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Wastewater-based Tracing of Doping Use

The prevalence of doping in sport and in the community at large continues to be a concern in many societies.

Numerous test protocols are in place to test individuals but the increased sensitivity of modern analytical techniques and the purity of the ultra

pure water available to use in testing have opened the scope for screening communal wastewater for drugs and their metabolites.

Causanilles et al (1) have successfully developed and tested a procedure for 15 substances from the groups of anabolic steroids (used to promote muscle mass) and

ease sensitivity and reduce matrix effects followed by liquid-chromatography coupled to high resolution mass spectrometry.

50 ml of sample were spiked with an isotope-labeled internal standard, filtered, and acidified before concentration on a mix-mode cationic polymer

-based cartridge.

The cartridge was washed repeatedly before elution with acetonitrile.

This was evaporated, redissolved in water and finally reconstituted in

90:10 water/methanol to give a volume of 0.5 ml.

This was analysed by UPLC (Ultra Performance Liquid Chromatography) coupled to a time-of-flight high-resolution mass spectrometer with a C18 column and a water/methanol mobile phase with the methanol content ranging from 20 to

100%.

Limits of detection ranged from 0.2 ngL⁻¹ for anastrozole to 20 ngL⁻¹ for trenbolone, nandrolone and mibolone.

Water from an ELGA PURELAB Chorus 1 was used throughout this work.

The absence of trace organic contaminants in the water is critical as water is used repeatedly in the sample preparation: in the hydrochloric acid

used to acidify the sample, to condition the SPE cartridge and to rinse it

twice, to enhance the removal of acetonitrile

and, finally, to reconstitute the sample ready for UPLC.

Water is also used as a mobile phase in the chromatography.

Samples were taken from the inlets to wastewater treatment plants in locations where sporting events of various types were taking place, before and

during the events.

24-hour composite samples were usually obtained.