

Testing for Alcohol Abuse

Background

Alcohol, despite being legal and widely available, is recognised as one of the most harmful of the drugs of abuse. Excessive use has a dramatic impact on a person's social responsibility and behaviour.

Assessing impairment due to alcohol use is relatively simple using a breathalyser, which estimates how much alcohol is present in the blood; the more alcohol the more impairment. However finding a diagnostic test to determine if alcohol use is a chronic problem, causing deterioration in social responsibility, is a much more difficult challenge technically and practically.

Alcohol only remains for up to 36 hours in the blood following even high levels of consumption and as such testing for alcohol is worthless in trying to establish a history of longer than 1 or 2 days. Several different tests are available to help determine if there has been excessive drinking historically, but unfortunately none of these tests independently, can answer this question reliably.

Through extensive research and development the Forensic Testing Service (FTS) are now a lot closer to providing the answers you need. Results derived from a menu of tests produce a more accurate and reliable assessment of alcohol abuse. To improve the utility of this information, FTS present a full synopsis and interpretation of all results in a concise report that is easy to understand. This ensures that the decisions made by the court are based on the best scientific evidence available, providing greater assurance that the right decisions are made.

Which Tests to use?

Summary Guidelines

To assess whether there has been chronic alcohol abuse over a period of 3 or more months then our guidelines are as follows:

Minimum Testing - Standard Alcohol Test

Preferred Testing - Standard Alcohol Test combined with the EtG Hair Test (assuming ore

than 3cm of hair is available).

Optimal Testing - Standard Alcohol Test with the EtG Hair Test performed each month for the period required (5 tests to cover a 6 month period) with the inclusion of an EtG Urine Test when the last test in the series is ordered.

Questions Answered

In child protection cases there appear to be three key questions that need answering with regards alcohol abuse (please tell us if you have others), firstly: -

1. Is the parent or guardian regularly drinking excessive amounts of alcohol?

To answer this question MHS recommend a combination of three tests on a single sample of blood. These tests are labelled **LFT**, **CDT** and **GGT-CDTr**(unique to MHS). MHS refer to this profile of tests as the **Standard Alcohol Test**. The results of this test profile are combined and the calculations derived from them provide an accurate and reliable method to identify excessive drinking patterns over the previous month.

The **LFT** component also provides some supporting evidence to the second question, which is: -

2. Is there any evidence to support a long history of alcohol abuse?

The **LFT** test can show prolonged alcohol abuse by identifying impaired function of the liver. Although certain **LFT** profiles do tend to be more predictive of alcohol use than others, impairment may not be due to alcohol use, (see below). To strengthen the evidence supporting long-term abuse, FTS recommend the addition of a more specific test: the **EtG**

Hair Test.

The amount of history available is however dependent on how long the hair sample is (every one cm providing approximately one months history).

This leaves a possible third question, which is: -

3. If the parent or guardian has a history of alcohol abuse, but claim to have stopped drinking, then have they abstained for long enough to give confidence that they are now fully reformed? This would usually require proof of abstinence for a minimum of three months or better six months.

This can also be answered by using the **Standard Alcohol Test**, repeated each month for the required period for which you need to show abstinence or responsible drinking behaviour. Furthermore to be sure there hasn't been a recent relapse (in the last 3 to 5 days) it is also advisable to add an **EtG Urine Test** on the last of the series of tests. Any recent use would otherwise be missed.

An alternative method would be to carry out a single batch of tests; the **Standard Alcohol Test** to cover the past 4 weeks history and an **EtG Hair Test** to provide information on earlier history. However, if less than 3 cm of hair is available, and then the testing needs to be carried out at monthly intervals to complete the period over which abstinence needs to be demonstrated.

So What Do All These Tests Mean?

The tests recommended above are explained individually in more detail below to help you better understand their strengths and weaknesses when selecting them to provide evidence for recent and historical alcohol use.

LFT's (Liver Function Tests)

The LFT's are a series of 8 separate tests for levels of enzymes and proteins in the blood (Bilirubin, Total Protein, Alk Phos, Globulin, Gamma GT, ALT, AST and Albumin) that shows if there have been any changes to the function and health of the liver.

Alcohol is extremely toxic at high levels and over time will cause damage to the liver. This damage is detected by changes in the levels of the liver enzymes and proteins listed above, some of which (Gamma GT in particular) being more sensitive to alcohol related damage than others.

