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WADA monitoring program substances-containing dietary supplements might cause unintentional doping or health risk

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## INTRODUCTION:

The World Anti-Doping Agency (WADA) issues the monitoring program annually. The substances in monitoring program are not prohibited, but they are monitored by WADA in order to detect potential patterns of misuse in sport. Many top athletes try to find “legal” performance enhancer products, especially containing these not prohibited substances (PSs), but instead of being safer, their use can provide high risk to a positive doping test. On the one hand, these ingredients can be expensive, thus to reduce the production costs in many cases they are omitted or substituted with other compounds. On the other hand, in several cases these DS are produced in illegal pharmaceutical industries without any quality control, thus contamination of DS with PS might occur. The detection of PSs by the WADA in DSs used by athletes is a crucial preventive step to avoid unintentional doping. Measurement of active compounds can help also in the evaluation of the cost/benefit of the usage of DSs.

## METHODS:

The analyses of DS containing active compounds present on the WADA monitoring list were carried out by means of suitable chromatographic techniques (liquid or gas) coupled to tandem mass spectrometry (LC- or GC-MS/MS). Our scopes were to quantify the legal active substances (ecdysterone (ECD), caffeine (CAF), synephrine (SYN), bemethyl (BEM)) and to detect eventual PSs (115 mostly occurring anabolic androgen steroids (AASs), stimulants, narcotics, diuretics, hormones and metabolic modulators). Our analytical methods were optimized to obtain the lowest possible limit of detection (0.6-500 ng/g or mL) of PSs.

## RESULTS:

Among the different analysed samples (14 ECD-containing DS; 30 CAF- and/or SYN-containing DS, 1 BEM-containing DS) more than 30% of them contained almost one PS, mainly AASs and stimulants, in the concentration range from ng/g to µg/g. At the same time in many cases the measured content of the active substances was not in accordance with that on the label. In the case of CAF-containing products 20% were contaminated with PSs, while only in half of them was the CAF content in the range of ±10% respect to the labelled values. In one pre-workout product the measured caffeine content was double as labelled, resulting in 597 mg/dose quantity, which can cause serious health issues for non-habitual CAF consumers. Totally, 14 different ECD-containing DSs from 9 brands were analysed. In all cases the measured ECD content was much lower than on the label. In addition, 25% of the samples contained PS. Concentration of the active compound and contaminations varied from batch to batch randomly. BEM-containing DS contained 3 different selective androgen receptor modulators and 1 stimulant in the concentration of µg/g.

## CONCLUSION:

Serious discrepancies were explored on the labelling of program substances-containing supplements, including lack of active compounds and presence of PS. The developed methods provide outstanding support for athletes regarding DS safety.

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