Health Consequences of Doping

Note: The text below is for general information purposes only. It is intended for elite coaches who will attend or have attended elite coach anti-doping training and who are seeking a general understanding of some of the effects of certain substances and methods. Science, substances and methods, and the manner in which substances and methods are used are, however, in constant evolution. For up to date and more detailed information, the reader should consult with an expert with the appropriate scientific background and experience.

General Comments on Health Consequences of Doping

It is very difficult to determine the exact side effects that a substance or a method or combination thereof may have on an athlete who is doping. This is partly because:

- the relevant studies cannot be conducted on individuals without a therapeutic reason to do so;
- the substances or methods used by doping athletes are usually developed for patients with well-defined disease conditions and are not intended for use by healthy people;
- volunteers in a therapeutic study are unlikely to be subjected to the same conditions of administration and dosage of a substance and/or method as those of an athlete who is doping;
- athletes who use prohibited substances often take them in significantly larger doses, and more frequently, than these substances would be prescribed for therapeutic purposes, and often use them in combination with other substances; and
- substances that are sold to athletes as performance enhancers are often manufactured illegally and may therefore contain impurities or additives, which can cause serious health problems or may even be fatal.

Because the many combinations and/or doses of performance enhancing substances used by doping athletes have never undergone official trials, for an athlete to acquiesce to doping is to accept being a guinea pig and to risk adverse effects of unknown nature and unknown gravity. The adverse effects outlined in this document are likely to be the very least of those that may be expected. The actual adverse effects and side effects of using large doses and drugs in combination with others are likely to be much more severe and serious. Using combinations of several drugs means not simply adding but compounding the risks.

Since hormones play multiple roles in the human organism's regulatory functions, the non-therapeutic use of any type of hormone risks creating an imbalance that affects several functions, and not only the function that is usually directly concerned by the given hormone.

Additional health risks are present when the use of substances or methods involves injections. Non-sterile injection techniques, including sharing possibly contaminated needles can increase the risk of transmission of infectious diseases such as hepatitis and HIV/AIDS.

Finally, use of any substance may also lead to addiction, whether psychological or physiological.

Agents with Anti-Oestrogenic Activity

Side effects of the use of compounds with anti-oestrogenic activity include:

- hot flushes
- weight gain
- fluid retention
- cardiovascular disorders such as thrombosis (blood clots), hyperlipidemia (excess fat in the blood)
- osteoporosis
- eye disorders
- liver toxicity

Alcohol

Alcohol can increase self confidence, which may result in the person taking risks that he/she would not normally take. This could place both the subject and other persons around him/her at risk. Furthermore, continued alcohol consumption can lead to:

- vomiting
- slurred speech
- double vision
- memory and comprehension loss
- liver damage
- impaired judgement, co-ordination and reactions
- incontinence
- sleepiness
- shallow breathing
- sexual disorders
- addiction

Anabolic Androgenic Steroids

The use of anabolic androgenic steroids can have serious effects on a person's health. The list of potential side effects is long and varied. Many of the reported side effects are reversible if the person stops using anabolic steroids; however, those indicated by an asterisk (*) in the table below may be permanent depending on dosage or duration of use.

Anabolic steroids mimic naturally occurring hormones; they can therefore interfere with normal hormone function and may result in harmful side effects such as:

- increased risk of liver disease
- increased risk of cardiovascular disease
- increased risk of contracting infectious diseases such as hepatitis and HIV/AIDS
- high blood pressure
- psychological dependence

Also In Males:	***Also In Females:***	***Also In Adolescents:***
▪ acne ▪ shrinking of the testicles* ▪ reduced sperm production* ▪ impotence* ▪ infertility ▪ enlarged prostate gland ▪ nreast enlargement ▪ premature baldness ▪ potential kidney and liver dysfunction* ▪ increased aggression and mood swings ▪ libido disorders	▪ acne ▪ development of male features ▪ deepening of the voice* ▪ excessive hair growth on the face and body* ▪ abnormal menstrual cycles ▪ enlarged clitoris* ▪ increased aggression and mood swings ▪ foetal damage ▪ alteration of libido	▪ severe acne on the face and body ▪ premature puberty ▪ stunted growth as a result of premature closure of the growth plates of the bones

Artificial Oxygen Carriers

The harmful side effects of artificial oxygen carriers can be extremely serious, particularly as it is difficult to measure correct doses of these chemicals.

Side effects of perfluorocarbons include:

- a transient fever
- reduction in platelet count
- blood infection (if preparations are impure)
- potential overloading of the white blood cells
- irritability
- diarrhoea
- stroke
- embolism (blocked blood vessel).

