



# ANIMALS DOPING



## Introduction:

Doping is comes from Dutch word (doop), meaning a thick liquid or sauces a reminder that it originally referred to a South Africa drink. In days gone by, (dope) was something you drank to help you work hard, if only for a short space of time. The use of substances and any other available methods of artificially enhancing performance in a sporting event, or when preparing for it. It is the administration to animal of any substances, other than a normal nutrient for the purpose of affecting its speed, stamina, courage or conduct in race. In other words, animal doping means the use of drugs or similar substances or preparations to artificially lift lower or maintain an animal's performance.



## History

- During prehistory, the plants being the only natural preparations available were overrunning the sports.
- From the end of the XIX century, the constant wish to enhance human possibilities is perpetuated, whatever the price to pay, so the more we wear on the more the formulas are sophisticated. It is the era of magic beverages and speed up potions, directly imported from racecourse including higgledy-piggledy.
- Atropine, caffeine, strychnine, cocaine and arsenic
- Second World War will deliver to the sport planet, via the sky (sportsmen), the amphetamines, synthetic substance acting on the central nervous system. The big era of the alert amines will last in the beginning of the 70. Their decline will take place with the first doping tests.
- During the last thirty years, the story of doping substances will go forward the rhythm of the performances of toxicologists, being in the cheater side or in the antidoping side. Every fight will bear the name of one or two molecules: corticosteroids, anabolic steroids (1970), testosterone, growth hormone (1980), and erythropoietin (1990)



## Uses:

- Giving a stimulant to make the horse run faster, common at youth livestock competitions and for animal fattening.
- Sedative to slow the animal down in case of nervous animals.
- A local anesthetic to mask lameness or tranquilizer to quite obstreperous horses.
- Male sex hormones to mars in estrous.
- Analgesic drugs to treat arthritic conditions.
- Some of show participants (30% of all) use illegal doping to improve their entries. They inject drugs or inject oil under the animal's skin to improve their appearance.
- Artificially improving animals productivity with drugs like steroids or similar substances or preparations is likewise prohibited by the Act, unless it can be proved that these products do not harm animal's health or welfare. Special substances can't be used to increase animals' productivity, unless it has been proven in scientific studies or by extensive established experience that these substances are harmless to animals. An animal may neither be fattened nor may force-feeding increase its productivity.



## **Agents used:**

### **1- Stimulants:**

Caffeine, which is cheap, easy to obtain, and quite effective.

Morphine and its derivatives which enables a horse to run well above its normal form.

Amphetamine and methyl amphetamine and similar drugs which delay the onset of fatigue.

Stimulants must be given within 3 hours of the beginning of the race.

For this reason it is usually recommended that during this period the horse should be in some controlled area of the racecourse where unauthorized persons can't approach it.

### **2- Depressants**

It includes chloral, chlorbutol and the barbiturates.

It must however be realized that many compounds will not fit exactly into these classifications, as their action depends on the dose given.

A small dose of chlorpromazine will quite an excitable horse and enable it to run a better race, while a large dose will act as a depressant and slow it down.

Similarly, while local anesthetics are generally used topically to mask lameness, they are said (possibly wrongly) also to act as CNS stimulators.



### 3- Equine growth hormone (EGH)

- The drug increases the muscles mass giving an unfair edge to athletes and horse, makes a horse look better and may make the horse run faster.
- High doses of growth hormone (EGH abuse) can damage growing bones, and could eventually cripple a young horse (against the welfare of the horse).
- EGH is worrying both horse racing & athletics authorities, as its detection is essentially impossible as it disappears from the body within hours.

### 4- Anabolic steroids

- Including testosterone to make the animals grow faster than nature. This practice can be implemented in three ways, by adding beta-agonist to animal feed or implants under the animals' skin or by Intravenous injection.

## 5- Diuretics



- There are more than 17 diuretic like amiloride, triamterene, spironolactone, canrenone, hydrochlorothiazide (Esidrex), torasemide, clopamide, indapamide, Furosemide (Lasix), Chlortaidone (Hygroton), Atenolol (Tenormin) and acetazolamide.
- Horse racing authorities prohibits them because they can mask the administration of doping agents by diluting their concentration.
- These practices are illegal in the European union but are much used in the USA. B-adrenergic agonist Clenbuterol, which used therapeutically in the treatment of airway diseases via aerosol based medicate delivery systems is prohibited by horse racing authorities.



## Doping analysis

- Method of drug detection must be found before approval of the drug.
- Samples are taken from, saliva, urine, sweat, and blood and recently from hair.
- Instruments used are HPLC/ UV, High resolution masses spectrometry, Gas chromatography or ELISA.

## Medico legal importance

- The Food and Drug Administration and state officials are growing more concerned about the use of steroids and other growth drugs in animals exhibited and sold at youth livestock shows. Many steroids have been used as many as a dozen prize-winning animals across the country. Officials are not only worried about cheating at the shows.
- The doping tests are to eliminate the cheats from international sport.
- Exceeding the recommended serving may cause serious health effects.
- Meat from the treated animals will harm humans. The use of clenbuterol, one of the most common animals doping drugs has been blamed for deaths in Europe, and there is a current Federal investigation of contaminated veal in the U.S.
- If an athlete eats an average quantity of pork, from an animal, which has a high concentration of nortesterone, the athlete can fail a doping test for nadrolone because he or she will have an accumulated level of metabolites. The same applies to beef which has been treated with anabolic steroids.
- The doping of racing animals is a thoroughly undesirable practice. Apart from its inherent dishonesty, it involves considerable danger to the jockey (the horse may falling or becoming unmanageable).
- It is liable to cause permanent impairment of the reproductive system of the female.
- It interferes with the selection of animals for breeding by conferring a false value upon inferior animals that have own under the influence of stimulants and not their intrinsic merits.





