Richmond London Borough Council v B, W, B and CB [2010] EWHC 2903 (Fam)

[2011] 1 FLR 1345

Family Division

Moylan J

12 November 2010

Care proceedings — Expert evidence — Alcohol abuse — Validity of hair testing to establish consumption below excessive consumption — Presentation of chemical analysis results

The mother had a history of severe alcohol abuse; her older children had been removed from her care. In care proceedings concerning the two younger children, an issue arose as to the whether the mother had consumed alcohol since the previous hearing. The relatively new technique of hair testing looked at two different ‘markers' to measure alcohol consumption, ethyl glucuronide (EtG) and fatty acid ethyl esters (FAEEs); the Society for Hair Testing had agreed that, in respect of 3 cm proximal samples (about 3 months' growth), results above specific ‘cut-off' levels were consistent with excessive consumption of alcohol, with the proviso that there was a 10% false positive at the cut-off levels; there was no peer agreed cut-off level for the line between abstinence and social drinking. The first laboratory cut a 3 cm sample taken from the mother into three 1cm samples; it then tested for EtG. There was a negative result in respect of the two older samples; EtG was detected in the newest segment of hair, but at a level significantly below the agreed cut off. A witness statement provided by a laboratory employee stated that ‘The results are consistent with the use of alcohol by (the mother) within the relevant one month period'. At the mother's request a different laboratory conducted a test for FAEEs on a 6cm segment of hair; the result was described as ‘negative', indicating ‘abstention or virtual abstention'. The second laboratory also ran a test for EtG, which produced a negative result, but did not make the result available to the parties. A standard document accompanying the second laboratory's certificate of analysis stated that the procedure ‘looks for and quantifies several markers that indicate alcohol abuse. These markers are only present when the subject consumes alcohol.' However, a promotional email sent by the same laboratory to the mother's solicitors stated ‘there is no such thing as a zero result because ethanol is present in all hair, even that of teetotallers'. Further tests on the mother's hair by the second laboratory were all negative, which was said to mean ‘no evidence of frequent excessive alcohol consumption'. Until the hearing the local authority was relying upon the first hair analysis results as establishing that the mother had consumed alcohol in the relevant period; after hearing oral evidence from the experts, the authority accepted that there was insufficient evidence to establish this, and that any further testing should be by way of urine testing.

Held – confirming an agreed supervision order –

(1) The guidance contained in Practice Direction: Experts in Family Proceedings Relating to Children [2009] 2 FLR 1383 was not advisory: it was mandatory, and was applicable to all expert evidence in family proceedings relating to children. Some of the expert evidence in this case appeared to have been treated as though it was not expert evidence, perhaps because results obtained from chemical analysis were thought to constitute essentially factual evidence. However, the Practice Direction applied to all expert evidence, and it would be rare that results from chemical analysis were not in fact being used and interpreted for the purposes of expert opinion evidence. In all cases, but particularly when a new technique was involved, the court and the parties needed to have available all the information necessary to understand what weight could be placed on the evidence, including any margins of error, whether

a proposition was a hypothesis or derived from peer reviewed and tested techniques, research and experience, and whether the proposition should be qualified in any way. Experts could rely upon their own experience and unpublished material to support their opinions, but the basis for the asserted opinion must be made sufficiently clear for its reliability to be properly assessed. As set out in *Re F (Children) (DNA Evidence)* [2007] EWHC 3235 (Fam), expert reports, especially those of a single expert, should be expressed in terms that could be understood by lay people, explaining clearly the scientific justification (and limitations) for the opinion expressed (see paras [8]–[12]).

(2) Considerable caution should be exercised when hair tests for alcohol were being interpreted and relied upon, particularly in isolation. Subject to the proviso that at very high levels (multiples of the agreed cut-off levels) hair tests might form a significant part of the evidential picture, hair tests should not be used to reach evidential conclusions by themselves in isolation from other evidence, but only as part of the evidential picture. In the absence of any peer agreed cut-off level for the line between abstinence and social drinking the court would need specific justification before accepting any such evidence (see paras [22], [55]).

