

# **HARMFUL EFFECTS OF DOPING**

## **S1. ANABOLIC ANDROGENIC STEROIDS (AAS)**

These are the substances that have both anabolic and androgenic properties. 'Anabolic' means 'tissue building' and 'androgenic' means 'masculinizing'. The anabolic properties may affect accelerated growth of muscles and bones while the androgenic properties may affect development of male reproductive system and secondary male sexual characteristics such as hairiness and deep voice. The anabolic androgenic steroids can be derived both endogenously (natural) as well as exogenously (synthetic).

After administration of anabolic androgenic steroids the formation of protein is promoted in genital organ, skin, skeleton and muscles. Athletes may be tempted to use anabolic androgenic steroids to improve their physical and physiological capacity to train and compete at highest level by reducing associated fatigues and recovery duration. In an impression to increase muscular power and strength these substances are sometimes taken by athletes involved in weightlifting, throwing and other sports involving strength parameters.

**Side Effects of Anabolic Androgenic Steroids:** The side effects associated with anabolic androgenic steroids are extremely serious and are divided into general, male specific and female specific.

**General Side Effects:** Greasy skin and acne, Infertility, Hypertension, Liver and kidney dysfunction, Aggressive behaviour, & Tumour

**Male specific Effects:** Breast development, Testicular atrophy, Diminished male hormone production, Diminished sperm production, Impotence, Alopecia & Prostate cancer

**Female specific Effects:** Male pattern hair growth and baldness, Menstruation disturbances, Decreased size of breast & Deeper voice (hoarseness)

**Other Anabolic Agents:** Other anabolic agents are substances which pharmacologically are not related to anabolic androgenic steroids, but may have the similar anabolic effect. This class of substances has been added in the WADA list of prohibited substances and methods because of clenbuterol and zeranol abuse in sports.

**Side Effects of other Anabolic Agents:** Trembling, Restlessness, aggressive behaviour, Anxiety, Arrhythmias & Muscle cramps

## **S 2 HORMONES AND RELATED SUBSTANCES**

Peptide and glycoprotein hormones are natural substances that act as 'messengers' within the human body and triggers the production of other hormones endogenously like testosterone and corticosteroids. The synthetic drugs like hCG, hGH, ACTH and EPO are known as analogues having similar effects to peptide hormones. Erythropoietin (EPO) hormone increases the number of red cells in blood and is used by athletes in endurance performances. Human growth hormones (hGH) are used by athletes for muscular strength. Human chorionic gonadotrophin (hCG) hormones are used by athletes to increase endogenous production of steroids specially to in an impression to improve the muscular strength. hCG is usually taken by those athletes who takes anabolic steroids to counteract the effects of testicular damage or as a masking agent. The use of synthetic gonadotrophin hormones by athletes stimulates ovulation in women and testosterone in men. Insulin may be illegally used in conjunction with anabolic steroids in an attempt to increase muscular strength. Adrenocorticotrophin (ACTH) hormone increases the level of endogenous corticosteroids in the blood and hence is taken by athletes in misconception to improve muscular strength.

**Side Effects of EPO:** Increased viscosity of blood, Hypertension, Myocardial infarction, Cerebral infarction, Pulmonary embolism & Convulsions

**Side Effects of hGH:** Acromegaly (overgrowth of limbs), Soft tissues swelling, Abnormal growth of organs, Arthropathies (joint disorders) & Diabetes mellitus

**Side Effects of hCG:** Menstrual disorders & Gynecomastia (breast development in males)

**Side Effects of insulin:** Hypoglycaemia, Nausea, Drowsiness & Brain malfunctioning

**Side Effects of ACTH:** Insomnia, Hypertension, Diabetes mellitus, Stomach ulcers & Osteoporosis

### **S3 BETA-2-AGONISTS**

Beta-2-Agonists if taken into bloodstream are having anabolic effects and hence WADA prohibited the use of all Beta-2-Agonists by athletes with the exception of inhaled formoterol, salbutamol, salmeterol and terbutaline to treat and/or prevention of asthmatic athletes. An abbreviated therapeutic use exemption certificate is required for the use of inhaled Beta-2-Agonists.

### **S4 HORMONE ANTAGONISTS AND MODULATORS**

These substances may be illegally used by athletes to counteract undesirable side effects associated with anabolic steroid use such as gynecomastia.

**Side Effects of Hormone Antagonists and Modulators:** Hot flushes, Gastrointestinal disorders, Fluid retention & Venous thrombosis

### **S5 DIURETICS AND OTHER MASKING AGENTS**

Masking agents are substances that have the potential to impair the excretion of prohibited substances to conceal their presence in urine or other doping control samples or to increase haematological parameters.

