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Detection of LH (luteinizing hormone) in Sport - One Year Statistics

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Abstract

The peptide hormone LH was measured in the urine samples of 1443 male athletes collected for doping control in China during the last year. Using ELISA, the concentrations of LH in the urine samples were determined. Statistics evaluation was made using SPSS.

Introduction

Luteinizing hormone (LH) is banned by the International Olympic Committee (IOC). To our best knowledge, there is no decision limit for LH positive cases. To be useful for doping control, the reference range for LH could be determined on a sufficiently large number of samples from athletes.

Materials and Methods

The urine samples were collected all from male athletes as in competition and out of competition doping control samples in China. The LH concentrations were determined routinely using EIA technology (Syntron Bioresearch Inc. Microwell LH EIA Catalog TSE 10-96, USA, Dist in Tianjin, China).

A batch of analysis consisted of a blank, calibration samples and quality control samples I (10.0 mIU/ml) and II (40.0mIU/ml). The calibration curve contained 6 points (0, 5, 10, 25, 50, 100 mIU/ml respectively).

Statistic Methods

The SPSS (Statistics Package for Social Science) for Windows V. 9.0 was used for statistical evaluation of the results. The reference range was obtained by the International Federation of Clinical Chemistry (IFCC) and International Committee for Standardization in Heamatology (ICSH)

Approved Recommendation on the Theory of Reference Values. Disregarding all negative values and using zero as replacement, all negative values were considered as a deviation of the determination of zero values.

Results and Discussion

The distribution of LH concentrations in urine samples from male athletes is presented in Fig. 1. The result of Normality Test is shown in Fig. 2 and Tab. 1.

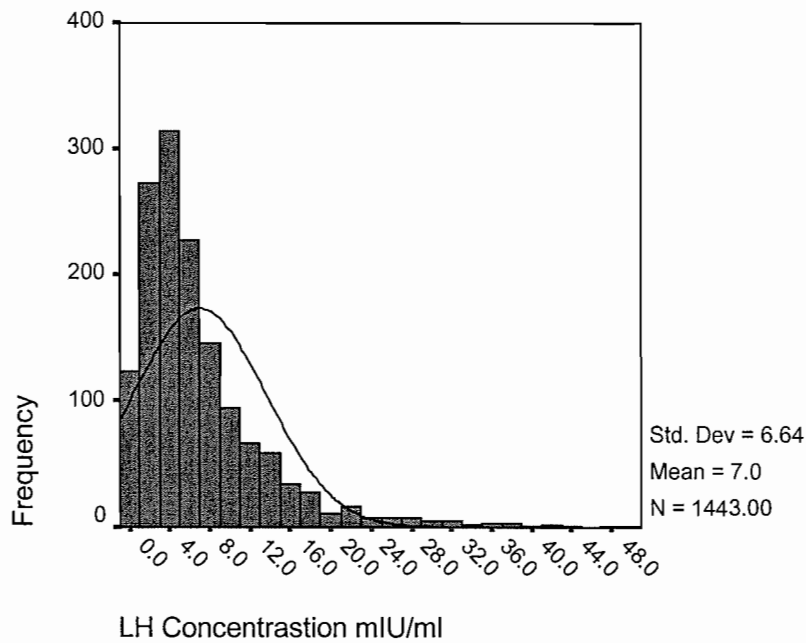


Fig.1 Frequency Distribution

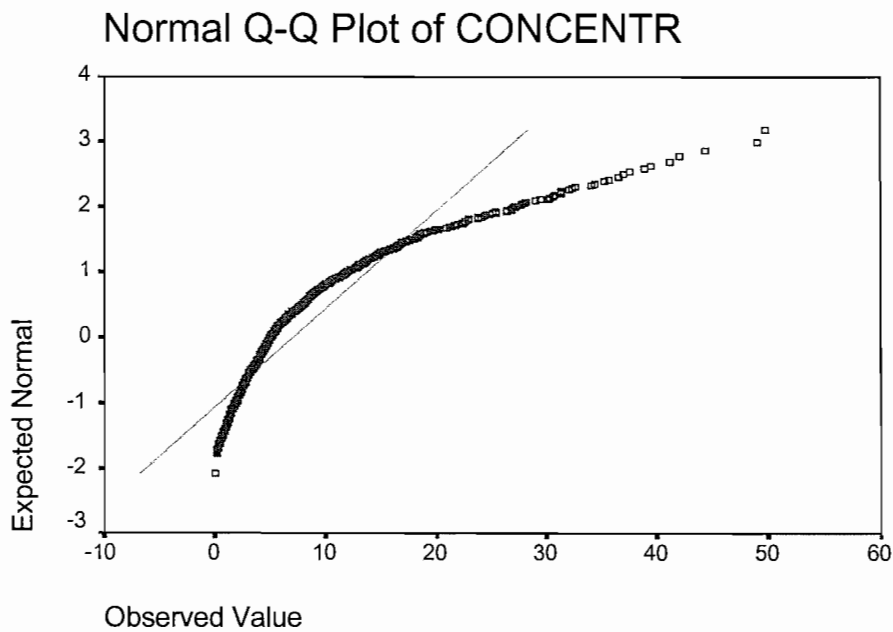


Fig. 2 Normal Q-Q plot

Tab.1 Tests of Normality

	Kolmogorov-Smirnov ^a		
	Statistic	df	Significance
LH Concentration mIU/ml	.152	1443	.000

a: Lilliefors Significance Correction

Because of Sig.= 0.000 < 0.05 it is not a normal distribution. The black curve in Fig.1 is the normal curve with the statistical data of Mean = 7.0 and Std. Dev. = 6.64. If it was based on a Gaussian form, the reference range was suggested to be < Mean + 4 Std. Dev. = 33.56 mIU/ml.

The different Mean values obtained from different methods for estimating are listed below:

Tab. 2 Estimated Mean Values

M-Estimators	Huber's M-Estimator ^a	Tukey's Biweight ^b	Hampel's M-Estimator ^c	Andrews' Wave ^d
Concentration	5.4693	4.9027	5.3512	4.8939

a: The weighting constant is 1.339.

b: The weighting constant is 4.685.

c: The weighting constants are 1.700, 3.400, and 8.500

d: The weighting constant is 1.340*pi.

The reference range based on the approved theory and methods (Non-parametric method) is shown in Tab. 3.

Tab. 3 Reference Range and Confidence Intervals

Parameters	2.50%	90% Confid.		95.7%	90% Confid.		N
		lower	Upper		Lower	Upper	
LH(mIU/ml)	0	0	0	26.77	24.40	28.03	1443

All urine samples showed here were screened by our routine procedure without any suspicious results. More than 200 urine samples showed very low concentrations of LH (≤ 2 mIU/ml). The concentrations of some endogenous substances of the 223 samples with low LH concentrations were calculated from screening data. The distributions of T/E, An./Etio. and 5 α -Adiol/5 β -Adiol ratios are listed in table 4.

To deal with such urine samples with very low concentrations of LH, it would be difficult to use the marker of T/LH for detecting doping with exogenous testosterone.

Tab. 4 Steroids Profile of the Urine Samples with Lower LH

Ratios	Mean	Std.Dev.	range
T/E	0.45	0.69	0-3.93
An./Etio.	1.48	0.62	0.38-3.47
5 α -diol/5 β -diol	0.90	0.42	0.12-2.37

Reference

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