



Use of Alcohol Markers in Hair for Abstinence Assessment 2012

Consensus of the Society of Hair Testing

1. Abstinence from alcohol means no intake of any alcoholic beverages or other alcohol containing products over a pre-defined time period.
2. Assessment of abstinence over a pre-defined time period is necessary for instance as a prerequisite of drivers licence regranting, for child custody cases and in clinical contexts (e.g. liver transplantation) or in forensic cases after previous chronic excessive alcohol consumption.
3. Measurement of long-term alcohol consumption markers is a usual way to determine alcohol abstinence although moderate drinking and occasional single drinking events cannot always be excluded.

It was shown in several studies and in practical application that from these long-term markers ethyl glucuronide (EtG) and/or fatty acid ethyl esters (FAEEs) in hair provide the most reliable results with respect to sensitivity and specificity.

4. In case of ethanol intake, after absorption, a small fraction is conjugated with glucuronic acid during phase II metabolism to form EtG.
5. EtG is a polar water-soluble substance, stable but sensitive to cosmetic treatment and whose incorporation is not biased by natural hair color.
6. Either gas or liquid chromatography coupled to (tandem) mass spectrometry with deuterated EtG as internal standard should be used to test for EtG in hair. Validated methods used for this purpose should have an LOQ ≤ 3 pg/mg for EtG in hair.
7. A concentration ≥ 7 pg/mg EtG in the 0-3 up to 0-6 cm proximal scalp hair segment strongly suggests repeated alcohol consumption.
A lower concentration is not in contradiction to the self-reported abstinence of a person during the corresponding time period before sampling.
8. EtG in hair is sensitive to cosmetic treatment. Therefore, type of cosmetic hair treatment must be recorded during sampling, visually controlled during sample preparation and dealt with in interpretation of the result. E.g. bleached and dyed hair samples may lead to false negative EtG results.
9. A negative pubic hair results strongly confirms abstinence.

10. FAEE are formed after alcohol consumption by different enzymes in blood and human tissues.
11. FAEE are insoluble in water and stable at neutral pH but are sensitive to hair treatment at alkaline pH.
12. The following four esters, ethyl myristate, ethyl palmitate, ethyl oleate and ethyl stearate should be quantified. For interpretation, the sum of the concentrations of these four esters should be used.
13. Headspace solid phase microextraction in combination with gas chromatography–mass spectrometry and use of deuterated FAEE's as internal standards is a suitable technique for determination of FAEE in hair. Validated methods used for this purpose should have an LOQ ≤ 30 pg/mg for each of the four measured FAEEs.
14. A sum of the concentrations of ethyl myristate, ethyl palmitate, ethyl oleate and ethyl stearate ≥ 200 pg/mg in the 0-3 cm proximal hair segment or of ≥ 400 pg/mg in the 0-6 cm proximal hair segment strongly suggests repeated alcohol consumption.

A lower concentration is not in contradiction to the self-reported abstinence of a person during the corresponding time period before sampling.

15. FAEEs in hair are sensitive to cosmetic treatment. Therefore, type of cosmetic hair treatment must be recorded during sampling, visually controlled during sample preparation and dealt with in interpretation of the result. Use of ethanol containing hair sprays or hair lotions may lead to false positive FAEE results.
16. EtG should be the first choice in abstinence assessment.
In doubtful cases, for mutual confirmation and for exclusion of false positive and false negative results the determination of both parameters can be useful. A negative FAEE result cannot overrule an EtG result ≥ 7 pg/mg.
FAEEs may be considered in case of permed, bleached or dyed hair.
17. It is not advisable to use the results of the hair testing for alcohol markers in isolation.
18. This consensus was adopted on June 28th 2012 and will be reviewed within the next two years.