Cases referred to in judgment top

F (Children) (DNA Evidence), Re [2007] EWHC 3235 (Fam), [2008] 1 FLR 348, FD

Oxfordshire CC v DP, RS and BS [2005] EWHC 2156 (Fam), [2008] 2 FLR 1708, FD

Practice Direction: Experts in Family Proceedings Relating to Children, 1 April 2008, [2009] 2 FLR 1383

R v Weller [2010] EWCA Crim 1085 (unreported) 4 March 2010, CA

Henry Lamb for the applicant
Jane Drew for the first respondent
George Butler for the second respondent
Sorrel Dixon for the third respondent
Richard Clough for the fourth and fifth respondents
Jacqui Gilliatt for the intervener

Cur adv vult

MOYLAN J:

[1] During the course of these care proceedings an issue arose as to the validity of hair testing for the purposes of seeking to establish whether a parent has consumed alcohol and, if so, to what extent. This arose in circumstances where the mother has a history of severe alcohol abuse which, with other factors, had resulted in her older children being removed from her care. In the event, once I had heard oral evidence from the experts involved in this case, that issue fell away for the purposes of these proceedings as it was accepted by the local authority that the evidence was not sufficient to establish that the mother had consumed alcohol in the period since early 2009. Further, and in my view, sensibly having regard to the evidence which I have heard, the local authority decided that any future testing should be by way of urine testing.

[2] It is very regrettable that this issue was not resolved earlier because it has resulted in the determination of these care proceedings, by an agreed supervision order, being delayed by some 8 months. This has, with hindsight, manifestly not been in the interests of the children the subject of these proceedings. For this reason and because the issues surrounding hair testing in connection with the consumption of alcoholic beverages are of wider interest, I am giving this public judgment which addresses only these latter issues.

[3] At this hearing the local authority has been represented by Mr Lamb, the mother by Miss Drew, the fathers by Miss Dixon and Mr Butler and the guardian by Mr Clough. Additionally, and unusually, the companies which have carried out the tests in this case, Trimega Laboratories

Ltd and TrichoTech, were given permission to intervene on the issue of the hair strand test results. Only Trimega have taken advantage of this opportunity and at this hearing they have been represented by Miss Gilliatt. I am extremely grateful to counsel for the assistance they have provided.

[4] I have heard evidence from Professor Pragst and Mr O'Sullivan. Both have made clear that they have connections with the interested commercial entities, namely Trimega and TrichoTech. Professor Pragst provides advice to Trimega and Mr O'Sullivan is an employee of TrichoTech. This could have raised concerns about the independence of their evidence but I am satisfied that the evidence each of them gave to me has been unaffected by their respective relationships with these entities.

[5] Professor Pragst is an internationally recognised chemist and forensic toxicologist. Between 1966 and 1987 he worked in the field of organic and physical chemistry in the Chemical Institute of Humboldt University, Berlin. In 1987 he moved to the Institute of Legal Medicine at the University Hospital Charite, Berlin. Between 1989 and 2006 he was head of the Department of Toxicological Chemistry at the Institute of Legal Medicine. Since then he has continued to work at the Institute as a guest scientist. He has been engaged in a number of research projects including one involving the analysis of hair. With colleagues he started researching alcohol markers in hair in about 1996/97, developed a method of testing for fatty acid ethyl esters in 2000 and published in 2001. He has also co-operated with colleagues investigating the presence and testing of ethyl glucuronide in hair including Dr Michel Yegles from the University of Luxembourg.

[6] Mr O'Sullivan is employed by TrichoTech as a laboratory manager. He is a graduate of the Institute of Biology (Biochemistry), a Chartered Biologist and a Member of the Institute of Biology. He has worked in the field of drug analysis for over 20 years and has worked specifically in the detection of drugs in hair since 1999. He is clearly extremely experienced but it was clear from his evidence that he would defer to Professor Pragst on issues relating to the use of hair for alcohol testing.

[7] As I have said, this judgment deals with the testing of hair for the purposes of expert evidence being provided to the court on the consumption of alcoholic beverages. While hair analysis for the use of drugs other than alcohol has been used for many years, hair testing specifically for alcohol use is a relatively recent and developing science, at least in the field of forensic toxicology. It is clearly particularly important when new scientific tests are being used for forensic purposes that they have a sound basis which makes it appropriate for the results to be used in court proceedings and which is sufficiently explained so that the court and the parties have a full understanding of the evidential basis both of the tests themselves and of any opinions based on the interpretation of the results of such tests.

