

Reprint from

RECENT ADVANCES
IN DOPING ANALYSIS
(7)

W. Schänzer
H. Geyer
A. Gotzmann
U. Mareck-Engelke
(Editors)

Sport und Buch Strauß, Köln, 1999

X. LIU, Y. ZHANG, M. WU, C. ZHANG:
The Steroid Profiles after Oral Administration of Testosterone Undecanoate with Different
Doses
In: W. Schänzer, H. Geyer, A. Gotzmann, U. Mareck-Engelke (eds.) Recent advances in
doping analysis (7). Sport und Buch Strauß, Köln, (1999) 311-315

Xin Liu, Yinong Zhang, Moutian Wu* and Changjiu Zhang

The Steroid Profiles After Oral Administration of Testosterone Undecanoate With Different Doses

China Doping Control Center, Beijing 100029, China

Abstract

This paper presents the urinary steroids profiles after the 4 volunteers have orally applied testosterone undecanoate with single dose and with continuously 5-days dose respectively. Some changes in steroid profiles are remarked but without significant difference. None of the results in the steroid profiles was over the thresholds, such as T/E ratio value. The results show that doping with oral administration of testosterone undecanoate is very difficult to detect because the T/E ratio value is not so high over 6.

Introduction

Normally testosterone is inactive on oral administration. But testosterone undecanoate is able to by-pass the liver via the lymphatic system and is therefore orally active. The “stack” use of some performance enhanced drugs is reported in publications (1,2). The therapeutic dose of Andriol® for an initial dosage for 2-3 weeks is 120-160 mg/day, followed by a dosage of 40-120 mg daily for maintenance (3).

Experimental

Andriol® is the trade mark for testosterone undecanoate capsules made by NV Organon, Holland, packaged under license by Nanjing Organon P.C., China. Each capsule contains 40 mg testosterone undecanoate.

Urine samples were analyzed by GC/MSD (HP 5973) with Proc. IVa for total fraction described below.

5 ml urine was centrifuged with 2500 rpm for 5 min, 50µl of internal standard solution (methyltestosterone 50ng/µl) were added to the urine, then the urine sample was applied to XAD-2 column, the column was washed 2 times with 5 ml purified water and eluted with 2 ml methanol, the methanol phase was evaporated to dryness with rotation machine, the residue was reconstructed in 1 ml buffer (pH 6.8) and 100 µl of β-glucuronidase (5000 unit),

* : corresponding author

then the buffed mixture was incubated at 55°C for 3 hours. 100 mg of solid buffer (pH8.8-8.9) was added to the incubated solution, then the solution was extracted with 5 ml ethyl ether form 10 min., the ether phase was separated from the solution and evaporated to dryness under nitrogen, the residue was derivatized with 50µl of MSTFA/TMSI/dithioer (1000:3:1) at 70 °C for 30 min. 1 µl of the derivatized solution was injected into GC/MS.

Results and discussion

The following Tab. 1 is the information of the volunteers.

Tab.1 Information of the volunteers

Code	Sex	Age	Weight (kg)	Ethnic
1	Male	23	76	Han
2	Male	24	58	Han
3	Male	36	75	Han
4	Male	54	61	Han

The four volunteers administered orally Andriol® 200 mg. One month later the same four volunteers administered orally Andriol® 80 mg/day for 5 days. Their urine samples were collected and analyzed with Proc.IVa.

After the oral administration of 200 mg testosterone undecanoate none T/E ratio values of the urine samples collected from the four volunteers was over 6 and showed some significant changes due to the administration. All other steroids profiles such as the ratio of androsterone to etiocholanolone, 5α- to 5β-androstandiol and 11β-OH-androsterone to 11β-OH-etiocholanolone showed in the normal range. But the ratio values of some endogenous steroids to epi-testosterone changed after oral administration of testosterone undecanoate.

From the picture the significant changes of some ratios could be found after about 6 to 20 hours of the administration. The ratio of androsterone to epi-testosterone showed the largest change and testosterone to epi-testosterone the smallest.

After one oral dosage of 200 mg the T/E ratios of the four volunteers are listed in the following Tab.2. It shows that the T/E ratios are far from the criteria for positive evidence when the people have normal very low T/E ratio. The concentration range for the four volunteers is in the range of 2 – 40 ng/ml urine.

