased over the counter.

12:

Stimulants were the first group of effective agents which were placed on the doping list that was drawn up in 1967. This group of substances includes very different agents, both natural agents and their derivatives and those that are artificially produced.

Amphetamines were developed in the first third of the last century, and soon targeted for use by the military in particular. The effect of these substances did away with the feeling of tiredness, enhancing performance in spite of exhaustion. The side-effects of the stimulant were either not known or else they were simply ignored.

Ephedrine is a group of effective agents that are derived from a stimulant that was discovered in the Chinese plant ma huang (ephedra sinica). Today these substances are still included as an ingredient in many pharmaceuticals, like those prescribed for the treatment of general influenza conditions, for example.

Caffeine was discovered in coffee beans, and it is also an agent in tea. Caffeine is also found as an effective agent in other plants like the guarana, native to Brazil, and in cola nuts.

Finally cocaine, an effective agent in the South American coca shrub, may be used to alleviate pain, or misused as a stimulant to bring about a state of psychic illumination. This is an ancient drug which was already known to the ancient peoples of South America, and the use of it is widespread in society today.

Stimulants continue to be used in sport. In the doping analyses registered by the IOC over a period of three years, totalling more than 7000 substances, in around 23% of the cases the presence of stimulants was established. That puts this group of effective agents among the most frequently misused doping substances, second only to the anabolics.

13:

Stimulants can be described as drugs which stimulate the body, acting directly on the nerves. They can pass through the barrier of the blood and the brain, and so also have effects on the central nervous system. The fact that they operate from this site explains the suppression of fear or exhaustion that they bring about. Their effect is so powerful that an athlete will no longer realise how exhausted he is, and there have been cases of overexertion leading to death, especially in top-level competitive sports. Associated with these effects, dehydration may also occur as a result of prolonged effort, and generally hyperthermia as well.

It is true that cocaine is hardly classified as a drug that has the same effect of performance enhancement as the amphetamines, but it cannot be ruled out that high levels of physical stress may be made psychically more bearable in the short term through the intake of cocaine.

Amphetamine abuse is found above all in activities that call for a high degree of staying power and consume a lot of energy.

Mountaineering amateurs, for instance, were requested to give a urine sample on the peak of a mountain. In something over 3% of the cases amphetamines were found in the urine samples.

We can assume, then, that the abuse of stimulants takes place in our society, and not just in isolated incidents.

14:

The side-effects of amphetamines on the heart are to be put down to the stimulation of the sympathetic nervous system. There are also reports of cerebral haemorrhages, as an occasional side-effect. Cocaine on the other hand leads to a depolarisation, and so to disturbances of the conduction system. One possible result of this is a racing heart. In a case of chronic abuse, these side-effects may issue in a chronic disease of the heart muscle (cardiomyopathy). After amphetamine abuse it can happen that the pulmonary blood pressure rises. But it seems that a certain predisposition must be present for this side-effect to develop. The misuse of amphetamines and cocaine can damage the musculature, leading to the destruction of tissue through myoglobinuria. This can result in serious damage to the kidneys. The stimulation of the sympathetic nervous system may also give rise to an increase in bodily temperature, which may go above 40° C.

Reduced appetite and dryness of the mouth are an expression of the reduced blood flow to the mucous membrane of the stomach and intestine, with the risk that ulcers may develop. In case of an overdose, nausea and vomiting may follow as an immediate reaction.

When toxic doses are taken, the side-effects listed above will be still more marked. Life-threatening states may result, and there have even been reports of death occurring.

15:

Narcotics are the second group of prohibited agents. This group includes all effective agents which act on the central nervous system to bring about the desired effect, namely the reduction of pain.

These are very powerful substances. All the active ingredients that belong to this group are more or less related in chemical terms to morphine, the active ingredient in morphium, opium and heroin.

These substances produce an effect by acting on the brain stem, just above the point where the spinal cord enters the brain.

In this overall picture of the brain, the point where the substance acts cannot itself be made out. If we wanted to see the actual point where it acts, we would have to dissect the brain lengthwise.

Pain caused by over-training or other factors may be combated in a general way by the use of these powerful analgesics, but they have powerful side-effects as well. These may produce somewhat negative effects, especially in a competitive situation. Consequently the use of these analgesics as a doping agent is documented only in rare cases. In positive tests carried out worldwide over three years, an average of only around 1% revealed the presence of narcotics.

