

Blood Alcohol Testing – Extended Information

What does the liver do?

The liver is the heaviest gland in the body, weighing about 1.4 kg in an average adult, and after the skin it is the second largest organ of the body. The liver is located in the upper right cavity of the abdomen (figure 1) and is responsible for a variety of functions within the body, which include;

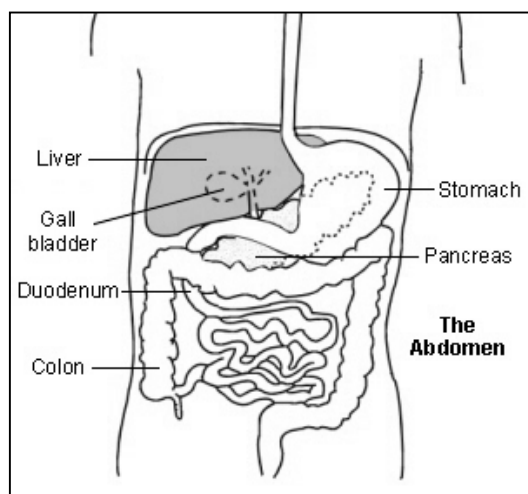


Figure 1: Diagrammatical representation of an adult abdomen taken from www.patient.co.uk

Carbohydrate Metabolism - the release or retention of glucose into the bloodstream to maintain a normal blood glucose level, as well as storing glycogen (fuel for the body) which is made from sugars.

Lipid Metabolism - helping to process fats and proteins from digested food

Protein Metabolism - making proteins that are essential for blood to clot (clotting factors).

Removal of Drugs and Hormones - helping to remove poisons and toxins such as alcohol and penicillin from the body. The liver can also chemically alter or excrete hormones such as estrogens and aldosterone.

Excretion of Bilirubin - bilirubin, derived from the heme of worn out red blood cells is absorbed by the liver from the blood and secreted into bile.

Synthesis of Bile Salts - A greenish-yellow fluid that contains bile acids, bile pigments and waste products such as bilirubin. Bile is stored in the gall bladder and helps the gut to digest fats.

How is alcoholic abuse diagnosed?

Liver Function Tests

In order to perform all of the functions of the liver, the liver cells produce chemicals called enzymes which act as catalysts for the chemical processes (metabolism). When the cells are damaged due to excessive alcohol consumption these enzymes leak out into the bloodstream altering the normal levels in the blood serum and thus providing indicators to assess liver damage by way of a standard blood test.

The liver function test assesses a number of liver produced enzymes within a blood sample, which indirectly can tell you something about how the liver is working. The most common enzymes tested for are:

- Alanine Aminotransferase (ALT)
- Aspartate Aminotransferase (AST)
- Alkaline Phosphatase (ALP)

- Gamma-Glutamyl Transferase (GGT or "Gamma GT")
- Bilirubin
- Albumin
- Clotting Studies (Prothrombin Time)

Each of these enzymes have results assigned to them in numbers and values. Laboratories in the UK provides a "normal value" or "reference value" to the test, which can give the doctor, nurse or specialist a guide as to whether or not your test is in the average for normal function or is outside of the normal range and may be abnormal. How abnormal can be assumed from how low or more often high the result is below or above the normal range. The level of accuracy in identifying whether an individual has alcohol dependency is greatly increased by combining the above tests. Moreover, the tests have a high negative predictive value (between 83 and 91%) making them very useful in identifying individuals who are not dependent.

Carbohydrate Deficient Transferrin (CDT) Test

Transferrin (Tf) is a globular glycoprotein produced by the liver and found within blood serum. The primary responsibility of Tf is the transportation of iron, however, it is also one of the most accurate markers used to indicate chronic alcohol consumption by clinicians and researchers due to its sensitivity and specificity (Sillanaukee, P. 1996). Stibler & Kjellin (1989) first reported the increased presence of transferrin isoforms (transferrin protein molecules with slightly altered chemical structures by loss of carbohydrate molecules) in serum obtained from alcoholics, which normalised after abstinence with a mean half-life value of 14-17days. This means that for most people who are alcohol dependent their elevated CDT level will be detected even if they have abstained for a short periods before the test. Carbohydrate Deficient Transferrin (CDT) is a collective term referring to the isoforms of transferrin which are produced when blood alcohol levels are increased.

The current hypothesis for the mechanism of action is that increased ethanol in the blood effects the structure of the transferrin protein by removing/inhibiting the binding of carbohydrate molecules resulting in increased levels of CDT (Niemela et al 1995), which can be detected by means of a standard blood test conducted by a GP.

Studies have shown that CDT values increase after 10 days of drinking at a level of 50-80 g ethanol per day indicating consistent consumption (Anton et al. 1994), this makes CDT a suitable biochemical marker for routine work in the detection of alcohol abuse and for monitoring either abstinence or relapse during treatment.

Interpretation of results

In interpreting the results from LFTs & CDTs, certain considerations must be taken into account. For example in a CDT test, false results may occur in individuals suffering from chronic hepatitis, cirrhosis and other related conditions, however these conditions would cause corresponding anomalies in the LFT results. For these reasons, combining LFT tests with a CDT test increases the level of confidence in results than simply utilising one test technology in isolation.

Both the LFT test and the CDT test are useful tools for specialists to call upon when dealing with alcohol abuse & addiction. However, they do only provide part of the overall picture which make up addiction assessments and should not be solely relied upon.

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