

# HAIR TESTING FOR ABSTINENCE OR CHRONIC EXCESSIVE CONSUMPTION OF ALCOHOL

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  $\geq 7$  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.

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.

## FAEE RESULT

A sum of the concentrations of ethyl myristate, ethyl palmitate, ethyl oleate and ethyl stearate  $\geq 200$  pg/mg in the 0-3 cm proximal hair segment or of  $\geq 400$  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.

The cut-off for the sum of the four esters in hair to strongly suggest chronic excessive alcohol consumption is proposed at 0.5 ng/mg scalp hair measured in the 0-3 cm proximal segment. If the proximal 0-6 cm segment is used the proposed cut-off is 1.0 ng/mg scalp hair. If samples less than 3 cm are used the results should be interpreted with caution.

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.

#### 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  $\geq 7$  pg/mg. FAEEs may be considered in case of permed, bleached or dyed hair.

Either EtG or FAEE 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.

HAIR TEST	LENGTH	RESULT	INDICATION
EtG	3cm to 6cm proximal scalp hair segment	< 7 pg/mg	Not in contradiction to the self-reported abstinence of a person during the corresponding time period before specimen collection
		7 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
FAEE	3cm proximal scalp hair segment	< 0.2 ng/mg	Not in contradiction to the self-reported abstinence of a person during the corresponding time period before specimen collection
		0.2 - 0.49 ng/mg	Strongly suggests repeated alcohol consumption during the corresponding time period before specimen collection
		> or = 0.5 ng/mg	Strongly suggests chronic excessive alcohol consumption during the corresponding time period before specimen collection
	6cm proximal scalp hair segment	< 0.4 ng/mg	Not in contradiction to the self-reported abstinence of a person during the corresponding time period before specimen collection
		0.4 - 0.99 ng/mg	Strongly suggests repeated alcohol consumption during the corresponding time period before specimen collection
		> or = 1.0 ng/mg	Strongly suggests chronic excessive alcohol consumption during the corresponding time period before specimen collection

NOTES: It is accepted that head hair grows at an average rate of 1 cm each month. If samples less than 3 cm are used the results should be interpreted with caution. 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.

#### References:

- Use of Alcohol Markers in Hair for Abstinence Assessment 2012 (Consensus of the Society of Hair Testing)  
<http://www.sohr.org/images/pdf/Use%20of%20Alcohol%20Markers%20in%20Hair%20for%20Abstinence%20Assessment%202012.pdf>
- Consensus of the Society of Hair Testing on Hair Testing for Chronic Excessive Alcohol Consumption 2011 (Consensus of the Society of Hair Testing)  
<http://www.sohr.org/images/pdf/Revised%20Alcohol%20marker%20Consensus.pdf>

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- Use of Alcohol Markers in Hair for Abstinence Assessment 2012 (Consensus of the Society of Hair Testing)  
<http://www.sohr.org/images/pdf/Use%20of%20Alcohol%20Markers%20in%20Hair%20for%20Abstinence%20Assessment%202012.pdf>
- Consensus of the Society of Hair Testing on Hair Testing for Chronic Excessive Alcohol Consumption 2011 (Consensus of the Society of Hair Testing)  
<http://www.sohr.org/images/pdf/Revised%20Alcohol%20marker%20Consensus.pdf>