

HAIR TESTING FOR ABSTINENCE OR CHRONIC EXCESSIVE CONSUMPTION OF ALCOHOL (Updated Jan. 2020)

Founded in December 1995, the Society of Hair Testing is located in Strasbourg, France. Goals of the Society are; 1) the promotion of research in hair testing technologies in forensic, clinical and occupational sciences, 2) development of international proficiency tests, 3) organization of meetings and workshops, and 4) encouragement to scientific cooperation and exchanges among members. Below you will find excerpts from the Society's Consensus on Hair Alcohol Testing.

Alcohol is a legal compound in many countries and is consumed in much higher amounts in comparison to other drugs of abuse and by a much higher portion of the population. Compared to other substances, the detection of chronic excessive alcohol consumption by hair analysis has some specific characteristics.

Currently, according to the World Health Organization and a literature survey, chronic excessive alcohol drinking corresponds to an average consumption of 60 g of pure ethanol per day over several months.

For clinical and forensic purposes, there is a demand to establish chronic excessive alcohol consumption.

The direct determination of ethanol itself in hair is not possible due to its volatility and its potential absorption from external sources. Instead, the minor ethanol metabolites ethyl glucuronide (EtG) and/or fatty acid ethyl esters (FAEE) should be measured in hair as direct alcohol consumption markers.

ETG RESULT

A concentration ≥ 5 pg/mg EtG in the 0-3 up to 0-6 cm proximal scalp hair segment strongly suggests repeated alcohol consumption (see Figure 1). A lower concentration is not in contradiction to the self-reported abstinence of a person during the corresponding time period before sampling.

The cut-off for EtG in hair to strongly suggest chronic excessive alcohol consumption is proposed at 30 pg/mg scalp hair measured in the 0-3 up to 0-6 cm proximal segment. If samples less than 3 cm are used the results should be interpreted with caution.

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. The same cut-off concentration can be used for hair sampled from other body sites with the exception of axillary and pubic hair regions and with consideration of the different represented time period.

FIGURE 1:

| HAIR ALCOHOL TEST RESULT INDICATIONS | | | |
|--------------------------------------|--|-------------------|--|
| HAIR TEST | LENGTH | RESULT | INDICATION |
| EtG | 3cm to 6cm proximal scalp hair segment | < or = 5 pg/mg | Not in contradiction to the self-reported abstinence of a person during the corresponding time period before specimen collection |
| | | > 5 to 29 pg/mg | Strongly suggests repeated alcohol consumption during the corresponding time period before specimen collection |
| | | > or = 30 pg/mg | Strongly suggests chronic excessive alcohol consumption during the corresponding time period before specimen collection |
| EtPa (ethyl palmitate only) | 3cm proximal scalp hair segment | < or = 120 pg/mg | Not in contradiction to the self-reported abstinence of a person during the corresponding time period before specimen collection |
| | | > 120 - 349 pg/mg | Strongly suggests repeated alcohol consumption during the corresponding time period before specimen collection |
| | | > or = 350 pg/mg | Strongly suggests chronic excessive alcohol consumption during the corresponding time period before specimen collection |
| | 6cm proximal scalp hair segment | < or = 150 pg/mg | Not in contradiction to the self-reported abstinence of a person during the corresponding time period before specimen collection |
| | | > 150 - 449 pg/mg | Strongly suggests repeated alcohol consumption during the corresponding time period before specimen collection |
| | | > or = 450 pg/mg | Strongly suggests chronic excessive alcohol consumption during the corresponding time period before specimen collection |

EtPa (ethyl palmitate) RESULT

In the past, a sum of the concentrations of ethyl myristate, ethyl palmitate, ethyl oleate and ethyl stearate were recommended to be used to assess a measurement of alcohol consumption. In December of 2016, the Society of Hair Testing updated their consensus guidelines, and suggest only to use the FAEE ethyl palmitate (EtPa) to assess a measurement of alcohol consumption.

The cut-off for the sum of EtPa (ethyl palmitate) in hair to strongly suggest chronic excessive alcohol consumption is proposed at 350 pg/mg scalp hair measured in the 3 cm proximal segment (see Figure 1). If the proximal 6 cm segment is used the proposed cut-off is 450 pg/mg scalp hair. If samples less than 3 cm are used the results should be interpreted with caution.

EtPa 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. Use of ethanol containing hair sprays or hair lotions may lead to false positive EtPa results. If other lengths of hair, or hair from other body sites are used; the results should be interpreted with caution.

SUMMARY

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 > 5 pg/mg. EtPa ethyl palmitate may be considered in case of permed, bleached or dyed hair.

Either EtG or EtPa can be used independently for chronic excessive alcohol consumption assessment. For mutual confirmation and for exclusion of false positive or false negative results the determination of both parameters can be useful.

Reference:

- 2019 Consensus for the Use of Alcohol Markers in Hair for Assessment of both Abstinence and Chronic Excessive Alcohol Consumption (Consensus of the Society of Hair Testing) https://www.soht.org/images/pdf/Revision_2019_Alcoholmarkers.pdf