[8] In this context, it must be understood that the Practice Direction: Experts in Family Proceedings Relating to Children, 1 April 2008, [2009] 2 FLR 1383 applies to all expert evidence. It provides, among other things:

> ‘[3.1] An expert in family proceedings relating to children has an overriding duty to the court that takes precedence over any (other) obligation …
> [3.2] Among any other duties an expert may have, an expert shall have regard to the following duties:
>
> (1) to assist the court in accordance with the overriding duty;
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> (2) to provide advice to the court that conforms to the best practice of the expert's profession; …
>
> [3.3] The expert's report shall …:
> (8) in expressing an opinion to the court:
> …

(b) describe their own professional risk assessment process and process of differential diagnosis, highlighting factual assumptions, deductions from factual assumptions, and any unusual, contradictory or inconsistent features of the case;

(c) highlight whether a proposition is a hypothesis (in particular a controversial hypothesis) or an opinion in accordance with peer reviewed and tested technique, research and experience accepted as a consensus in the scientific community; …

(9) where there is a range of opinion on any question to be answered by the expert:

(a) summarise the range;

(b) highlight and analyse within the range of opinion an "unknown cause", whether on the facts of the case (for example, there is too little information to form a scientific opinion) or because of limited experience, lack of research, peer review or support in the field of expertise which the expert professes;

(c) give reasons for an opinion expressed: the use of a balance sheet approach to the factors that support or undermine an opinion can be of great assistance to the court.'

[9] This guidance in the Practice Direction is not advisory, it is mandatory, subject only to the qualification that its terms have to be applied purposively to the specific circumstances of each case. It is applicable, as I have said, to all expert evidence in family proceedings relating to children.

[10] I have referred to the Practice Direction because some of the expert evidence which has been produced in this case appears to have been treated as though it was not expert evidence. It may well be that results obtained from chemical analysis are such as to constitute, essentially, factual rather than opinion evidence because they are not open to evaluative interpretation and opinion. Although I would add that it is common for such analysis to have margins of reliability. However, the Practice Direction applies to all expert evidence and it will be rare that the results themselves are not used and interpreted for the purposes of expert opinion evidence.

[11] It is self-evident why expert evidence needs to be given in accordance with the Practice Direction. The court and the parties need to have available all the information necessary to understand what weight can be placed on the evidence. This might be expected to include any margins of error in the chemical analysis, whether any proposition advanced based on the results of the chemical analysis is a hypothesis or a proposition derived from peer reviewed and tested techniques, research and experience and whether the proposition is or should be qualified in any way because, for example, it is based on limited empirical research. This is important in any event but is of particular relevance when new developments are being used to support forensic evidence, as has been the case with hair strand testing for alcohol.

[12] This is not to say that experts cannot rely on their own experience and unpublished material to support their opinions. It is well established that they can: see, for example, *R v Weller* [2010] EWCA Crim 1085 (unreported) 4 March 2010. However, the basis for the asserted opinion must be made sufficiently clear for its reliability to be properly assessed. During the course of submissions I was also referred to *Re F (Children) (DNA Evidence)* [2007] EWHC 3235 (Fam), [2008] 1 FLR 348 which dealt with DNA evidence. I agree with the points identified by Anthony Hayden QC, sitting as a deputy High Court judge, in para [31] of his judgment including in particular the need for experts to bear in mind that their reports should be expressed in terms which can be understood by lay people and in terms which explain clearly the scientific justification (and limitations) for the opinions being expressed. This is particularly acute when, as will often occur in family cases, expert evidence is being given by a single expert.

[13] In this judgment I deal only with the testing of hair. There are, of course, other longer established methods for seeking to establish alcohol consumption, including blood and urine testing. These test for the presence of ethanol and are, therefore, more direct than the tests being considered in this case. There are limitations, because of the length of time for which ethanol remains in the blood or urine, but they provide a more secure factual foundation.

Hair strand testing for alcohol consumption

[14] Briefly explained, hair strand tests to measure alcohol consumption are based on seeking to establish the concentration of ethyl glucuronide (EtG) and fatty acid ethyl esters (FAEEs). The levels of concentration are given as nanograms of EtG/FAEEs per milligram of hair or picograms of EtG/FAEEs per milligram of hair. The reason both nanograms and picograms are used is that the levels being analysed are very, very small. Accordingly, the results for EtG are usually given in terms of picograms to avoid the use of noughts below the decimal point – one nanogram equals 1,000 picograms.

[15] Hair grows at the rate of between approximately 0.7 and 1.5 cm per month. Accordingly, 3 cm represents, on average, 3 months' growth.

[16] The level of EtG or FAEEs found in a hair sample reflects the consumption of alcohol over the whole of the period covered by the sample. It does not determine the manner in which such alcohol might have been consumed: ie it does not determine the number of times on which alcohol might have been consumed nor the amount consumed on each such occasion.

It shows only the average consumption for the relevant period because both EtG and FAEEs are incorporated in the hair in or near the root and into grown hair.

