

Highlights of Analytical Chemistry in Switzerland

Division of Analytical Chemistry

A Division of the Swiss Chemical Society

Hair Testing: A New Area in Forensic Toxicology

Christian Staub*

*Correspondence: PD Dr C. Staub, University Center of Legal Medicine, West Switzerland; 1 rue Michel Servet, CH-1211 Geneva 4
Tel.: +41 22 379 56 08, Fax: +41 22 789 24 17, E-Mail: christian.staub@hcuge.ch

Keywords: Doping analysis · Drugs · Forensic toxicology · Hair analysis · Pharmaceuticals

Interesting methodological developments in the last twenty years have increased the role of hair in forensic toxicology. The first period (1989–1998) was devoted to the analysis of classical drugs of abuse, such as opiates, cocaine, cannabinoids, amphetamines and benzodiazepines (the most abused pharmaceuticals in Europe and Switzerland). Most of the developed methods for these compounds were the work of active researchers regrouped under the auspice of the international Society of Hair Testing (SoHT) founded in December 1995. The second period (1999–2008) was characterized by the detection in hair of a single exposure and the related applications in doping control or in drug-facilitated crimes. Hair analysis can essentially contribute to doping analysis in special cases, in addition to urine. Some methods were also published for the determination of biomarkers (e.g. ethylglucuronide, a marker of alcohol abuse), since ethanol is not directly detectable in hair. Still more recently, hair analysis was also presented as a powerful tool for documenting a clinical case of dioxine over-exposure.

The first step in hair testing is the sampling: the hair is collected from the vertex posterior as close as possible to the scalp. Generally a lock of 20 to 30 hairs is collected. When a segmental analysis is required, the laboratory has to cut the hair in sections

of 1 to 3 cm. Then the hair is pulverized, incubated in a solution of acid or organic solvent in order to extract the compound(s) of interest from the hair matrix. After a purification step, the extract is analyzed by gas or liquid chromatography coupled to mass spectrometry (e.g. GC/MS, GC/MS/MS, LC/MS or LC/MS/MS). All these techniques are recognized as the ‘gold standard’ in hair analysis.

Hair analysis has opened a new area in forensic toxicology because hair is the unique sample which allows having toxicological history over a time window of weeks to months.

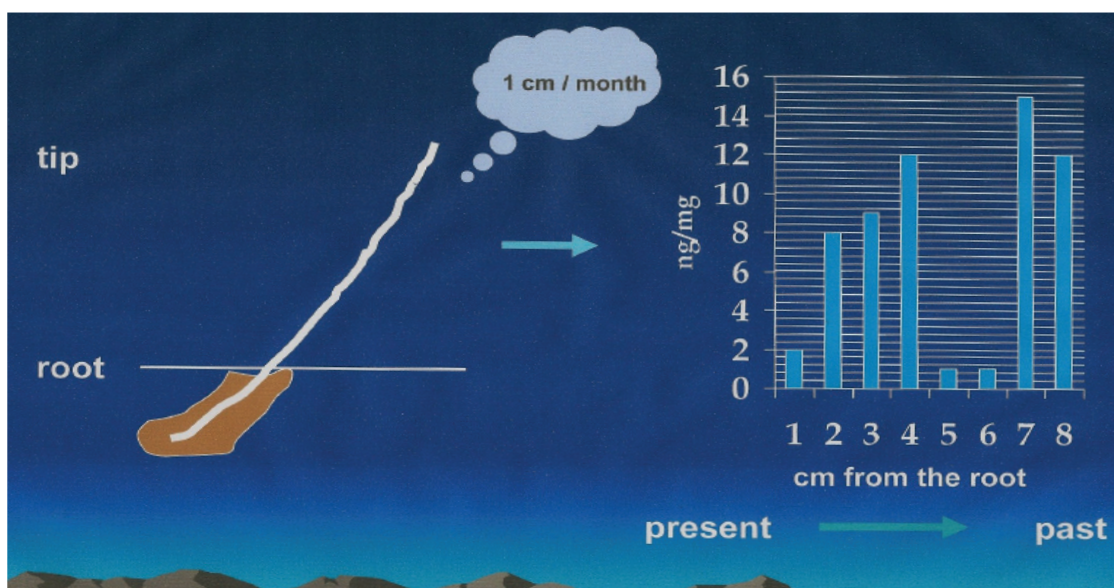
Received: 21. Feb. 2009

References

- ‘Analytical and Practical Aspects of Drug Testing in Hair’, Ed. P. Kintz, CRC Press, Boca Raton, 2006.
V. Cirimele, M. Villain, G. Salqu bre, C. Staub, P. Kintz, *Forensic Sci. Int.* 2008, 176, 51.



Hair sampling: the first important step in hair testing



Principle of hair analysis: decrease of consumption with two month of abstinence (concentration of cocaine in hair)

Can you show us your analytical highlight?

Please contact: Dr. Veronika R. Meyer, EMPA St.Gallen, Lerchenfeldstrasse 5, 9014 St.Gallen
Phone: 071 274 77 87, Fax: 071 274 77 88, Mail to: veronika.meyer@empa.ch