Reprint from

RECENT ADVANCES IN DOPING ANALYSIS (8)

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Antidoping Testing at the VII IAAF World Championships in Athletics, 21-29 August 1999 Sevilla (Spain)

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1. ABSTRACT.

Controlling drug misuse in competing athletes was the aim of this Laboratory during the VII IAAF World in Athletics. During these nine days 317 samples were analysed. The number of samples to be analysed every day ranging from 27 to 47, 54% of total samples corresponds to men.

This poster describes procedures, instrumentation, staff organisation and sample distribution. A request of the IAAF a study monitoring differences between pH and specific gravity values when they were measured at the laboratory and Stadium was carried out.

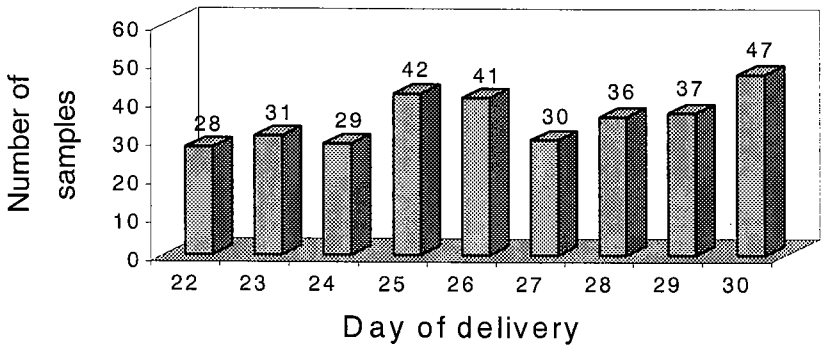
2.- LABORATORY LOGISTICS.

The analysis of all doping control samples was performed at the IOC accredited Laboratory of The Higher Sport Council, Madrid, Spain.

Laboratory	Personnel	Instrumentation	Task
I	1 supervisor 2 analyst 1 technician	2 GC-NPD HP 6890 Plus 2 GC-MSD HP 5970, 5972	Procedure I. Analysis of nitrogen containing compounds excreted free. Procedure II. Analysis of nitrogen containing compounds excreted conjugated
II	1 supervisor 6 analyst 1 technician	4 GC-MSD HP 5970, 5973 2 EIA System	Procedure IV Analysis of anabolic steroids (free and conjugated) Procedure VI. Analysis of hCG and LH.
III	1 supervisor 3 analyst	2 GC-MSD HP 5971, 5973 2 HPLC-DAD HP 1090	Procedure V. Analysis of diuretics by GC/MSD. Quantitation of ephedrines and caffeine by HPLC.
IV	1 supervisor 2 analyst	2 GC-MS Saturn 2000 Ion Trap Varian 1 Magnetic sector mass spectrometer Autospec Ultima. Micromass	Procedure IVc. Analysis of anabolic steroids (low concentration) by GC-HRMS. Procedure IVb. Confirmation of anabolic steroids by GC/MS/MS

3.- SAMPLE DISTRIBUTION.

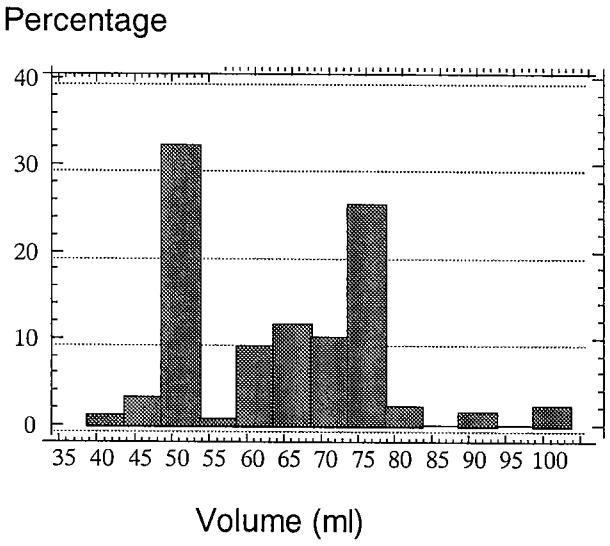
Special mention deserves the very well organised sample delivery at the Laboratory. Every night the samples were driving by security personnel from the Stadium in Sevilla to the Laboratory in Madrid (537 km.) and deliver at 7 a.m, therefore only two shift were needed to run the Laboratory.



Finished sample analysis, the Laboratory director informs directly by Fax or mobile phone the results to the IAAF delegate.