16:

The side-effects of narcotics are various. As all the effective agents from the narcotics group that are on the list of prohibited agents can be derived from morphine, they are all more or less strongly addictive.

As well as studies carried out on sick individuals, there have also been studies carried out on the effects and side-effects of narcotics using healthy volunteers. On the basis of these studies, the following results can be set forth.

Ingestion of the drug on just one occasion may already produce various side-effects in addition to the desired effect of pain relief. These do not occur in all cases, but are still relatively frequent. Among these are "doziness", confusion, dizziness and mood swings.

Nausea and vomiting are the result of the action of narcotics on the stomach and intestinal tract; in some cases slight respiratory depression may occur, and there may also be sweating and disturbed vision caused by the narrowing of the pupils.

In case of prolonged or more frequent use, as well as the effect of habituation, constipation results, and the danger of dependency increases very rapidly.

Besides the psychic and physical side-effects, other effects have been described, particularly itchy skin, which has been discussed as a genuine side-effect.

It is in any case a cause for concern that the ingestion of powerful analgesics of the narcotics class, corresponding to the IOC's prohibited list, is a danger to the health of those engaged in sport when not taken under doctor's orders.

17:

Anabolic agents accelerate the buildup of protein, in particular in the musculature. They may be substances derived from the male sexual hormones (anabolics), or alternatively other effective ingredients which have a marked anabolic side-effect, such as for example the beta 2 agonists. They may be taken in the form of tablets, or else given as an intramuscular injection.

Anabolic agents produce a positive nitrogen balance in the body, with the result that the biosynthesis of protein is enhanced.

Anabolic substances have an effect on the musculature in particular, when training is carried out under the influence of these agents.

As substances that are related to the male sexual hormones, anabolics have the side-effects that would be expected. These are also sexually specific. The beta 2

agonists, on the other hand, have other side-effects, corresponding to the site on which they act, namely the beta receptors.

As well as the anabolic steroids, the group of beta 2 agonists has also been found to act anabolically as a side-effect. Consequently this group of substances is also abused for purposes of muscle development. The side-effects are often of a general nature, including slight tremor, restlessness, possibly a racing heart and headaches.

18:

As has already been mentioned, the anabolics, being derived from the male sexual hormones, have sexually specific effects.

In women the misuse of anabolics leads in all cases to masculinisation (virilisation), to a greater or lesser degree. One of these side-effects is that the voice becomes lower, another is the increase in hair growth (hirsutism).

Naturally the anabolics also have negative effects on the female monthly cycle, which may become irregular or in cases of prolonged abuse can stop altogether.

Sexually specific side-effects in men may be the development of gynaecomastia, a fatty imitation of the female breast. As the hormonal balance is disturbed, the testicles will soften and later shrink. This is associated with the risk of a temporary or lasting infertility, because the formation of sperm (spermatogenesis) is negatively affected.

Then too there are other dangerous side-effects that are not sex-related, those on the heart and blood vessels for instance (cardiovascular effects) or on the liver, and those less dangerous but aesthetically unpleasant side-effects such as steroid-related acne, increase of bodily weight, possibly as a result of water retention, and injuries like the tearing of muscles or tendons. Behavioural changes cannot be ruled out either, such as a fanatical motivation to train or even uncontrollable outbreaks of rage, as well as depression when the intake of anabolics is discontinued.

19:

Even if, up to the present time, there has not been a completely watertight proof of the direct connection between a heart attack and an earlier or current misuse of anabolics in excessive amounts, there are many factors giving rise to suspicion, and these must be taken seriously. There are studies of individual cases as well as summaries, including comparisons of the frequency of disease occurring in anabolic abusers with individuals who have never taken them.

20:

In the field of sport, diuretics are misused for various different reasons. A rapid loss of weight can be achieved through the excretion of water. In types of sport where competition is organised on the basis of weight categories, this makes it possible for an athlete to enter in a lower weight class.

Accelerated excretion may also be resorted to as part of an attempt to excrete other doping substances more quickly or to make it hard to prove their intake in view of the level of dilution that has been reached.

Around 4% of the doping substances registered by the IOC over a period of three years in positive A-tests were diuretics.

Diuretics are sometimes taken in body-building as well, so as to cover up the anabolic side-effect of water retention in the tissue, and to make the musculature

clearly visible through the dehydrated skin. This type of abuse has been found in a few cases even in community open-air sports.

The side-effects on health will show themselves in numerous physiological processes, depending on how necessary the electrolytes are, and also in various organ systems.

