

Fighting the Olympic drug cheats

Brazil's Doping Control Laboratory will analyse more than 7,300 samples of athletes' urine and blood for over 200 prohibited substances and their metabolites*.

Gas chromatography/mass spectrometer systems can detect concentrations of banned substances, down to picogram levels – a trillionth of a gram-per-millilitre

*compounds produced when a body processes a particular drug

BEREG-KIT collection bottles:

Urine samples provided in tamper-proof bottles, used for testing at Olympics since Sydney Games in 2000

Sample A: Filled with 60ml. Part of sample screened for prohibited substances. Remainder of sample stored

Laser labels: Each anonymous sample identified by unique seven-digit number and bar code

Security cap: Rings with metal and glass teeth interlock once cap has been screwed down.

Only way to open bottle is to break cap

Sample B: Filled with 30ml. Stored for later use to confirm Sample A findings. B samples frozen for up to eight years

PERFORMANCE-ENHANCING DRUGS

► Anabolic steroids

Synthetic derivatives of male hormone testosterone.

Used to increase muscle mass and strength. Enables user to work out harder and more frequently. Some designer steroids are undetectable

► Human growth hormone

Also known as gonadotropin. **Boosts muscle mass and decreases adipose tissue.** Injected to improve strength and endurance

► Diuretics

Increase flow of urine to flush drugs from body

► Beta-2 agonists

Used to treat asthma by opening airways. High doses can act as anabolic agent to promote muscle gain and increase oxygen intake. **Used by swimmers**

► Beta blockers

Decrease heart rate, reduce hand tremor, and inhibit anxiety. **Used by archers and shooters**

► Creatine supplements

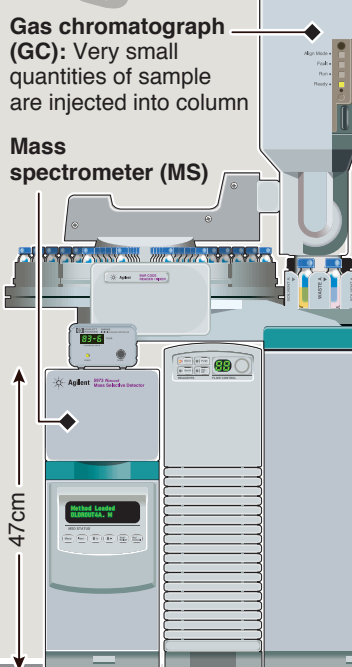
Makes ATP (adenosine triphosphate), which enables quick bursts of activity. **Used by weightlifters, sprinters**

► Erythropoietin

EPO acts on bone marrow to increase production of red blood cells and haemoglobin to boost oxygen to muscles. **Epoetin – synthetic form of erythropoietin – used by endurance athletes**

► Gene doping

Injecting purified EPO gene directly into muscle. **Gene test to be used at Rio**



Oven: Column – 1-4 metres long, up to 4mm in diameter – is coiled up in thermostatically controlled oven

Separation: Molecules in sample separate as they travel through column

Detector: Each molecule takes specific time to exit column

Mass spectrometer: After passing through GC, each molecule is ionized by MS into electrically charged atoms (ions). These are fanned out into spectrum based on mass

Results: Each mass spectrum represents unique "fingerprint" of molecule, which can be compared to database of mass spectra. Some "spikes" indicate chemicals produced naturally, others reveal presence of banned substances