4. PREVIOUS MEASUREMENTS.

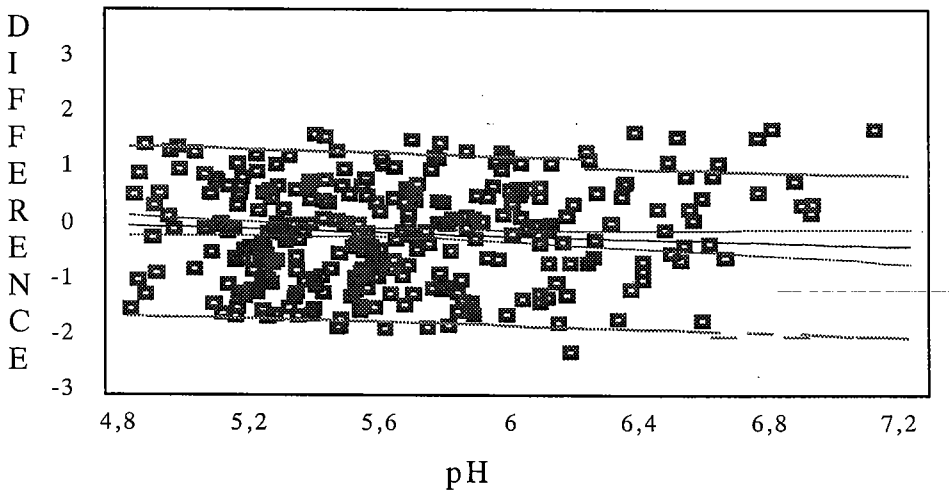
IAAF Procedural Guidelines for Doping Control establish that a 40 ml volume sample is enough to complete all the antidoping test, however when it was needed to quantify or repeat some assays it was found some difficulties. With a volume of 50 ml., which is consider for most of the National and International Sports Bodies as the minimum volume of urine to be collected, these problems were avoided.



pH meassurements: According to IAAF request, the Laboratory carried out a

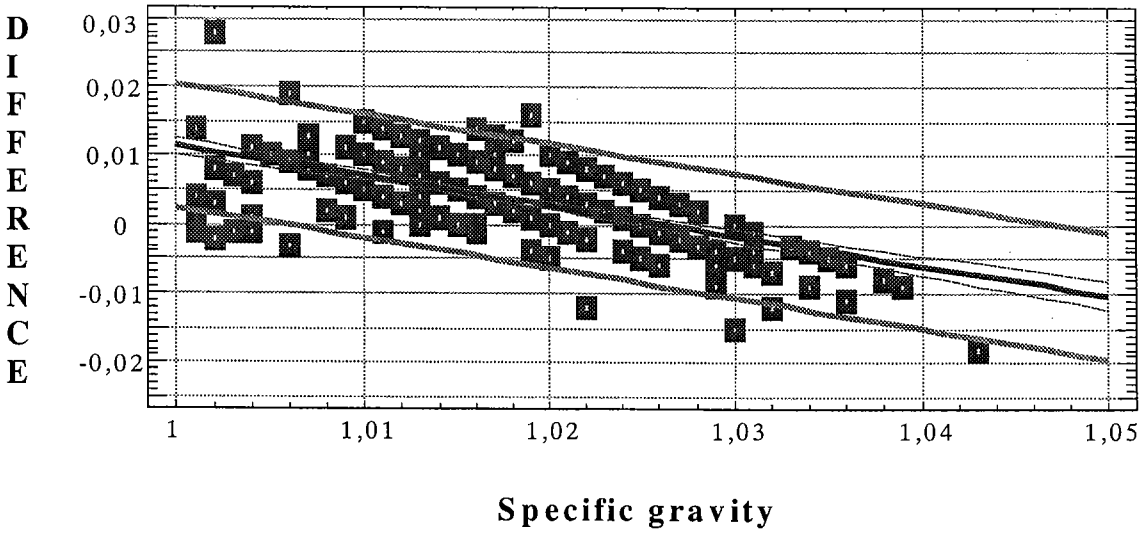
study to compare pH values when a pHmeter (laboratory) and dip-stiks (Stadium) were used. Figure below, shows a correlation study between differences and pH value. The graph shows the average difference and the confidence limits at 95%. Most of the samples, aprox. 83%, showed pH values between 5.0 and 6.0.

DIFFERENCE= pH dip-stick value less pH pHmeter value



Differences seem to be keeping constant in the range of pH values analysed, there was not observed any tend to increase the difference according to the pH value. The average value of the difference is centred on 0, discrepancies on the pH value were not correlated with pH value or with the technique used to measure it.

