



Analysis of Non-Hormonal Nutritional Supplements for Anabolic-Androgenic Steroids - An International Study -

An investigation of the IOC accredited doping laboratory Cologne, Germany.

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From October 2000 until November 2001 634 non-hormonal nutritional supplements were obtained in 13 countries from 215 different suppliers. The supplements were bought in shops in the respective countries (578 samples = 91.2 %), on the internet (52 samples = 8.2 %) and by telephone order (2 samples = 0.3 %). Two samples (0.3 %) were sent by the IOC. 289 supplements were from prohormone-selling companies and 345 supplements came from companies which do not offer prohormones. After isolation from the supplement matrix 11 different anabolic androgenic steroids, mainly prohormones of testosterone and nandrolone were analysed with gas chromatography / mass spectrometry.

Out of the 634 samples analysed 94 (14,8 %) contained prohormones not declared on the label (“positive supplements”). We could not obtain reliable data for 66 samples (10.4 %) because of matrix effects. Out of all positive supplements 23 samples (24.5 %) contained prohormones of nandrolone and testosterone, 64 samples (68.1 %) only contained prohormones of testosterone, 7 samples (7.5 %) only contained prohormones of nandrolone. None of the samples contained the prohormone of boldenone.

In relation to the total number of products purchased per country most of the positive supplements were bought in the Netherlands (25.8 %), in Austria (22.7 %) in the UK (18.8 %) and the USA (18.8 %).

country	no. of products	no. of positives	percentage of positives
Netherlands	31	8	25.8 %
Austria	22	5	22.7 %
UK	37	7	18.9 %
USA	240	45	18.8 %
Italy	35	5	14.3 %
Spain	29	4	13.8 %
Germany	129	15	11.6 %
Belgium	30	2	6.7 %
France	30	2	6.7 %
Norway	30	1	3.3 %
Switzerland	13	-	-
Sweden	6	-	-
Hungary	2	-	-
total	634	94	14.8 %

According to the label all positive supplements could be attributed to companies only located in five countries; the USA, the Netherlands, the UK, Italy and Germany.



21.1 % of the nutritional supplements from prohormone selling companies contained anabolic androgenic steroids, whereas 9.6 % of the supplements from companies not selling prohormones were positive.

The positive supplements showed anabolic androgenic steroid concentrations of 0.01 $\mu\text{g/g}$ up to 190 $\mu\text{g/g}$.

Excretion studies with application of supplements containing nandrolone prohormones corresponding to a total uptake of more than 1 μg resulted in urinary concentrations of the nandrolone metabolite norandrosterone above the cut-off limit of the IOC for several hours (positive doping result).