[17] I must also deal with some of the terminology used in this judgment. Alcohol testing means testing for the purpose of seeking to establish the levels of EtG and FAEEs in a person's hair. I deal later in this judgment with the evidential value of these tests for the purposes of determining whether someone has consumed alcohol in the form of alcoholic beverages and, if so, to what extent. Abstinence means not drinking alcoholic beverages at all. Social drinking means consuming alcoholic beverages but at a level below that categorised as excessive consumption. Excessive consumption means the consumption of alcoholic beverages above the level set by the World Health Organisation, namely more than 60 grams of pure ethanol (7/8 units) per day over a period of several months.

[18] The limit of detection (LOD) is the lowest level at which the presence of a substance can properly be said to be detected. The limit of quantification (LOQ) is the lowest level at which the amount of a substance is sufficient for it to be quantified. If results are below the LOD or even below the LOQ they are at the limits of the test's capabilities and, as a result, there can be significant analytical errors within this range. In addition, the LOQ can vary depending on the ‘noise' produced by the instruments being used.

[19] The Society of Hair Testing was set up in 1995 as an international body to promote research, develop international proficiency tests and encourage co-operation and exchanges between members. During the course of his evidence, Professor Pragst referred to the importance of laboratories undertaking proficiency tests to compare their results.

[20] On 16 June 2009 the Society adopted and published a ‘Consensus of the Society of Hair Testing on hair testing for chronic excessive alcohol consumption' (‘the Consensus'). The Consensus sets out agreed cut-off levels for both EtG and FAEEs which would ‘strongly suggest chronic excessive alcohol consumption'. The levels proposed are obviously above, and significantly above, both the LOD and the LOQ. For EtG the agreed cut-off level has been put at 30 pg/mg (0.03 ng/mg) for the proximal 3 cm segment of hair. For FAEEs the agreed cut-off level has been put at 500 pg/mg (0.5 ng/mg), again for the proximal 3 cm segment of hair.

These levels have been agreed, partly so that standard levels are applied across all laboratories and partly because of a consensus that the results thereby produced are sufficiently robust to be relied upon. Professor Pragst said that these levels were agreed because there was general agreement that at these levels 10% of the results would be false positives and 10% would be false negatives. The length of 3cm was taken as the optimal length because this is the length tested by most laboratories and because there are not many 6 cm samples or shorter segments in the published research data. In respect of this last point, Professor Pragst said that the published data was not sufficient to establish the validity of testing 1cm sections of hair (save as described in para [22(iv)] below).

[21] The cut-off levels referred to above address only the issue of excessive consumption. No cut-off levels have been agreed for the purposes of seeking to identify a dividing line (in terms of amount of EtG and FAEEs) between abstinence and social drinking. This is in part because hair strand testing has been shown to produce false positive results: ie they have established the

presence of EtG and FAEEs above the LOQ in those who have not consumed alcoholic beverages. It is also, importantly, because of the lack of empirical research, in particular published research, sufficient to justify the identification of such a dividing line.

[22] By the end of the hearing all counsel were agreed that the evidence in this case establishes the following points:

(i) when used, hair tests should be used only as part of the evidential picture. Of course, at the very high levels which can be found (multiples of the agreed cut-off levels) such results might form a significant part of the evidential picture. Subject to this however, both Professor Pragst and Mr O'Sullivan agreed that 'You cannot put everything on the hair test'; in other words that the tests should not be used to reach evidential conclusions by themselves in isolation of other evidence. I sensed considerable unease on the part of Professor Pragst at the prospect of the results of the tests being used, other than merely as one part of the evidence, to justify significant childcare decisions;

(ii) because of the respective strengths and weaknesses of each of the tests (for EtG and FAEEs), if hair tests are going to be undertaken, both tests should be used. Research has shown that the tests can produce conflicting results;

(iii) the results produced by the tests should be used only for the purposes of determining whether they are or are not consistent with excessive alcohol consumption by use of the cut-off levels referred to in para [20] above. If they are not – in other words if the concentration found is below the generally recognised cut-off levels – the results are consistent with (indicative of) abstinence/social drinking. If the results are above the generally recognised cut-off levels, they are consistent with (indicative of) excessive alcohol consumption. Further, as referred to earlier in this judgment, at these cut-off levels the research evidence suggests that 10% of the results will be false positives. The tests cannot establish whether a person has been abstinent both because the non-detection of either EtG or FAEEs does not mean that the subject has not consumed alcohol and also because the detection of either at volumes below the cut-off levels referred to above does not mean that they have. Finally, on this point, the tests are not designed to establish abstinence or social drinking;