Possible side effects of haemoglobin based oxygen carriers include:

- high blood pressure
- vasoconstriction (constriction of the blood vessels)
- kidney damage
- iron overload

Beta Blockers

Side effects of using beta blockers include:

- lowered blood pressure and slow heart rate
- sleep disorders
- sexual dysfunction
- feelings of tiredness and decreased performance capacity in endurance activities
- spasm of the airways
- heart failure
- depression
- constriction of blood vessels in the arms and legs

Beta2 Agonists

Possible side effects of beta2 agonists include:

- palpitations
- headaches
- nausea
- sweating
- muscle cramps
- dizziness
- mood disorders

Blood Doping

Blood doping carries dangerous health risks including:

- jaundice
- circulatory overload
- increased risk of contracting infectious diseases such as hepatitis and HIV/AIDS
- septicaemia (blood poisoning)
- blood clots, stroke or heart failure
- metabolic shock
- allergic reactions (ranging from rash or fever to kidney damage) if wrong blood type is used

Cannabinoids

Effects of cannabinoids may include:

- state similar to drunkenness
- loss of perception of time and space
- drowsiness and hallucinations
- reduced vigilance, balance and co-ordination
- reduced ability to perform complex tasks
- loss of concentration
- increased heart rate
- increased appetite
- mood instability – rapid changes from euphoria to depression

Long-term marijuana use may result in:

- loss of attention and motivation
- impaired memory and learning abilities
- weakening of the immune system
- respiratory diseases such as lung and throat cancer and chronic bronchitis
- psychological dependence

Corticotrophins

The short-term side effects of ACTH use include:

- stomach irritation
- ulcers
- irritability
- infections

Other side effects may include:

- softening of the connective tissue
- high blood sugar (hyperglycaemia)
- reduced resistance to infections
- weakening of an injured area in muscles, bones, tendons or ligaments
- osteoporosis
- cataracts
- water retention

Diuretics

Some of the side effects of the use of diuretics include:

- dizziness or even fainting
- dehydration
- muscle cramps
- drop in blood pressure
- loss of co-ordination and balance
- confusion, mental changes or moodiness
- cardiac disorders

Erythropoietin (EPO)

There are some serious health risks associated with use of EPO such as:

- thickened blood
- increased risk of blood clots, stroke and heart attacks
- increased risk of contracting infectious diseases such as hepatitis and HIV/AIDS
- risk of developing, as an autoimmune reaction, EPO antibodies that can definitively destroy the EPO that is produced naturally by the body

Gene Doping

Since most gene transfer technologies are still in experimental phases, the long-term effects of altering the body's genetic material are unknown, although several deaths have already occurred during experimentation. Some of the potential side effects of gene doping are:

- cancer development
- allergy
- metabolic deregulations

Glucocorticosteroids

When administered into the blood stream, glucocorticosteroids have numerous side effects, involving different body systems. Possible side effects of large doses of glucocorticosteroids include:

- fluid retention
- increased susceptibility to infection
- osteoporosis (abnormal loss of bone tissue resulting in fragile porous bones)
- weakening of injured areas in muscle, bone, tendon or ligament
- disorders of the nervous system, such as convulsions and muscle cramps
- decrease in or cessation of growth in young people
- loss of muscle mass
- heartburn, regurgitation and gastric ulcers
- softening of connective tissue (such as tendons and ligaments)
- alteration to the walls of blood vessels, which could result in formation of blood clots
- psychiatric disorders, such as changes in mood and insomnia

Gonadotrophins

As hCG stimulates the production of testosterone, the side effects can be similar to those experienced from anabolic steroid use. Other side effects of gonadotrophins use include:

- bone and joint pain
- hot flushes
- decrease in libido
- impotence
- allergic reactions and rash
- nausea, dizziness
- headaches
- irritability
- gastrointestinal problems
- irregular heart beats
- shortness of breath
- loss of appetite
- depression
- tiredness
- rapid increase in height

Growth Hormone and Insulin-Like Growth Factor

There are dangerous side-effects related to the use of these substances including:

- tremors, sweat, anxiety
- worsening of cardiovascular diseases
- increasing development of tumors
- cardiomegaly (abnormal enlargement of the heart)
- accelerated osteoarthritis (chronic breakdown of cartilage in the joints)
- acromegaly in adults (distorted growth of internal organs, bones and facial features and the enlargement and thickening of fingers, toes, ears and skin)
- muscle, joint and bone pain
- hypertension
- fluid retention
- diabetes in individuals who may already be prone to the disease
- gigantism in young people (excessive growth of the skeleton)

Insulin

The side effects of insulin use for non-medical purposes are severe and include low blood sugar (hypoglycaemia), which in turn may cause:

- shaking
- nausea
- weakness
- shortness of breath
- drowsiness
- pancreas disease
- coma
- brain damage and death

Narcotics

The use of narcotics to reduce or eliminate pain can be dangerous as the substance is merely hiding the pain. With the false sense of security caused by narcotics, the user may ignore a potentially serious injury, and continue activity, risking further damage or causing permanent damage. Apart from the risk of further or permanent damage, narcotics can have other dangerous side effects such as:

- slowed breathing rate
- decreased heart rate
- sleepiness
- loss of balance, co-ordination and concentration
- suppression of the respiratory system and death
- euphoria
- nausea and vomiting
- constipation
- physical and psychological dependence, leading to addiction

Stimulants

The use of certain stimulants can cause serious cardiovascular and psychological problems, as well as various other side effects, such as:

- overheating of the body
- dry mouth
- increased and irregular heart rate
- increased blood pressure
- dehydration
- increased risk of stroke, cardiac arrhythmia and heart attack
- visual disorders
- problems with co-ordination and balance
- anxiety and aggression
- insomnia
- weight loss
- tremors (involuntary trembling or shaking)

Stimulant use can also result in dependence and addiction.