

## 8.11.2000 Nahrungsergänzungsmittel: Untersuchung auf Dopingsubstanzen



### Die Untersuchung von Nahrungsergänzungsmitteln auf Dopingsubstanzen

Neue Publikation aus dem Institut für Biochemie der Deutschen Sporthochschule Köln mit Methoden und Ergebnissen zur Untersuchung von Nahrungsergänzungsmitteln auf Dopingsubstanzen.

Analysis of Nutritional Supplements for Dope Substances

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Athletes are nowadays targeted by the sport nutritional industry to a great extent. It is often believed that preparations legally sold as supplements cannot contain banned dope substances. This is not true. Some nutritional supplements contain substances like guarana, ma huang, or caffeine which may cause positive doping cases in sports. We have also found supplements containing forbidden anabolic androgenic steroids which were not listed on the label and which result in positive dope cases.

A method for the analysis of nutritional supplements for dope substances is presented. For screening, an excretion study is performed. The obtained urines are analysed in the screening procedures for dope substances according to M. Donike<sup>1</sup>. For screening of anabolic steroids enzymatic hydrolysis is performed with glucuronidase from *E. coli*. After separation with *t*-butylmethyl ether (TBME) the samples are derivatised with MSTFA/NH<sub>4</sub>I/ethanethiol-TMS and analysed by GC/MS in the EI mode<sup>2</sup>. Stimulants are analysed after separation with TBME under addition of Na<sub>2</sub>SO<sub>4</sub> (saturation) by GC/MS and GC/NPD. Additionally the analysis of caffeine is performed with direct injection of the urine into HPLC/DAD<sup>3</sup>.

In case of positive results in the screening the nutritional supplements themselves are analysed. With the above mentioned methods we detected nutritional supplements which contained the following anabolic steroids not listed on the label: DHEA, androstendione, 4-androstendiol, 5-androstendiol, testosterone, norandrostendione and norandrostendiol (table 1 and 2). In the case of the ma huang, guarana, and caffeine containing supplements the excretion studies have shown that the recommended dose of these supplements may lead to positive cases for ephedrine (figure 1) and caffeine which are substances with a cut off limit in dope control (12 µg/ml of urine for caffeine, 10 µg/ml of urine for ephedrine and methylephedrine, 25 µg/ml for phenylpropanolamine and pseudoephedrine).

These results show the importance for supplements to pass a more stringent quality control and that athletes should be informed about possible conflicts with dope control regulations. Table 1: Screening for

anabolic steroids: Positive findings for the metabolite norandrosterone in the urines of volunteers 4 hours after the application of 1 capsule of nutritional supplements, which did not contain any declaration of anabolic androgenic steroids on the label.

| Supplement          | Volunteer | Norandrosterone (ng/ml) |
|---------------------|-----------|-------------------------|
| Chrysin, Quercetin  | 1         | 623                     |
|                     | 2         | 34                      |
|                     | 3         | 157                     |
| Tribulus Terrestris | 4         | 16                      |
|                     | 5         | 5,5                     |
|                     | 6         | 3,8                     |
| Guarana             | 7         | 360                     |

Table 2: Analysis of the nutritional supplements themselves after positive findings in the screening of excretion studies.

| Declared substances (not analysed)   | Not declared anabolic androgenic steroids   |
|--|---|
| Chrysin 200 mg<br>Quercetin 300 mg<br>Saw Palmetto 150 mg<br>Other Isoflavones | Androst-4-en-3,17-dion 0.1 – 0.8 µg<br>19-Norandrost-4-en-3,17-dion 1.6 – 382 µg<br>19-Norandrost-4-en-3β,17β-diol 0.7 – 23 µg  |
| Tribulus Terrestris 650 mg   | Androst-4-en-3,17-dion 0.3 – 76 µg<br>Androst-4-en-3β,17β-diol 0 – 3.8 µg<br>Androst-5-en-3β,17β-diol 0 – 30 µg<br>19-Norandrost-4-en-3,17-dion 0.04 – 0.6 µg<br>19-Norandrost-4-en-3β,17β-diol 0 – 15 µg |
| Guarana 1000 mg  | Androst-4-en-3,17-dion 20 – 3330 µg<br>Androst-5-en-3β,17β-diol 0.5 – 450 µg<br>Testosterone 1.5 – 20 µg<br>19-Norandrost-4-en-3,17-dion 32 – 1336 µg   |

## Literatur

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