(iv) the current peer agreed cut-off levels for both EtG and FAEEs are for the proximal 3 cm segment of hair. Whilst the testing of 1 cm segments (of the proximal 3 cm segment of hair) might have some value for the purpose of looking at trends (and also at very high levels referred to in (i) above), no cut-off levels have been established or generally agreed for 1 cm segments nor, as referred to earlier in this judgment, is there sufficient published data on testing such segments to enable the validity of such tests to be established. Accordingly, any evidence based on the testing

of 1 cm segments is unlikely to be sufficient to support conclusions as to the level of alcohol consumption;

(v) notwithstanding what is set out in the Consensus, the witnesses in these proceedings agreed that, when tests demonstrate levels of EtG and FAEEs above the cut-off levels referred to in para [20], the results can be said to be 'consistent' with excessive consumption over the relevant period. When a test demonstrates a lower level it is 'consistent' with abstinence/social drinking;

(vi) as referred to in (iii) above, the current state of research means that there is no peer agreed cut-off level for the line between abstinence and social drinking. In the absence of any such peer reviewed and agreed cut off, any court would, in my view, need specific justification before accepting any such evidence.

The evidence

[23] Having summarised the effect of the evidence given in this case, I propose briefly to summarise the evidence itself.

[24] Alcohol cannot be detected directly in hair. However, when it is metabolised the body produces two minor metabolites, namely ethyl glucuronide (EtG) and fatty acid ethyl esters (FAEEs). These metabolites are incorporated in and can be measured in hair. They are direct markers because they both contain the two carbon atoms present in ethanol. However, the fact that either EtG and/or FAEEs are found to be present in hair in measurable quantities does not mean (ie does not support the proposition) that the subject of the test has consumed alcohol. Either could be found to be present as a result of other factors including through alimentary alcohol (eg some breads) and endogenous alcohol (through normal human metabolism).

[25] EtG is metabolised from ethanol in the liver. It is a very hydrophilic (water loving) compound. At present, although not conclusively established, EtG is understood to become incorporated into hair mainly through sweat. By this means it is incorporated into the hair matrix. It can be seen immediately that the extent to which it is incorporated will depend on a number of factors including how people sweat and the length of a person's hair; in addition, there are significant biological variations between people. There are other variable factors such as EtG, on the one hand, being susceptible to being washed out and, on the other, being capable of being incorporated as a result of the use of products on the hair which contain alcohol.

[26] FAEEs are a group of more than 20 fatty acids. They are formed in the liver, the blood and all other tissues. They are very lipophilic (fat loving). FAEEs are incorporated in hair through the sebum glands. This takes place both through the hair root and also outside the root. Four of the FAEEs are tested, broadly being the four which have the highest concentrations. FAEEs are not easily washed out of hair but can be affected by hair treatments – bleaching will reduce their concentration while the use of products containing alcohol will increase their concentration. Further, FAEEs can be detected in hair as a result of exposure to alcohol in the atmosphere (such as a pub if there is a large amount of alcohol vapour in the air).

[27] Hair can be tested to establish the concentration of these minor metabolites present in the sample. It is a complex process using either gas chromatography/mass spectrometry or liquid chromatography/mass spectrometry.

[28] Research has shown that there is a relationship between alcohol consumption and the concentration of these markers in hair. There are many factors which will affect the level of the concentration of the markers, as a result of which there is no direct correlation between alcohol

consumption and the level of concentration of the markers. However, research has shown that there is sufficient of a relationship to justify using these markers to identify those who abuse alcohol. The definition used is that provided by the World Health Organisation of an average of 60 grams of ethanol per day over the course of several months.

[29] The cut-off levels set out in the Consensus have been agreed because they represent the optimal level at which there were the lowest number of false positives and the lowest number of false negatives. As a result of the variables present, such as the fact that metabolism varies from person to person, it is not possible to identify a clear divide. In Professor's Pragst research (and, I believe, others) the cut-off level was set, through empirical research and ROC analysis, at the point where the results were understood to produce 10% false negatives and 10% false positives.

[30] The tests have been designed to establish a pattern of drinking over a period of time and have not been designed, for example, to test for a single episode of drinking – the amount of either ETG or FAEEs present is averaged for the whole period tested. Nor, more importantly, have they been designed to establish abstinence or social drinking. Abstinence cannot be established by means of these tests because research has shown that even those who have not consumed alcoholic drinks can test positive for both EtG and FAEEs. This was not anticipated and their presence is explained by the fact that normal foods can contain alcohol and by the production of endogenous alcohol through normal human metabolism. Further, there is no reliable published data on the relationship between the consumption of alcohol and the concentration of these markers at levels below that which is consistent with excessive consumption as referred to in the next paragraph.