21:

General side-effects occurring frequently of which we have reports are weakness, tiredness and exhaustion. For the most part this can be put down to the loss of electrolytes. A considerable loss of kalium, such as occurs in connection with some diuretics, may have a negative impact on the action of the heart. In this connection we have reports of disturbance of the heart's natural rhythm.

The loss of water means that the proportion of water in the blood will be reduced, with an increasing risk of thrombosis as a result. Too rapid loss of water following from excessive dosage of diuretics may also result in hypovolemic conditions or even shock. The loss or transposition of electrolytes may result in ailments of the stomach and intestinal tract, and in case of hard physical work may also cause muscular cramps.

The loss of electrolytes may also have an effect on the senses. Sensory disturbances and disturbances of vision and hearing cannot be ruled out. There have been numerous reports of toxic effects on the ears.

22:

Growth hormone may be derived from natural sources, or it may be produced by gene technology. With preparations of unknown origin, in particular, there is no way of determining the source they come from. Indeed, there are preparations of growth hormone actually offered on the black market today which have been obtained from human cadavers.

Consequently there are two kinds of health hazard associated with the misuse of growth hormone – on the one hand the risks that arise from the side-effects, on the other, the risk of a disease being transmitted from infected biological material.

The improper use of growth hormone in healthy individuals has a great many direct effects and side-effects, because the receptors for growth hormone which are responsible for the hormone's effect are to be found in almost all the tissues of the body. One of the effects (especially in the liver tissue) is the release of IGF-1, which enhances the action of the hormone still further.

Side-effects of improper use can include for example headaches, water retention in the tissue, sweating, exhaustion and pains in the joints. An enlargement of the hands, feet, nose, ears, chin and tongue can occur, as also of the inner organs.

Growth hormone has an impact on the metabolism, with the effect that fatty tissue is broken down and muscle built up, so that its effect is opposed to that of insulin. But it also has an effect on the metabolism of sugar, and in cases of long-standing abuse can cause diabetes.

The effect of the hormone on the heart shows in an unphysiological enlargement, which can develop into a disease of the heart muscle. There is an increased risk of dying of heart disease. It is also known that patients with acromegaly are subject to a greater risk of contracting cancer of the prostate or colon.

Finally, when the source is not known, the possibility cannot be excluded that the preparation has been obtained from cadavers, carrying a very high risk of infection.

Diseases that particularly call for mention in this connection are hepatitis, HIV and Creutzfeld-Jakob disease.

23:

The cycle of the formation of red blood corpuscles is controlled by the oxygen content in the blood, which is “measured” by receptors on an ongoing basis as a control variable. If the oxygen content is reduced and the body reaches a state of hypoxia, the production of EPO will be triggered, and following from this red blood corpuscles will be formed in the red bone marrow. The important organ in connection with this cycle is the kidney, in the tissue of which EPO is very probably formed.

As the increase in the red blood corpuscle count makes it possible for the blood to carry more oxygen, the severity of the hypoxia is alleviated and the control loop is closed.

It is possible to intervene in this control loop by introducing EPO externally, bringing about an increase in the red blood corpuscle count even without training. Consequently EPO was developed as a medical drug for the treatment of anaemic patients whose natural production of EPO was severely affected as a result of damage to the kidneys or kidney failure.

24:

Erythropoietin (EPO), whether in the form natural to the body (hEPO) or that produced by gene technology (rhEPO), has no side-effects based on its structure. All its effects that are hazardous to health are linked to the effect of the formation of red blood corpuscles.

The haematocrit is a relative value which indicates the percentage ratio of the cellular components that are present in the blood. Practically the entire proportional balance of cells is to be attributed to the quantity of erythrocytes.

In healthy individuals the haematocrit generally comes to something between 45% and 48%. Heavy sweating can certainly cause the haematocrit to rise, though values over 50% are not usually registered. At these levels the flow properties of the blood are still within the physiological zone.

Individuals with an exceedingly unusual genetic makeup can have higher haematocrit levels. Such high levels just before a competition cannot usually be explained. More important, though, is the health hazard to the sportsman in such a case, seeing that additional exertion and sweating can cause the haematocrit to reach a level that is life-threateningly high. When values over 50% are reached, the flow properties of the blood in the blood vessels deteriorate, and the blood flow can actually come to a stop in the capillaries or smaller blood vessels. The blood coagulates, and the adjacent tissue areas die off.

25:

As well as prohibited agents, the IOC/WADA list also includes prohibited methods.