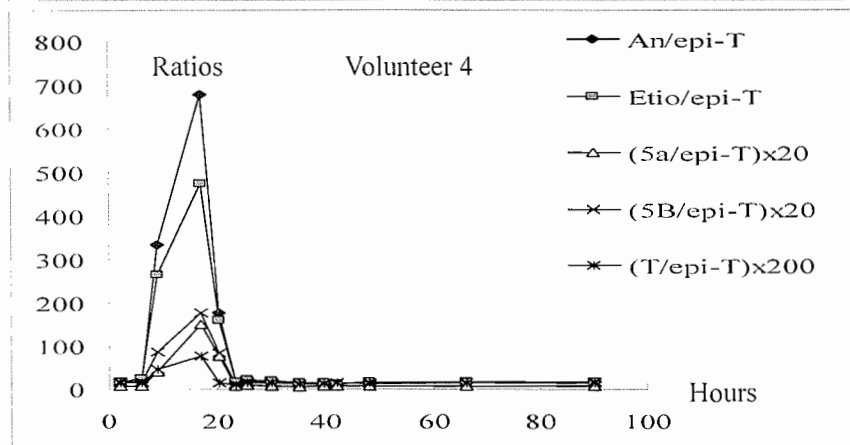
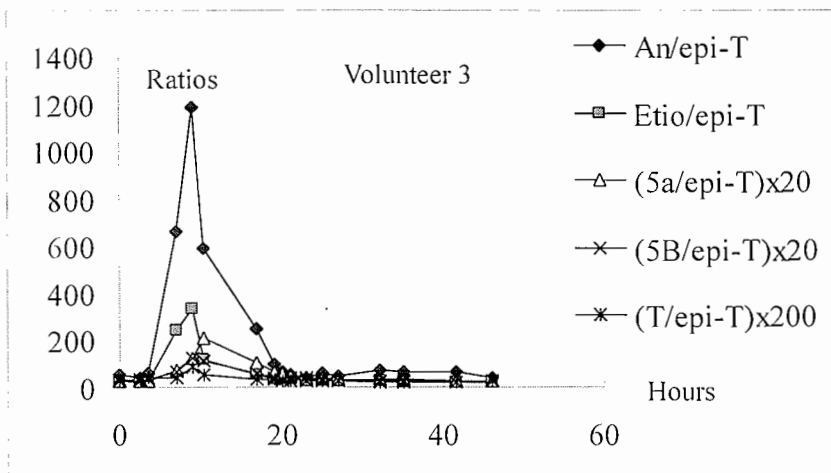
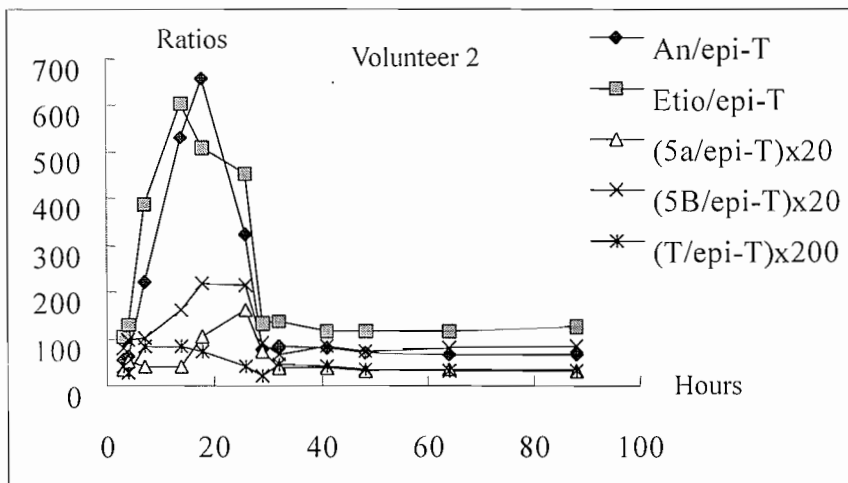
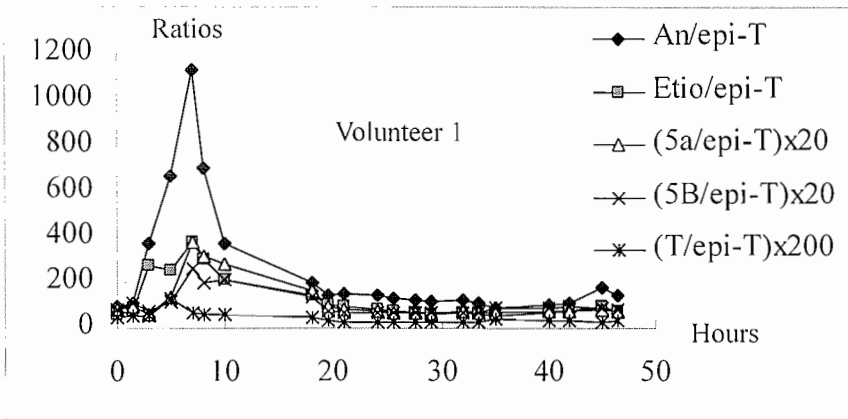


Fig 1. The ratios of some endogenous steroids to epi-Testosterone after oral administration with single dose of 200 mg testosterone undecanoate

Five peaks are clearly seen after administration for 5 days in the Fig.2. This may mean that with our experimental conditions the excretion of testosterone undecanoate was not affected by mutidosage with Antriol®.