4.- Specific gravity: Differences between the Stadium dip-sticks values and Laboratory specific gravity measure are shown in figure below.



The specific gravity values ranging from 1.010 to 1.043; 17.6% of samples have values lower than 1.010; 19.2% of samples have values higher than 1.025.

According to the previous graph, it could be observed that the average value is not centred at 0 value, at values under 1.020 there is a tend to obtain higher values of specific gravity when dip-sticks was used, in fact there were a seventeen per cent of the samples with a specific gravity lower than 1.010 without an additional sample.

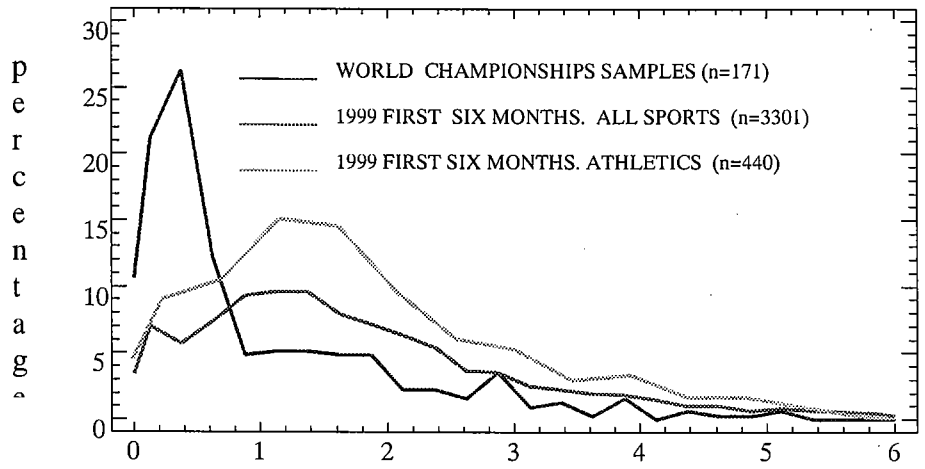
According to the results, the use of dip-stick to measure specific gravity seems to be not acceptable and therefore the use of a refractometer at the time of collecting the samples is recommended.

5. RESULTS.

The VII IAAF World Championships in Athletics provided an opportunity to apply the analytical chemistry to the complex issue of testing 320 samples for over 250 compounds in nine days with a response time of only 24 h. Less than 2 per cent of the samples were found to contain substances banned by the IAAF. The IAAF included four Quality Control Samples in order to guaranty the detection capacity of the laboratory, the samples came from excretion studies of Mesterolone, Pseudoephedrine, Furosemide and Formebolone.

Some banned or restricted substances according to the IAAF Antidoping List were detected. Four cases of Salbutamol, two hCG cases, one ephedrine, one pseudoefedrine and one terbutalin cases were detected. In any case it is the IAAF and their Anti-Doping Commission who conclude on the "positivity" of the cases accordance with their anti-doping regulations.

In the T/E distributions amongst male athletes it can be observed that the vast majority of male samples have anomalous low T/E ratios, between 0.1 and 0.6, compared with the distribution in all the male samples analyzed in the first semester of 1999 in this laboratory or in the male samples from athletics except World Championships in the same period of time, where there is a first minor population with a maximun around 0.2 and a second population with a maximun around 1.3.



These differences were based on the high proportion of low values (lower than the normal average) of Testosterone concentration found in World Championships samples, where more than a half of population are around 10 ng/ml.

We have compared, also, other characteristic hormonal profile relations, Androsterone/Etiocholanolone and Androsterone/Testosterone for the three populations mentioned before.

In the case of A/Etio ratio there are no significant differences between the three populations. In relation to A/T ratio, it was observed that World Championships male population were distributed in a wider rank, probably due to the high proportion of low testosterone concentrations.

Regarding the distributions for DHEA and DHT, sulphate and glucuronide conjugated, concentration amongst male samples in the three populations (world championships samples, samples analysed in the first semester of 1999 in this laboratory and samples from athletics in the same period of time) is shown in graphics below. In both cases it was observed that the world championships samples are distributed in a wider rank tending to higher value that the reference population.

DHEA concentration distribution amongst male samples from the championships have a maximum around 60 ng/ml, the two other populations have the maximum around 25 ng/ml. DHT concentration distribution amongst male samples analysed in our laboratory the first semester of 1999 (all sports and athletics) have a maximum around 5 ng/ml whereas the samples from the championships have the maximum around 30 ng/ml.