[31] Balancing the strengths and weaknesses of the tests for both EtG and FAEEs in hair has led to it being generally acknowledged that, currently, they should only be used to ascertain whether the results are consistent with excessive consumption. As referred to earlier in this judgment, the Society of Hair Testing published the Consensus in June 2009. In order to arrive at an agreed uniform approach and thereby to standardise what had previously been variations in practice between the various laboratories that provide hair tests for alcohol, the Consensus made the following recommendations:

(a) ‘the cut off for EtG in hair strongly to suggest chronic excessive alcohol consumption is proposed at 30 pg/mg (0.03 ng/mg) scalp hair measured in the 0–3 cm proximal segment';

(b) ‘the cut off for the sum of the four esters (FAEEs) in hair strongly to suggest chronic excessive alcohol consumption is proposed at 0.5 ng/mg (500 pg/mg) scalp hair measured in the 0–3 cm proximal segment'.

These recommendations reflect the current international consensus and are due to be reviewed in 2011. The proposed review reflects the fact that the science in this area is developing.

[32] Professor Pragst recommends that both tests (ie for EtG and FAEEs) should be carried out in part because of the different ways in which they are incorporated into hair and their different susceptibilities.

[33] All references to the length of a sample relate, for obvious reasons, to the length from the scalp end of the sample.

Hair test evidence in this case

[34] On 2 September 2009 a sample of the mother's hair was taken. This was then tested on 4 September by TrichoTech. A 3 cm section of the sample was cut into three 1 cm segments and each segment was separately tested for the presence of EtG. EtG was not detected in the two older segments but was detected in the newest segment. The amount detected was 0.022 nanograms per milligram (22 pg/mg) of hair.

[35] A report was provided in the form of a Criminal Justice Act witness statement from Mr O'Sullivan dated 17 September 2009 rather than in the form of an expert report. He stated that:

> 'The results are consistent with the use of alcohol by (the mother) within the time period covered by the most recent hair section analysed …
> Based on the current scientific evidence, EtG results in isolation can be suggestive of alcohol use or abstinence however they may not be conclusive. Clinical judgment in combination with laboratory tests is therefore strongly recommended for the best diagnosis. The degree of any alcohol use is a clinical decision.
> It is not possible to determine the amount of alcohol an individual has consumed from the level of EtG detected in any hair section tested. There are many factors that influence the amount of EtG in hair such as the strength of alcohol consumed, the effect of cosmetic hair treatments and individual variations in alcohol metabolism.
> For general guidance only, the level of EtG detected in the most recent hair section is in the low range in comparison with other samples analysed at the laboratory that have tested positive for EtG.'

[36] It can be seen that this statement did not provide a wholly clear picture of what was being said could be deduced from the discovery of 0.022 ng/mg of EtG in one segment of the mother's hair. It was said that the result was 'consistent' with the use of alcohol but it was then also said that EtG results 'can be suggestive of alcohol use or abstinence'. During the course of the hearing Mr O'Sullivan made it clear that TrichoTech have since changed their practice so that this result would now no longer be deemed significant – in part because they do not now rely on the results from 1 cm segments only but look at the average results from a 3 cm segment. If this latter approach had been adopted in September 2009 the result would have been said to have been negative.

[37] A further test was then undertaken, at the mother's request, by Trimega. A sample of hair was collected on 22 October 2009. A 6 cm segment

was tested for FAEEs. The concentration detected was an average of 0.03 ng/mg. In a 'Certificate of Analysis' this was described as a 'Negative' result explained as meaning: 'A negative result indicates no evidence of frequent excessive alcohol consumption in the fatty acid ethyl esters'. This interpretation was confirmed in a witness statement. It was later said by Trimega that the negative results indicated 'abstention or virtual abstention' during this 6-month period; ie mid-April to mid-October.

[38] In addition, although unknown to any of the parties until this hearing, a 3 cm section had also been analysed for the presence of EtG. This was done for the laboratory's own purposes. The result was 1.8 pg/mg; this is a 'negative' result. At this level the process is such that there exists a very wide margin of error; the result of 1.8 pg/mg is below the level of quantification. It is regrettable that this result was not made available to the parties as it might have affected the course of these proceedings.

[39] In October 2009 the parties in these proceedings were, therefore, faced with one test result which was said to be consistent with the consumption of alcohol in the period between the end of July and the end of August 2009 and another test result which was said to indicate abstention or virtual abstention.

