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## The Importance of Chemistry in the Control of Doping in Sports during the Olympics

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### Editorial

Chemical applications in the world of sports are diverse and of paramount importance for athletes to perform well. However, some of these athletes decide to use prohibited substances in order to obtain advantages against their opponents. A good case to exemplify what has been said here is that of the Russian athletics federation, which was banned from the Rio de Janeiro Olympics due to the doping scandal.

Electronic semiconductor doping, widely used in the field of inorganic chemistry, is very beneficial, quite different from the biochemical doping of athletes who, when introducing foreign substances into their bodies, generate changes that will bring serious complications in the future.

### The main types of substances used in doping are:

#### Stimulants

They directly affect the central nervous system by increasing the heart rate. They are widely used by athletes in order to obtain the same effects as adrenaline (a natural hormone), such as improved reflexes and the ability to concentrate. We can mention amphetamine and cocaine as stimulants.

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## Diuretic

They are substances that help increase the formation of urine. Many athletes use this type of drug for weight loss, especially in sports such as boxing, in which athletes are separated by weight category. Diuretics are also widely used as a way to more quickly eliminate some doping substances through the urine.

## Anabolic Steroids

Some athletes use anabolic steroids for rapid mass gain, however these types of substances are very harmful to the human body if not applied by medical prescription. Anabolic steroids can be natural like testosterone or synthetic. The indiscriminate use of testosterone can cause loss of curves in women along with deepening of the voice.

The IOC (International Olympic Committee) has been investing heavily in recent decades in anti-doping analyses, numerous tests need to be done to detect small amounts of doping substances. These substances are considered foreign to the human body, which eliminates them mainly through urine. Anti-doping tests take place after the end of sporting activity. In team sports, an athlete is selected to collect a urine sample, which will be analyzed in order to find traces of substances considered prohibited.

The advancement of analytical chemistry contributed a lot to better results and the punishment of many athletes who decided to try to win in the worst possible way. Chromatography and mass spectrometry are methods that have achieved considerable success in doping control.

However, there are some natural chemical substances that anti-doping tests cannot differentiate if they come from the body itself or if they originated from external sources.

Large investments in anti-doping analyzes are important, however, it would be essential to seek to make athletes aware not to use prohibited drugs so that those who should be seen as an example do not end up becoming an embarrassment to the nation.

## Conflict of Interest

The authors declare no conflict of interests.

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