“Impact of glucocorticosteroid administration on the steroid profile”

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Project overview

The misuse of testosterone and other endogenous anabolic androgenic steroids is detected through alterations in the urinary steroid profile. The steroid profile, composed of concentrations and ratios of endogenous steroid hormones, has been implemented by WADA in the athlete´s biological passport.

Metabolites included in the steroid profile have both gonadal and adrenal origin. Administration of glucocorticosteroids inhibits the hypothalamic-pituitary-adrenal axis by negative feedback, and reduces the adrenal steroid production. Due to significant adrenal origin of some of the metabolites included in the steroid profile (androsterone, etiocholanolone, 5α-androstane-3α,17β-diol, and 5β-androstane-3α,17β-diol and epitestosterone), it might be expected that reduction in the production of androgens by adrenal glands will have an effect on the urinary steroid profile, mainly in women where the relative importance of androgens generated in the adrenal cortex is greater. Due to the wide use of glucocorticosteroids in sports, its effect on the steroid profile deserves to be studied.

The aim of the project is to investigate the impact of the administration of glucocorticosteroids by systemic routes on the parameters of the steroid profile in healthy volunteers. The effect of single systemic doses (intramuscular or oral doses) of synthetic glucocorticosteroids on the different parameters of the steroid profile will be evaluated in men and women.

Results and Conclusions:

The steroid profile is a powerful tool to detect the misuse of endogenous anabolic androgenic steroids (EAAS) in sports. Glucocorticoids (GCs), which are only prohibited in competition using systemic administration routes, inhibit the hypothalamic-pituitary-adrenal axis. Due to the partial adrenal origin of the compounds included in the steroid profile, the administration of GCs might affect their excretion in urine and, therefore, modify the steroid profile. The aim of the present work was to investigate if GCs administered by either systemic or local routes could affect the steroid profile.

Three of the most frequently detected GCs in sports (prednisolone, betamethasone and triamcinolone acetonide) were administered to healthy male and female volunteers (n=40) using different administration routes (topical, oral and intramuscular administrations at different doses). In total, 66 administration studies were performed. Urine samples were collected

before and after GCs administration. The steroid profile (testosterone T, epitestosterone E, androsterone A, etiocholanolone Etio, 5α-androstane-3α,17β-diol 5αAdiol and 5β-androstane-3α,17β-diol 5βAdiol) was measured by gas chromatography-mass spectrometry.

The excretion rates of the steroid profile metabolites decreased after systemic GC administration (oral and intramuscular administrations). This excretion decrease was found to be associated with the dose and the administration route. However, the ratios evaluated on the steroid profile module of the athlete's biological passport model were not altered.

The results obtained show that GC administration does not distort the establishment of normal ranges of T/E, 5αAdiol/5βAdiol, A/T, A/Etio or 5αAdiol/E ratios. Therefore, GCs administration does not need to be considered a confounding factor in the steroid profile evaluation.