- **Gene therapy & Doping**

- Following the Genome Project buzz, the next question is what can we do with all that information? ....One answer is **gene therapy**. Scientists around the world are searching for ways to alter damaged or diseased genes and revolutionize how we treat illness. Many predict that in the near future, hemophiliacs for example will be able to have a blood-clotting factor inserted into their genes. Many people in the sports world are concerned that athletes will try to use certain therapies to secure a competitive edge.



## Gene therapy:

- It is a newly emerged field aim at finding a cure at the gene level for genetic diseases.
- Genetic diseases are defined as these, which result from defective gene (dysfunctional protein specific function).  
Examples of genetic predisposed diseases are hemophilia in man and animals, muscular dystrophy, Alzheimer's disease, Autosomal abnormalities (mongolism or Down syndrome), sickle shape anemia and X-fragile syndrome.



- **Gene therapy techniques**

- Gene addition type is the main.
- This involves attempt to provide a corrected DNA fragment of a gene to a defective one. It takes place by a variety of means, not only in-vitro but also in clinical trial inpatients.
- The ultimate goal is to want the therapeutic DNA to become a permanent part of the host's chromosomes.
- This would ensure its stability and would be replicated along with the host's chromosomes during each cell division.
- A number of vehicles have been developed to deliver corrective genes into cells. In this way (gene therapy), many predict that in the near future, hemophiliacs for example will be able to have a blood-clotting factor inserted into their genes



## Type I Epo (erythropoietin)

- This hormone instructs the body to manufacture new red blood cells.
- Inserting a gene into a person's bloodstream to boost production of the hormone erythropoietin (epo).
- Patients who suffer from severe anemia, such as people with AIDS or kidney failure stand one-day benefit tremendously from this form of gene therapy because their bodies produce inadequate amounts of red blood cells.
- For athletes and racing horses, increased epo production would enhance oxygenation of tissues, in turn increasing aerobic stamina.
- This is different from synthetic epo, which can be temporarily injected, then flushed out of the system.
- Some endurance athletes to increase oxygen transport and aerobic power in an attempt to improve endurance capacity and recovery during competition use recombinant human erythropoietin (Rhu Epo).
- The close to perfect homology between endogenous and recombinant Epo, its short plasma half life and the late clinical manifestation of its effect mean that no reliable analytical technique is yet available to detect its use by athletes.



## Type II Muscle-boosting hormones

- Inserting muscle-beefing genes into muscle cells (like epo gene therapy).
- Techniques to strengthen muscles are being developed to help people with illness, in this case people with degenerative muscle conditions such as muscular dystrophy.
- Whereas the epo therapy would be pervasive through the body, this approach would target specific muscles.
- Extending this treatment to athletes could one-day mean strengthening a tennis player's shoulder muscles, a sprinter's calves, a boxer's biceps.
- Studies with a protein muscle growth factor called (IGF-1) have demonstrated compelling results.



## TYPE III Blood vessel generation

- Inserting genes to help grow new blood vessels.
- This therapy is being developed to help elderly people with peripheral arterial disease, the death of tissues in the body's extremities due to inadequate oxygen supply.
- The gene would turn on (or turn up) production of new vessels.
- If athletes used treatments for bolstering vessel production, the result could be a hypersupply of oxygen and other nutrients to the tissues with better supply lines, muscles, lung, the heart and other parts of the body would not tire as easily.
- The technology that would enable gene doping is currently under development, and the stream of reports about successful animal tests continues. The cover story of the issue of scientific American assents that by 2012 gene therapy will probably be a well-established and widely used medical technique with animal testing in full swing coupled with the push by pharmaceutical companies to pioneer this huge new market.



## Gene Doping & Health Risks

- Boosting muscles mass and increased oxygenation of tissues already developing gene therapy to increase red blood cell production, which raises the amount of oxygen delivered to cells.
- The treatment is meant to help people with severe anemia, but also bolster the aerobic capacity of healthy people.
- Another biotech firm is working on a gene therapy for patients with degenerative muscle disease such as muscular dystrophy.
- Researchers have successfully beefed up the muscle with genes demonstrating that this technology could one day be used to boost muscles of athletes as well.
- Healthy people who choose to unnaturally boost their epo levels will increase their chances of stroke and heart attack because adding red blood cells makes the blood thicker, as it gets thicker, it become more difficult for the body to pump blood successfully to all tissues of the body, causing clots wherever vessels can't compensate for this increased thickness.



- Athletes using synthetic epo today face similar risks but after a few weeks the drug is flushed through the system and red blood cells production returns to normal levels. But with permanently altered genes, abnormally high red blood cells production would continue indefinitely and the blood could get thicker and thicker until the stress damaged the circulatory system.
- With muscular alterations, muscles would likely become disproportionately strong pulling on surrounding tendons and bones causing tears or fractures.
- 3- Scientists emphasize that the unknowns of this treatment may in fact be the most dangerous factors of all.
- No one knows for sure if these gene alterations would be detectable. Experts in the U.S. Anti-Doping agency said, there would be no way to test for this type of doping with current technologies (detection would be nearly impossible).