2016 Consensus for the Use of Alcohol Markers in Hair for Assessment of both Abstinence and Chronic Excessive Alcohol Consumption

1. Introduction

1.1. 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 (FAEEs) can be measured in hair as direct markers of alcohol consumption.

1.2. In this consensus FAEEs are defined as: ethyl myristate, ethyl palmitate, ethyl oleate and ethyl stearate. For interpretation, the concentration of ethyl palmitate should be used[1]. Ethyl myristate, ethyl oleate and ethyl stearate can be measured for confirmation.

1.3. It is not advisable to use the results of hair testing for alcohol markers in isolation; all relevant factors surrounding a case must be considered when providing expert interpretation and opinion.

1.4. Abstinence from alcohol means no intake of any alcoholic beverages or other alcohol containing products over a pre-defined time period.

1.5. Measurement of markers to identify long-term alcohol consumption is generally used to corroborate claims of alcohol abstinence.

1.6. Occasional drinking events cannot always be excluded.

1.7. Chronic excessive alcohol drinking corresponds to an average consumption of 60 g or more of pure ethanol per day over several months.

2. General Considerations

2.1. The site of hair collection plays an important role in the concentration of markers detected. Hair taken from the vertex region of the scalp is preferred.

2.2. In instances where head hair is not available, body hair can be collected. The different physiology of non-head hair has to be considered during interpretation.

2.3. Powdering hair for the extraction of EtG is best practice.

2.4. Pre-analytical washing with a non-polar solvent prior to extraction of FAEE is recommended.

2.5. The incorporation of EtG and FAEEs into hair is not biased by natural hair colour.

2.6. Cosmetic treatments

2.6.1. The concentration of EtG and FAEEs in hair can be influenced by cosmetic treatments and thermal hair straightening tools.

2.6.2. The type of cosmetic hair treatment should be documented during sampling and considered during interpretation.

2.6.3. Bleaching, perming and dying of hair may lead to lower concentrations of EtG or false negative results; and may also influence concentrations of FAEEs.

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[1] The use of ethyl palmitate for interpretation instead of the sum of the four esters in the previous consensus has the advantage of better analytical performance particularly in the low concentration range and was shown to have no disadvantages concerning discrimination power, sensitivity and specificity.

2.6.4. EtG appears not to be influenced by hairspray, gel, wax, oil, grease or ethanol-containing hair care products.

2.6.5. Use of ethanol-containing hair care products (e.g. hairspray or hair lotions) may lead to false positive FAEEs.

3. Abstinence Assessment

3.1. Abstinence assessment over a pre-defined time period is necessary in many cases. Examples include: prerequisite for regaining driving licence, child custody cases, clinical contexts, forensic cases.

3.2. EtG should be the first choice in abstinence assessment.

3.3. Ethyl glucuronide (EtG)

3.3.1. A concentration < 7 pg/mg does not contradict self-reported abstinence of a person during the corresponding time period before sampling.

3.3.2. A concentration ≥7 pg/mg EtG in the proximal scalp hair up to 6 cm strongly suggests repeated alcohol consumption. Segmentation may provide additional information.

3.3.3. If samples less than 3 cm or greater than 6 cm are used, the results should be interpreted with caution.

3.3.4. The same cut-off concentration can be used for non-head hair with the exception of the axillary hair which is not suitable for EtG measurement. The possibilities of a longer time period represented by non-head hair and of a higher sensitivity of pubic hair should be considered in interpretation.

3.3.5. A positive EtG result ≥7 pg/mg cannot be overruled by a negative FAEEs result (below the cut-offs as described in 3.4)

3.4. FAEEs

3.4.1. The analysis of FAEEs alone is not recommended to determine abstinence from ethanol. It can be used in cases of suspected false negative EtG results, applying an ethyl palmitate cutoff concentration of 0.12 ng/mg for a 0-3 cm proximal scalp hair segment or 0.15 ng/mg for a 0-6 cm proximal scalp hair segment.

3.4.2. A positive FAEE result combined with an EtG below 7 pg/mg result does not clearly disprove abstinence, but indicates the need for further monitoring.

4. Chronic Excessive Consumption

4.1. For clinical and forensic purposes, it is necessary to establish concentrations of alcohol markers in hair which correspond to assessment of chronic excessive alcohol consumption.

4.2. EtG and FAEEs can be used alone or in combination for chronic excessive alcohol consumption assessment.

4.3. Ethyl glucuronide (EtG)

4.3.1. A concentration of >30 pg/mg EtG in the proximal scalp hair up to 6 cm strongly suggests chronic excessive alcohol consumption. Segmentation may provide additional information.

4.3.2. If samples less than 3 cm or greater than 6 cm are used, the results should be interpreted with caution.

4.3.3. 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.

4.4. Fatty Acid Ethyl Esters (FAEEs)

4.4.1. A cut-off concentration of 0.35 ng/mg for ethyl palmitate in scalp hair is considered strongly suggestive of chronic excessive alcohol consumption when measured in the 0–3 cm proximal segment.

4.4.2. If the proximal 0-6 cm segment is used the proposed cut-off concentration is 0.45 ng/mg scalp hair.

4.4.3. If other lengths of hair, or hair from other body sites are used; the results should be interpreted with caution.

This consensus was adopted on Wednesday 29th August 2016 by the Society of Hair Testing during the meeting in Brisbane, Australia in 2016