Each of these tests has a value and the laboratory provides a 'normal value' or 'reference value' to the test, which shows whether the test is within the normal range. Abnormal functions are shown by how much they are below or above the normal range.

Usually the liver function test gives an indication of how much the liver is inflamed and possibly either damaged or changed in its ability to function properly. A certain profile of raised levels may be indicative of regular and heavy use of alcohol, however these are not necessarily specific to alcohol use.

Raised liver enzymes are non specific markers of liver disease and may be associated with inflammation of the liver due to viral infections (hepatitis), therapeutic drugs or toxins or obstruction to bile flow (cholestasis).

Fatty infiltration of the liver and some rare metabolic disorders may also result in raised liver enzymes. It is important to understand therefore that the LFT's do come with a "health warning";

Normal values for LFT's can vary between men and women, at different times of the day and as you get older. Furthermore 'abnormal' liver function test results are not uncommon in the general population. All of the tests can be affected by disorders and diseases that are unrelated to the use of alcohol. abnormal LFT's do not necessarily relate to alcohol abuse and as such we advise caution when interpreting these test results.

Expert interpretation of these tests is absolutely essential to understanding what the results mean and this is provided by FTS. **LFT's** are helpful, but only part of the picture. They provide complimentary and supporting evidence to the more specific **CDT and EtG Tests**.

CDT (Carbohydrate Deficient Transferrin)

This is a more specific blood test than the **LFT's** in assessing alcohol use, however as with **LFT's**, other conditions have also been shown to cause abnormal levels of CDT. Transferrin is naturally present in the body for transporting iron in the blood. Alcohol in the blood can damage this Transferrin removing its carbohydrate and changing it to Carbohydrate Deficient Transferrin or CDT. The more alcohol we drink the more CDT is produced. However a small amount of CDT can occur naturally in the body and it usually takes several days of alcohol consumption for levels to be raised. Once they have been raised it takes approximately 2 to 3 weeks of abstinence for the levels to return to normal. This makes CDT a very useful test to

determine whether regular and excessive amounts of alcohol have been consumed over approximately the past 2 to 3 weeks. Unfortunately it isn't quite that simple and again, as with **LFT's**, caution must be advised when interpreting CDT test results.

CDT concentrations from healthy women are typically higher than those of healthy men. This is because females frequently have sub clinical iron deficiency, which results in higher CDT concentrations. Raised CDT levels are also caused by a number of clinical conditions including biliray cirrhosis, chronic hepatitis, end stage liver diseases, cystic fibrosis and CDG syndromes.

There are also several conditions that can affect the sensitivity of CDT as marker of chronic alcohol abuse including age, drinking patterns, body mass,hypertension and smoking.

CDT does however have fewer sources of false positives than the **LFT's** and is one of the more specific single laboratory markers of chronic alcohol abuse.

Combining **LFT's** with a CDT test increases the level of confidence in results compared to utilising only one test technology in isolation. However, they do still only provide part of the overall picture, and should not be solely relied upon.

GGT-CDTr (Gamma Glutamyltransferase - Carbohydrate Deficient Transferrin ratio)

It is now possible to identify alcohol abuse more accurately following the introduction of **FTS's** new **GGT-CDTr Test**. Studies (ref. 1) have shown that an abnormal **GGT-CDTr Test** gives much greater assurance that an individual is abusing alcohol than combining traditional **LFT's** and CDT alone. The sensitivity of **GGT-CDTr** in correctly classifying heavy drinkers is >90% which is significantly better than using CDT alone at ~65%, GGT ~55%, AST ~45% and ALT ~50%.

Furthermore unlike the other LFT's the sensitivity of **GGT-CDTr** remains high whether liver disease is present or not. Using the **GGT-CDTr Test** also provides a longer window of detection, taking up to 5 weeks to normalise compared with 2 to 3 weeks for CDT alone.

EtG Testing (Ethyl glucuronide)

EtG is a direct metabolite of alcohol and is found in blood, urine and hair samples following alcohol consumption. The **EtG Urine Test** provides a recent history of between 2 to 4 days of alcohol use, unlike the **LFT's**, which would not detect recent high levels of use and as such the test is useful in identifying a recent relapse following a period of abstinence.

The **EtG Hair Test** provides information for a much longer history than urine and can be up to 12 months depending on the length of hair tested (each cm of hair covers approximately a months history). It is important however not to confuse hair testing for alcohol use with drug testing in hair. The source of EtG in hair is less well understood,although it appears that one source is the EtG released in sweat, which contaminates the hair externally.