

“Effect of tea consumption on the steroid profile in healthy volunteers”

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Project Review:

The misuse of testosterone and other endogenous anabolic androgenic steroids is detected through alterations in the urinary steroid profile. The steroid profile is composed of concentrations and ratios of endogenous steroid hormones, their precursors and metabolites, and it is measured in the glucuronide metabolic fraction. Glucuronidation of testosterone and other androgens is catalyzed by UDP-glucuronosyltransferases (UGTs). Green and white tea extracts inhibit the isoenzyme UGT2B17 in "in vitro" studies and, therefore, glucuronidation of testosterone and other androgens. Due to structural similarities, it is possible that tea extracts also alter the activity of other isoenzymes involved in the glucuronidation of androgens.

Tea is the most widely consumed beverage in the world next to water and, for this reason, the relevance of the inhibition of UGT isoenzymes by tea constituents in the "in vivo" metabolism of all androgens included in the steroid profile deserves to be studied. The consumption of tea may produce alterations in the steroid profile leading to misinterpretations on the longitudinal studies and/or masking the exogenous administration of some endogenous steroids.

The aim of the present research project is to investigate the effect of green and white tea on the urinary steroid profile in healthy volunteers. The effect of an acute exposition to one of the main flavonoids of tea, epigallocatechin-3-gallate, and the effect of regular tea consumption on the steroid profile will be evaluated in Caucasian population.

Results and Conclusions:

The steroid profile (SP) has been included in the athlete's biological passport to detect the misuse of endogenous anabolic androgenic steroids in sports. The SP is composed of concentrations of testosterone (T) and related metabolites (epitestosterone, androsterone, etiocholanolone, 5 α -androstane-3 α ,17 β -diol and 5 β -androstane-3 α ,17 β -diol) and the ratios between them. Green tea (GT), along with its flavonol epigallocatechin-3-gallate (EGCG), has been shown in in vitro studies to inhibit the UGT2B17 isoenzyme, which is involved in the glucuronidation of T and related metabolites included in SP. Therefore, GT consumption could alter the SP leading to misunderstandings in doping controls. The aim of the present work was to study the effect of GT consumption on the SP.

A clinical study was developed with 29 male volunteers, covering a wide range of T/E ratio values (arm 1, 0.12 \pm 0.02, n=12; arm 2, 1.64 \pm 0.90,

n=17). The clinical protocol was designed to evaluate the effects after repetitive consumption of high doses of EGCG. For this reason, participants were asked to consume 5 GT beverages along the whole day for 6 consecutive days and, in day 7, they consumed 9 GT beverages. Urine samples were collected before and during tea consumption. The SP metabolites were measured using gas chromatography-mass spectrometry.

The excretion rates of the SP metabolites did not change during and after GT consumption. Stable excretion profiles were obtained in daily periods as well as in excretion rates over the day for all metabolites included in the SP. Moreover, the individual evaluation of the subject's steroidal biological passport resulted in normal sequences. The results obtained show that GT consumption does not distort the establishment of normal ranges of SP parameters. Therefore, GT administration does not need to be considered a confounding factor in the SP evaluation.