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Detection of salivary steroid levels after transdermal testosterone administration

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Abstract

The transdermal administration of testosterone and other steroids represents an efficient application pathway, provides significant bioavailability and gained increasing popularity amongst endocrinologists and patients due to its easy and non-invasive utilization. A similar appreciation of transdermal steroid administration amongst athletes is due to the analytical difficulties to identify low-level administration in conventional doping analysis. The response in urinary concentrations or concentration ratios (e.g. T/E) of steroids is often insignificant and not suitable to trigger target analyses, in particular IRMS.

Incidental findings in a recent project indicated that steroid concentrations in alternative specimens (in particular saliva) were partially more significant and might provide additional indications for potential manipulations. The quantitative and reproducible collection of alternative specimens still represents a crucial problem, although saliva is meanwhile accepted as parameter to quantify steroids for clinical purposes (e.g. cortisol and testosterone). According to experiences in forensic toxicology, we have tried to optimize a quantification procedure based on the Quantisal[®] test kits. An incorporated liquid detector permits the quantitative collection of 1 mL saliva which is stabilized by a buffer solution.

However, the distribution of steroids between the collection swab, buffer and organic extractant represents a crucial equilibrium. After preliminary optimization of the sample preparation we could prove a significant (up to 10 fold of the base values, i.e. 50-100 pg/mL) long-term increase of salivary testosterone concentration after single transdermal administration of testosterone (50 mg Testogel[®] and Testopatch[®] at 3.8 mg in 16 hours, respectively). Relevant steroid concentrations and ratios in corresponding serum and plasma samples remained apparently unsuspecting.

Further attention need to be focused to the choice of suitable endogenous references requiring further method optimization. Other matrices are under consideration, e.g. sweat which shows similar behavior but is rather difficult to collect and thought to be less suitable for quantitative analyses.

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