[40] With the Certificate of Analysis from Trimega came a standard document entitled 'Hair Alcohol Testing Results Summary'. In respect of the presence of FAEEs this document states:

> 'The procedure looks for and quantifies several markers that indicate alcohol abuse. These markers are only present when the subject consumes alcohol.
> The markers are derived from the effect of consumed alcohol on a range of fatty acids secreted by the body to produce a homologous series of fatty acid ethyl esters. These esters can only form from the consumption and are unaffected by the use of alcohol in shampoo, conditioners

and treatment of any kind. The presence of these esters in the hair sample is evidence that the alcohol was ingested and absorbed by the body.'

[41] In early November, the mother's solicitors by chance received a promotional email from Trimega which listed a number of questions and answers, including the following:

'Q: Does the EtG and FAEE concentration found in my client's test results equate to the quantity my client has consumed?
A: No. We cannot quantify the exact amount of units your client has been drinking as Trimega does not measure the alcohol itself but rather identifies and quantifies metabolites produced by the body once alcohol has ingested. Results cannot be quantified into consumption levels due to differences in alcohol metabolism and physiology in hair growth … As with all medically-based tests, results are not subject to the lineal laws of basic mathematics.
Q: If you cannot determine the quantity of alcohol consumed from the test results, what do these tests determine?

A: Trimega determine whether the donor falls above or below the cut off level that we have set, which is 60 grams of pure ethanol per day over a protracted period.
Q: What is meant by a "positive" result?
A: A positive result is reported when the total concentration of FAEE and/or EtG exceeds the cut off level which correlates to 60 grams plus on a daily basis.
Q: Would teetotallers return a "zero" result?
A: There is no such thing as a zero result because ethanol is present in all hair, even that of teetotallers. These traces are the product of the environment, the metabolism of certain foods and cosmetics.'

[42] It can be seen that the above statements in the email differ from the 'Results Summary' in which it was stated that 'These markers are only present when the subject consumes alcohol'. As will be apparent from this judgment, this bald assertion is not supported by research which has shown that false positive results can be obtained from those who have not consumed alcohol. However, as a result of this and other evidence in this case the local authority asserted, and continued to assert until the hearing before me, that the mother had consumed alcohol in the period since July 2009.

[43] As a result of the differences between the test results and also because of uncertainty as to what propositions it was being said the results supported, the mother's solicitors sent a number of written questions to both Trimega and TrichoTech.

[44] In his response, on behalf of TrichoTech, Mr O'Sullivan gave answers which, in hindsight, only further confused the position by stating among other things that:

- for EtG to be detected in any hair section analysed by TrichoTech, 'it is estimated that the donor would have to consume, as a minimum, between approximately twenty and fifty units of alcohol per week over the course of the time period being tested';
- the result of the test on the mother's hair 'is consistent with the use of alcohol'
- EtG results 'in isolation can be suggestive of alcohol use or abstinence; however they may not be conclusive. Clinical judgment in combination with laboratory tests is therefore strongly recommended for the best diagnosis'.
- the analytical cut-off for EtG is 0.01 ngs/mgs of hair.

He also enclosed the Consensus.

[45] In their response Trimega, among other things, state that they are not aware of any test which can demonstrate 'complete abstinence' and that FAEE alcohol tests can never produce a 'zero result' as the body absorbs small amounts of ethanol from the environment and from some

types of food. It is also said that it is ‘scientifically unsound' to test hair for the presence of EtG on a month by month basis (ie by 1 cm segments) because of the effect of EtG

laden sweat on the more mature sections of hair. As referred to earlier, Trimega also stated that their test results of the mother's hair indicated abstinence or virtual abstinence.

[46] A number of reports have been obtained from a consultant psychiatrist. Her reports are not relevant for the purpose of the issue addressed in this judgment save for comments made on hair testing for alcohol. I quote:

> ‘The general view is that if ethyl glucuronide (EtG) is found in a hair strand sample, then the person has been drinking alcohol at a minimum of twenty units a week during the period tested. However, anecdotally there have been reports that low levels can be found in abstinent people.'

She also refers to her understanding that EtG and FAEEs are produced following the consumption of alcohol and ‘as they are said to originate only from alcohol, then they are accepted as very specific markers'. In addition, the consultant makes the very sound point that all results need to be taken in the context of a particular case, including the history and other medical information.