Tab. 2 The T/E Ratios after a Single Oral Administration

Volunteer Code	Volunteer 1	Volunteer 2	Volunteer 3	Volunteer 4
The lowest	0.12	0.11	0.10	0.05
Average	0.22	0.23	0.16	0.10
The largest	0.66	0.42	0.42	0.38

It was reported(4) that after testosterone enantate administration (intramuscularly) the absolute concentration of testosterone in the urine samples collected from Orientals never reached the basal Caucasians levels. In our study the similar phenomena were observed after testosterone undecanoate administration. The T/E could not show any significance after the administration for 5 days. The ratios of some endogenous steroids to epi-testosterone showed clear changes.

Conclusion

After oral administration of testosterone undecanoate with single and multi dose, the T/E ratios could not indicate the intake of testosterone. But the ratios of androsterone, etiocholanolone, 5 α -, 5 β -androstandiol to epi-testosterone showed significant change after administration. The ratio of androsterone to epi-testosterone may be served as one of the parameter for detecting doping with testosterone.

Reference

- 1) Charles E. Yesalis, Anabolic Steroids in Sport and Exercise, Human Kinetics Publisher (USA), 1993
- 2) Steve Gallaway, The Steroid Bible, third edition, Belle International (USA), 1997
- 3) Instruction paper for Andriol®, NV Oranon, Holland
- 4) X.De.La.Torre et al., Testosterone Detection in Different Ethnic Group, Recent Advances in Doping analysis (4), Sport & Buch Strauss, Koeln, 1997

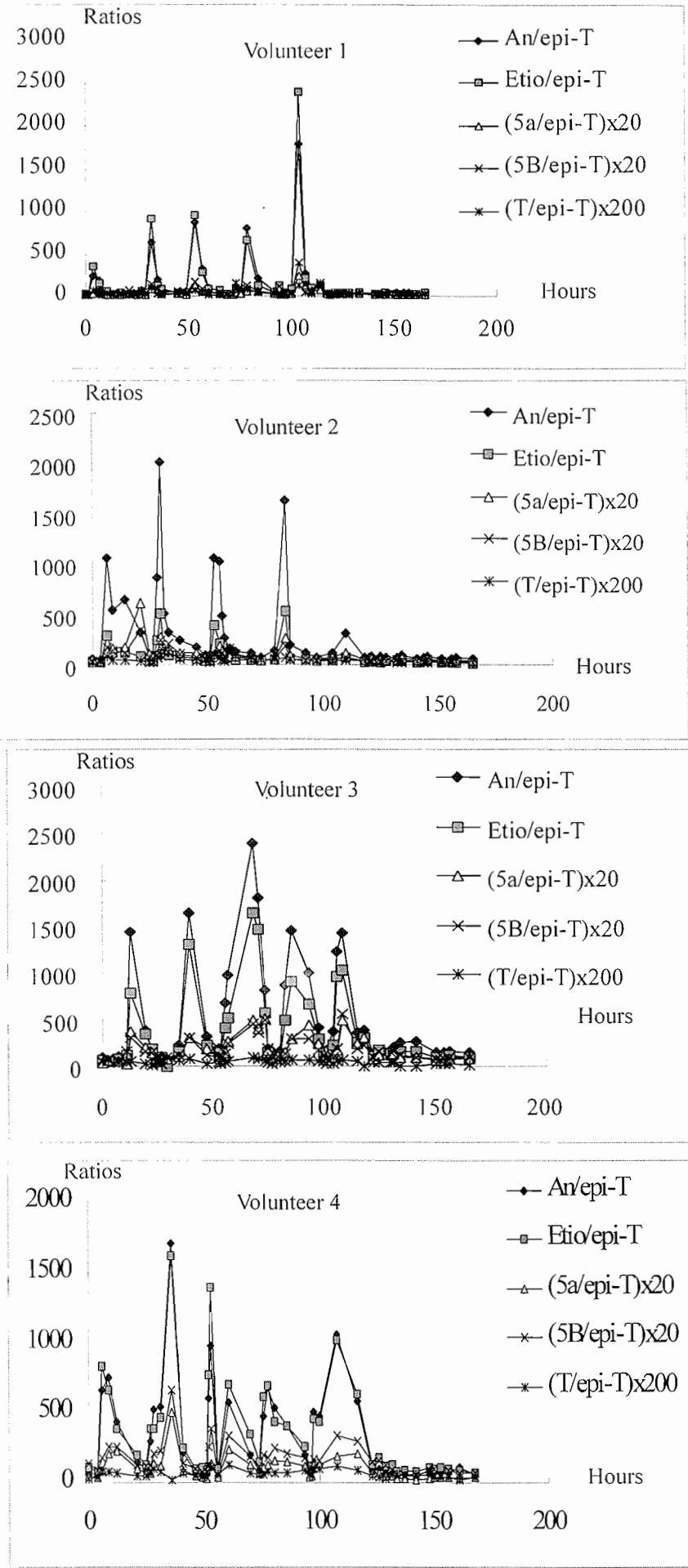


Fig.2 The ratios of some endogenous steroids to epi-Tes-tosterone after oral administration for 5 days