PROJECT REVIEW

"Sewer based tracing of doping use by amateur athletes"

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Sewage based tracing of doping use by amateur athletes. The present project investigates the applicablilty of sewage analysis to assess doping use in the general population and for amateur athletes in particular. To this end an analytical chemical tool will be developed that can identify and quantify existing as well as new doping substances present in sewage and pooled urine. The project will assess uncertainties associated with the various steps of sewage based epidemiology: sampling, sewage treatment plant and sewer system design, excretion rates, substance stability (in sewer), population size. The methodology used will employ high resolution mass spectrometry that will allow identification of hitherto unknown doping substances, quantification of known substances, and retrospective searches for newly identified doping agents in samples earlier collected. The methodology developed will be tested in sewage from three major cities in The Netherlands and during a major amateur sport event.

Results and Conclusions:

The present study investigated the applicability of the chemical analysis of wastewater to assess the use of doping substances by the general population and amateur athletes. To this end, an analytical methodology that can identify and quantify a list of substances from the groups of anabolic steroids, weight-loss products and masking agents in wastewater has been developed. The method uses solid phase extraction to increase the detection sensitivity of the target analytes, expected to be present at very low concentrations (ng L-1 range), and decrease possible matrix interferences. Instrumental analysis is performed by liquid chromatography coupled to high-resolution mass spectrometry, allowing data acquisition in both full scan and tandem MS mode. The method has been successfully validated at two concentration levels (50 and 200 ng L-1) with limits of quantification ranging between 0.7 and 60 ng L-1, intra- and inter-day precision expressed as relative standard deviation below 15%, procedural recoveries between 60 and 160% and matrix effects ranging from 45 to 121%. The stability of the analytes in wastewater was evaluated at different storage temperatures illustrating the importance of freezing the samples immediately after collection. The application of the method to 24-h composite wastewater samples collected at the entrance of three wastewater treatment plants and one pumping station prior to, during, and immediately after different sport

events revealed the presence in wastewater, and hence the use, of the weight-loss substances ephedrine, norephedrine, methylhexanamine and 2,4-dinitrophenol. In particular norephedrine and 2,4-dinitrophenol use appeared to coincide with the event., and in greater quantities than anabolic steroids.