

Metrology

Measurement in Sport

Amount of Substance

Fairness is crucial to Olympic events, and that means performance-enhancing drugs are banned, and frequent drug testing is essential.

The use of performance-enhancing drugs in sports is not new – Thomas Hicks won the marathon at the 1904 Olympics, thanks to being dosed by his coach with a cocktail of strychnine and brandy (before and during the event!) Following a rise in both drug use and in the awareness of this problem, the International Olympic Committee banned doping in 1967. Today, the **World Anti-Doping Agency (WADA)** specifies which performance-enhancing drugs are banned.

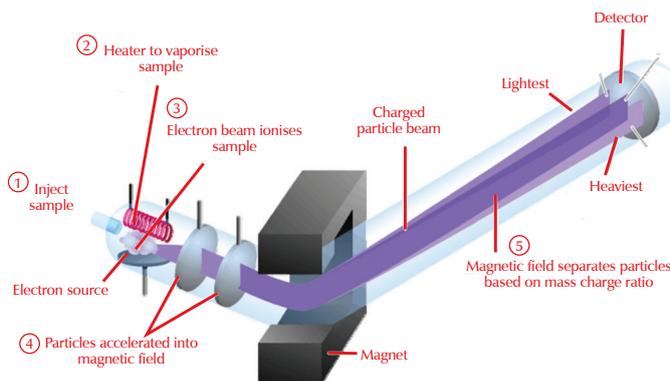
Did you know? Drug testing in the Olympics first took place in the **Cycling Team Time Trial** race at the 1964 games.

What matters is the number of molecules of the drug in an athlete's body. The SI unit for the amount of substance is the mole: one mole of a drug molecule is 602,214,179,000,000,000,000,000 identical copies of that molecule.

There are three main ways to test for drugs:

Mass spectrometry
Samples are vaporised and then ionised. A magnet sends the ions in different directions depending on their masses, so they are identified by their arrival positions. This is a highly accurate but expensive process.
Gas chromatography
Samples are vaporised and passed through a tube filled with a mixture of silicon grains and liquid. Different components of the sample travel at different speeds through the tube and so arrive in turn at a detector to be identified. This is relatively inexpensive, but cannot differentiate components with the same travel speed.
Immuno-assays
Antibodies are introduced to the sample, and react to the presence of the drug. The strength of the response is a measure of the amount of drug present. Immuno-assays are simpler but less accurate than the other tests.

How a mass spectrometer works



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