Prohibited methods serve either to give the athlete greater staying power, or to cover up the fact that doping with prohibited agents has been practised.

Blood doping, or the use of artificial oxygen carriers, gives greater staying power, while the use of plasma expanders or substances which make it hard or impossible to demonstrate the presence of doping substances belongs to the second group.

Finally the prohibited methods also include such forms of manipulation as make proper testing impossible, like handing over urine not one's own in a concealed container.

The prohibited methods too give rise to various health hazards.

26:

The practice of blood doping is a very involved business, and it is difficult to prove that it has been resorted to.

What is at issue here is a transfusion of the athlete's own blood, which has been taken from him/her in the course of what is known as altitude training in a state where the red blood corpuscle count is high, and is then given back again just before the competition. Blood doping now also covers the use of concentrates of red blood corpuscles.

The dangers to health as a rule arise when the process is improperly executed. When it is not a case of the athlete's own blood being used, none of the accidents associated with blood transfusion can be excluded in the individual case. Itching is mentioned with some frequency as a reaction to a blood transfusion, while an anaphylactic reaction is only to be expected in case of gross error. Every injection, infusion or transfusion involves a certain risk of infection: this will be more likely to occur, the more carelessly the process is carried out.

27:

The use of artificial oxygen carriers is very dangerous, as none of these effective agents yet exist in the form of medicaments. At best they are still in the testing stage. Consequently there is little known about possible side-effects. After the doping scandal of the Tour de France in 1998, the death of a racing cyclist was linked to the intake of PFC (perfluorocarbon).

To the extent that these artificial oxygen carriers are directly put into the bloodstream, the same risks apply as were mentioned in the previous slide.

28:

The use of what are known as plasma expanders has been found to occur in sport. Plasma expanders are infused solutions which have the additional effect of causing water to pass from the tissue into the bloodstream.

Ever since Finnish athletes were proved to have been doping with EPO, with the help of the demonstration that HES (hydroxyethyl starch) had been used, plasma expanders have been banned from sport.

Plasma expanders reduce the concentration of haemoglobin in the blood and lower the haematocrit after the misuse of EPO.

A health hazard can arise if in the course of competitive exertion the body's loss of water reaches life-threatening proportions. Health hazards also exist in the same way as with other infusions, especially if the process is improperly executed.

29:

The list of the groups of prohibited agents and prohibited methods includes a group that is not generally prohibited, but which may be prohibited by individual sporting federations in keeping with their regulations, or by organisers like the IOC in the individual case.

This group includes alcohol, the cannabinoids, local anaesthetics and glucocorticosteroids.

The presence of these substances has been established in doping tests only on infrequent occasions.

In limited quantities alcohol has a rather relaxing effect; for this reason it is also known as “target fluid”.

‘Cannabinoids’ is the general term given to the effective agents contained in Indian hemp. Hashish and marijuana are the parts of the plants that are processed for purposes of drug abuse.

Only the use of certain local anaesthetics – substances, that is, designed to bring about local narcotisation – is permissible, on the basis of local or intra-articular injection, and only when acting on medical advice.

The glucocorticosteroids are likewise only allowable when applied locally.

30:

In leisure sport, special nutritional supplements are out of place. Instead, a balanced diet is appropriate to the healthy practice of sport.

Information on the dangers of nutritional supplements, and on what are known as social drugs, can be found on the webpage www.dopinginfo.de.

This slide gives a summary, detailing some of what is known about the various nutritional supplements.

31:

Doping is regarded as unethical behaviour towards all those who take part in competitions, whether they are involved in an active athletic role or as functionaries and organisers. A competition involving sportsmen and sportswomen who have either taken effective agents that are prohibited or made use of prohibited methods is tantamount to a betrayal of the audience and the sponsors.

The imposition of penalties for doping, then, is not just a responsibility for those who organise sporting events: it is also a matter for the sporting federations to which the sportsmen and sportswomen belong, and for national governments as well. Consequently there have been statutory regulations against doping as long as there have been rules governing sporting procedures.

Those targeted by sanction measures are in the first instance those who can be proved to have practised doping. But in increasing measure the background environment is being taken into consideration as well, seeing that doping is not just malpractice by a single individual, but involves the interaction of the individual with his or her environment. The doping scandal of the Tour de France in the year 1998 may be cited as an example. This came to light because a member of the backup crew of a team was found to be in possession of doping substances when crossing the frontier.

32:

When presenting graphic materials, you are requested to name the source in each case.