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ARE CUT OFF LEVELS RELEVANT IN HAIR STRAND TESTING IN A CHILD PROTECTION ARENA?

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What are cut off levels?

In the context of Hair Strand and Nail testing, a cut-off is a level or threshold that is applied to test results by general testing laboratories to simplify reporting and interpretation of test results. Cut-offs are used to divide results into two categories; 'Positive' and 'Negative' or sometimes described by the laboratory as 'Positive' and 'Not Detected'.

When used in legal proceedings, this method of reporting can be very misleading in a significant proportion of cases. This is because a 'Positive' result does not mean it is more likely than not drugs have been used, only that it was found in the sample. Furthermore, when results are reported as 'Negative' or 'Not Detected' this does not mean it is more likely than not drugs haven't been used, only that the drug is either at a lower level than the cut off or it wasn't in the sample.

What also adds to the confusion when applying cut-offs to these results is that in a proportion of cases even very regular drug use does not always produce a 'Positive' result or any detectable drug at all.

Quite simply, when cut offs are used to interpret results of Hair Strand testing, the opinions produced on a case by case basis **cannot achieve** the burden of proof required in Family / Civil proceedings; **'balance of probabilities.'**

Where do cut off levels come from?

It's been over 25 years since Hair Testing was introduced into care proceedings as evidence, and the Society of Hair Testing (SoHT) proposed certain reporting cut offs to guide laboratories how to report results. Yet 25 years on, the simple process of reporting results using these same cut offs, and the quality of the evidence produced, has changed very little.



The main challenge for testing labs in years gone by was to understand what the presence and levels of drug in hair represented. Hair presented a new challenge, because unlike the more conventional samples usually tested; blood, urine and oral fluids, hair existed outside the body and therefore was exposed to the environment. So, how would labs know if the drugs they found in hair represented environmental contamination and exposure to others using drugs, or active use of the drug?

Some limited and uncontrolled studies on unsegmented hair revealed that levels of commonly abused drugs like Cocaine, Heroin and Cannabis usually exceeded certain thresholds when the donor was a regular user of these drugs. When levels fell below these very approximate thresholds, in some cases the results could be attributed to the donor having regular exposure to drugs and not drug use. The reporting threshold or cut off was established for the very common drugs at a level high enough to generally filter the data into the population that used and the population that didn't use.

Therefore, while this general screening, adopted and still used by the majority of accredited hair testing laboratories in the UK, is useful for commercial, clinical and epidemiological screening, in our experience and that of a growing body of other experts and courts, it is not appropriate for care cases and legal proceedings. This is because the opinions formed in these cases must achieve balance of probabilities on a case by case basis and there is now a comprehensive and continually growing body of evidence accumulated, that clearly demonstrates the use of cut-offs for reporting cannot achieve this required standard of proof.

Why can cut off levels be problematic?

There are many factors that can impact on the presence, levels and profile of drugs in a hair sample and the use of cut offs ignores all these factors. These can be very common such as: hair bleach, permanent dye, straightening, certain shampoos and conditioners, hair style and grooming profile to name a few. The segmental profile of results is also a pivotal factor that influences interpretation in numerous cases also ignored when applying cut-offs. In addition, and perhaps most surprisingly, factors such as the colour of somebody's hair has a significant impact on detection rates. So, for example having black hair can mean that you are more likely to lose custody of your child compared to having blonde or ginger hair. Ignoring this factor leads to discrimination on hair colour alone when using cut offs to report Hair Strand results.

Codeine Concentrations (pg/mg hair)



Negative
Red
66.6

Negative
Blonde
119.6

Positive
Brown
250.8

Positive
Black
1134.0

Rollins, D. (2004) Role of Melanin in Drug Incorporation into Hair, Presentation, SOHT, Des Plaines, IL

This study involved controlled administration of the opiate codeine to a group with a range of hair colours. All received the same dose at the same frequency over the same period. Hair samples covering the period of administration were collected and tested. Results showed that those with black hair had ~10 times higher levels than those with blonde hair and over 15 times higher compared to ginger hair.

The SoHT cut off used to report opiates is 200 pg/mg. Therefore, those with brown/black hair are reported 'Positive', those with light or ginger hair reported Negative.

This is because Opiates (including heroin), Cocaine and many common drugs bind predominantly to the dark pigment in the hair.

FTS do not use cut offs to report results. However, if FTS applied the SoHT Cut-offs to results of ~4000 hair samples in cases previously tested by FTS, where drug use has been declared, or where the result profiles and history indicates drug use is very unlikely, depending on the cases in each group, it would have resulted in significant misreporting:

Up to 15% hair samples in cases **'not'** using Heroin would be **'Positive'**

Up to 20% hair samples in cases **'not'** using Cocaine would be **'Positive'**

Up to 20% hair samples from chronic Heroin users would be **'Negative'**

Up to 20% hair samples from chronic Cocaine users would be **'Negative'**

Up to 60% hair samples from chronic Cannabis users would be **'Negative'**



"The use of cut off's does not take the numerous influencing factors into account, which means that statistically a person with dark hair using drugs is more likely to lose custody or contact with their child when compared a person with blonde or ginger hair using the same drugs at the same frequency. These cut offs were designed and are suitable for routine commercial, clinical and epidemiological testing, but should have no place in a family court where any findings must meet the appropriate burden of proof; balance of probabilities. In order to achieve this standard a detailed investigation of all influencing factors with appropriate associated data is required before reliable opinions can be made."

Paul Hunter
Technical Director, FTS

For further help and advice please contact us:

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