### **S6 STIMULANTS**

Stimulants are substances, which have a direct stimulating effect on the central nervous system. The stimulant increases the excitation of brain and spinal cord, cardiac output and rate of metabolism. The stimulants that are widely used in sports are amphetamine, cocaine and ephedrine. The players use these substances to attain the same effect as adrenalin, which is secreted naturally in human body. The stimulants may produce alertness, wakefulness and increased ability of concentration. These substances may develop the faculty to exercise strenuously or produce a decreased sensitivity to pain.

WADA has forbidden the use of stimulants in sports. Many cough and cold medications contain stimulants. One group of stimulants is the sympathomimetic amine of which ephedrine is an example. In lower doses these amines are often present in cold and hay fever medications and often these medications are easily available from pharmacies and retail outlets without the need of medical prescriptions. Thus such type of medications should be avoided by the athletes.

**Side Effects of Stimulants:** If an athlete after consuming stimulants performs under severe circumstances eg long periods and or in the heat, the athlete's body heats up intensively and due to influence of stimulants it may become difficult for the human body to cool down. The cardiovascular system and other vital organs also start malfunctioning by the use of stimulants and in some cases may lead to death. Other potential harmful effects of stimulants are listed below:

**Harmful effects of stimulants:** Loss of appetite, Insomnia (loss of sleep), Euphoria, Hallucinations (Psychosis), Trembling, Restlessness, agitation, tenseness, Hypertension, Palpitation and heart rhythm disorders, Hyperthermia (increased body temperature)

### **S7 NARCOTICS**

The narcotics prohibited in sports are those derived from morphine and its chemical and pharmacological analogues.

These substances act on central nervous system and reduce pain feeling. The use of narcotics causes a false sense of cure in an injured athlete that leads to ignorance of a potentially serious injury and risking further damage.

**Side Effects of Narcotics:** Addiction, Loss of balance and coordination, Nausea and dizziness, Insomnia & depression & Decreased heart rate

### **S8 CANNABINOID**

Cannabinoid is psychoactive chemical. Marijuana, hashish and hashish oil are derived from cannabis plant. Prolonged use of cannabinoid may result in loss of motivation, decreased concentration, impaired memory and learning disability, respiratory diseases such as lung cancer, throat cancer and chronic bronchitis.

**Side Effects of Cannabinoid:** Impaired balance and coordination, Loss of concentration, Increase in heart rate, Increased appetite, Drowsiness & Hallucination

### **S9 GLUCOCORTICOSTEROIDS**

Glucocorticosteroids are prohibited in-competition when administered orally, rectally, intravenously or intramuscularly. Administration of glucocorticosteroids through these routes requires therapeutic use exemption certificate (TUE). All other routes including anal, aural, dermatological, inhalation, intra articular, nasal and ophthalmological require athletes to follow abbreviated therapeutic use exemption certificate (ATUE).

**Side Effects of Glucocorticosteroids:** Fluid retention, Hyperglycaemia, Systemic infections & Musculoskeletal disorders

### **P1 ALCOHOL**

Alcohol is a central nervous system depressant which slows down the actions of the brain and body. Combining alcohol with other drugs can magnify the effects of alcohol or of the other drugs which can be dangerous in many circumstances.

**Side Effects of Alcohol:** Impaired judgment, Loss of reflexes and muscular coordination, slurred speech & sleepiness and poor respiration

### **P2 BETA BLOCKERS**

These drugs may be illegally used by athletes in precision sports requiring accuracy and steady limbs eg archery, shooting, modern pentathlon, luge, diving, bob sleigh, ski jumping and motor sports.

**Side Effects of Beta Blockers:** Hypotension & Decreased heart rate

### **M1 ENHANCEMENT OF OXYGEN TRANSFER**

Blood doping may be illegally used to increase red blood cells in an attempt to improve the oxygen carrying capacity in endurance events.

**Side Effects of Blood Doping:** Increased blood viscosity, Clotting susceptibility, Hypertension, Vasoconstriction, Kidney dysfunction & Risk of cardiac arrest, brain stroke and pulmonary embolism

### **M2 CHEMICAL AND PHYSICAL MANIPULATION**

Chemical and physical manipulations including catheterization without medical justification and masking agents are prohibited methods and should not be used by athletes.

**Side Effects of manipulations:** Cystitis (bladder infection) and other dysfunctions and disorders depending upon the type of manipulation.

### **M3 GENE DOPING**

Gene doping is banned by WADA in sports.