[47] On 26 January 2010, Professor Pragst and Mr O'Sullivan had an experts' meeting by telephone. By this date, neither had been requested to provide a full report and perhaps in part as a result of this the meeting appears to take the form more of a symposium than a formal experts' meeting. As McFarlane J cautioned in *Oxfordshire CC v DP, RS and BS* [2005] EWHC 2156 (Fam), [2008] 2 FLR 1708 at [109]:

> ‘Experience shows that the manner in which experts express themselves at such meetings is less guarded than when they are writing reports for the court or giving oral evidence.'

[48] During the course of the meeting the experts provided a great deal of additional information. Professor Pragst makes it clear that if FAEEs are being produced their concentration will increase from the proximal to the distal end of the hair being tested. This is because of the way they are incorporated into the hair. Mr O'Sullivan stressed that EtG testing on hair should really be used only as an indicator of excessive alcohol use. Both Professor Pragst and Mr O'Sullivan agreed that ‘You cannot put everything on the hair test' – you have to look at the whole picture.

[49] Professor Pragst also referred to the fact that positive results for both EtG and FAEEs can occur even though the subject of the tests has not consumed alcohol – ie false positive results. The reasons for such results occurring are said to include the existence of alimentary alcohol and of endogenous alcohol as well as the treatment of hair with products containing alcohol.

[50] The mother's hair was further tested by Trimega for the presence of FAEEs in February 2010 and for FAEEs and EtG in May and July 2010. The results were all ‘negative' meaning that there was ‘no evidence of frequent excessive alcohol consumption'. The concentration of FAEEs from the February 2010 test of a 6 cm segment of the mother's hair was 0.53 ng/mg; the cut-off level then being used for 6 cm of hair was 1ng/mg. In his oral

evidence Professor Pragst said that this (0.53 ng/mg) quantity of FAEEs had been found in hair samples taken from children and teetotallers and that this result could not, therefore, be used to put forward any degree of probability that alcohol had been consumed. He made it clear later in his evidence that below the agreed cut-off levels, the test results are properly described as being in the range of social drinkers/abstinence because the tests do not enable these two categories to be distinguished. This sample, again unknown to the parties, was also tested for EtG. The result was, again, below the limit of quantification.

[51] The standard form explanation which was provided by Trimega with these later test results was different to that which was being used in 2009. However, the explanation remains, to put it neutrally, confusing. While it refers to the potential effect of endogenous alcohol, alimentary alcohol and hair products containing alcohol and to the tests being used as 'markers for chronic high alcohol consumption', it continues to be asserted that FAEEs and EtG are 'only present when the subject consumes alcohol'. This latter assertion is not correct.

[52] In addition, the witness statements provided on behalf of Trimega, which further sought to explain the test results, went much further than the evidence which I have heard would support. They included the assertion that the mother 'likely exhibits the characteristics of a very moderate drinker'; that the results tend 'to indicate continued low alcohol consumption'; and that 'interpretative reference ranges have been established' to distinguish between chronic alcohol abusers, moderate social drinkers and teetotallers. None of these assertions was supported by the evidence given at the hearing.

[53] Finally, both Professor Pragst and Mr O'Sullivan provided written answers to certain questions. The former stated that social drinkers may have EtG and FAEE values in the same range as teetotallers and that, as a consequence, the Society of Hair Testing has not agreed cut-off levels to seek to distinguish between the two categories. The latter stated that EtG testing by TrichoTech is 'not designed to show use or abstinence of alcohol; it is designed to show excessive use … only'.

[54] I should also make clear that the results of other tests and other evidence did not indicate that the mother had consumed alcohol in the period since early 2009.

Conclusion

[55] I have set out in para [22] the effect of the evidence in this case. The evidence in this case and these conclusions have highlighted the need for the exercise of considerable caution when hair tests for alcohol are being interpreted and relied upon, both generally and particularly in isolation. Further, these conclusions only emerged during the course of the oral hearing. This should not have occurred as they should have been apparent at a much earlier stage of the proceedings. I regret to say that the hair testing evidence given in this case failed the parties and in particular the children.

[56] In his final submissions on behalf of the guardian, Mr Clough pointed to the potential consequences for the children in this case of the local authority's reliance on the results obtained from the hair sample taken in September 2009 – he described them as potentially 'catastrophic'. This is not to blame the local authority for such reliance but rather is a proper reminder of

the need for expert evidence to be given in a manner which accords with the principles underlying the Practice Direction.

Order accordingly.

Solicitors:*A local authority solicitor*

HCL Hanne and Co for the first respondent

Mackesys for the second respondent

Neirizi Swan for the third respondent

Fisher Meredith for the fourth and fifth respondents

Payne Hicks Beach for the intervener

PHILIPPA JOHNSON

Law Reporter