

## A Testosterone/Epitestosterone (T/E) Relationship in Urine Samples obtained from Athletes Attending an International Competition

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**SUMMARY.** A Testosterone/Epitestosterone (T/E) relationship has been studied in urine samples obtained from 98 athletes attending an international competition. Among T/E relationship values, no values higher than 6 has been found. Six is considered the limit set up by IOC and other international sport organizations. Statistical parameters for the population under study were as follows: mean 1.3; SD 0.97; median 1.55; minimum 0.10; maximum 4.12 GC-MS has been used to measure T/E ratio.

**RESUMEN.** "Relación Testosterona/Epitestosterona en muestras de orina de deportistas participantes en un certamen internacional" Se estudió la relación Testosterona/Epitestosterona (T/E) en 98 muestras de orina pertenecientes a atletas participantes en un certamen internacional. En ninguna de las muestras estudiadas se halló una relación T/E mayor de 6. Seis es el límite fijado por el COI y otros organismos deportivos internacionales. Los parámetros estadísticos hallados fueron los siguientes: media: 1.3; desvío estándar: 0.97; mediana: 1.55; mínimo: 0.10; máximo: 4.12. La cuantificación fue llevada a cabo por GC-MS.

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### INTRODUCTION

It is very well known that some athletes may use different substances, as synthetic anabolics, to improve artificially their performance. The development of sophisticated analytical procedures for detection of those products has induced the use of endogenous substances as testosterone.

Epitestosterone is a metabolite of testosterone and the ratio Testosterone/Epitestosterone (T/E) could be employed as a tool to know testosterone intake.

As regards T/E relationship, ranges have been set up from *ca.* 0 up to six<sup>1,2</sup>. Six is considered a negative value with regard to doping practices. In 1998, IOC added that the epitestosterone value should not be higher than 200 ng/ml<sup>3</sup>. Whenever values higher than 6 are obtained a follow-up procedure must be applied to the athlete involved during a determined period so that it could be ascertained whether the

value is of physiological origin caused by some pathology or it is just pointing out to the athlete's unsportsmanlike behavior.

There is also the possibility that, to keep the T/E relationship with an unfair plan in mind, an athlete is likely to have epitestosterone administered, reason for which IOC did set up the above mentioned 200 ng/ml top regulation.

This paper study the sample collected from an international (Latin-American) athletic competition. Our aim was getting basic parameters to be used in further comparisons. Previously, our team had performed this type of research on different types of substances<sup>4,5</sup>.

### MATERIALS AND METHODS

#### *Samples*

Urine samples were collected immediately once the sport activity involved was over. Samples from participating athletes: two athletes per team had been selected by drawing lots.

**KEY WORDS:** Athletes, Epitestosterone, Relationship, Testosterone.

**PALABRAS CLAVE:** Deportistas, Epitestosterona, Relación, Testosterona.

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Relationship T/E	n
0.01 - 0.50	13
0.51 - 1.00	20
1.01 - 1.50	16
1.51 - 2.00	18
2.01 - 2.50	17
2.51 - 3.00	2
3.01 - 3.50	7
3.51 - 4.00	4
4.01 - 4.50	1

**Table 1.** Frequency intervals for the obtained values

**Drugs and reactives**

Drugs listed below were of analytical grade. Other drugs used are of a usual analysis type and will not be described.

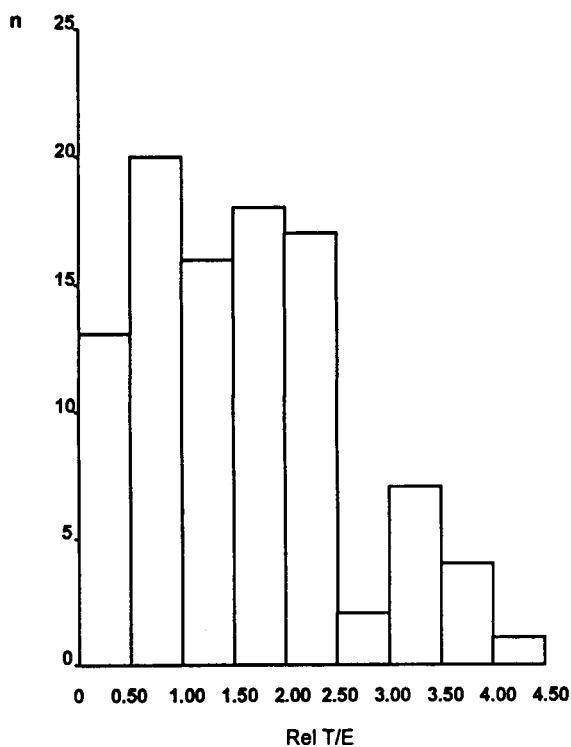
Betaglucuronidase (Boehringer). Reverse phase C 18 columns for solid phase extraction (J. Baker). Testosterone (Sigma). Epitestosterone (Sigma). MSTFA (N-methyl-N-trimethylsilyl trifluoroacetamide, Pierce). TMSI (Trimethyl silylimidazole, Pierce). Dithioerythritol (Sigma).

**Apparatus**

Gas chromatography with selective mass detector, Hewlett Packard, model 5890 II Series, with an HP 5972 mass specific detector. Column: capillary methyl silicone. Vector gas: helium, Split mode.

**Methodology**

T/E relationship analyses have been performed as per an IOC-validated methodology at the Federazione Medico Sportiva Italiana's Rome-located laboratory <sup>6</sup>. Relationships have been established on the basis of a relation among ions. Values have been extrapolated on a calibration curve .



**Figure 1.** Frequency bar graph of the obtained values.

**RESULTS**

The T/E relationships are shown in Table 1, as well as in Figure 1 ranked according their interval of frequency. The statistics parameters we found were: mean: 1.3; SD: 0.97; range: 0.10-4.12; median: 1.55.

**DISCUSSION AND CONCLUSIONS**

T/E relationship is considered to be a good control tool for any possible testosterone administration to some athlete.

The values we have obtained from this study are similar to the ones found by others authors (Table 2).

It should be emphasized the fact that in not

Author	T/E (X)	SD	Range	Populations	n
Dönicke <sup>7</sup>	1.35	1.07	0.02 - 5.89	Students	105
Dönicke <sup>7</sup>	1.43	1.00	0.05 - 7.05	cyclists	482
*Mereck - Engelke <i>et al.</i> <sup>8</sup>	1.82	0.21	1.2 - 2.5	Volunteer	1
	0.13	0.01	0.11 - 0.16	"	1
	0.91	0.10	0.79 - 1.22	"	1
	0.90	0.15	0.69 - 1.46	"	1
	1.04	0.17	0.76 - 1.53	"	1

**Table 2.** Testosterone/epitestosterone ratio obtained by others authors. \*Mereck Engelke *et al.* <sup>8</sup> values were obtained from 5 volunteers during 30 days.

any case the relationship T/E threshold of 6, as stated by IOC and other International Sporting Organizations has been exceeded. Thus, it could be assumed that no unsportsmanlike administration of either testosterone and/or epitestosterone had occurred.

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