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Urinary analysis of four testosterone metabolites and pregnanediol by gas chromatography-combustion-isotope ratio mass spectrometry after oral administrations of testosterone

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Résumé / Abstract

The most frequently used method to demonstrate testosterone abuse is the determination of the testosterone and epitestosterone concentration ratio (T/E ratio) in urine. Nevertheless, it is known that factors other than testosterone administration may increase the T/E ratio. In the last years, the determination of the carbon isotope ratio has proven to be the most promising method to help discriminate between naturally elevated T/E ratios and those reflecting T use. In this paper, an excretion study following oral administration of 40 mg testosterone undecanoate initially and 13 h later is presented. Four testosterone metabolites (androsterone, etiocholanolone, 5 α -androstanediol, and 5 β -androstanediol) together with an endogenous reference (5 β -pregnanediol) were extracted from the urines and the $\delta^{13}\text{C}/^{12}\text{C}$ ratio of each compound was analyzed by gas chromatography-combustion-isotope ratio mass spectrometry. The results show similar maximum $\delta^{13}\text{C}$ -value variations (parts per thousand difference of $\delta^{13}\text{C}/^{12}\text{C}$ ratio from the isotope ratio standard) for the T metabolites and concomitant changes of the T/E ratios after administration of the first and the second dose of T. Whereas the T/E ratios as well as the androsterone, etiocholanolone and 5 α -androstanediol $\delta^{13}\text{C}$ -values returned to the baseline 15 h after the second T administration, a decrease of the 5 β -androstanediol δ -values could be detected for over 40 h. This suggests that measurements of 5 β -androstanediol δ -values allow the detection of a testosterone ingestion over a longer post-administration period than other T metabolites $\delta^{13}\text{C}$ -values or than the usual T/E ratio approach.

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