



Canadian Liver Foundation
Fondation canadienne du foie

Bringing liver research to life
Donner vie à la recherche sur le foie

Liver Tests

What are liver tests?

Liver tests (LTs) are blood tests used to assess the general state of the liver or biliary system. Few of these tests actually measure how well the liver or biliary system is functioning, but rather reflect the presence of damage or inflammation.

How useful are LTs in detecting liver disease?

LTs are used to guide the physician along with the history and physical examination, in the diagnosis and management of a number of liver diseases. A problem in relying on these biochemical tests is that they are indirect measurements from the blood, of what is happening in the liver.

What are the most common LTs?

Liver Enzymes

Alanine aminotransferase (ALT) and aspartate aminotransferase (AST)

Perhaps the most commonly used indicators of liver (hepatocellular) damage are the alanine aminotransferase (ALT) and aspartate aminotransferase (AST), formerly referred to as the SGPT and SGOT. These are enzymes normally found in liver cells that leak out of these cells and make their way to the blood when liver cells are injured. The ALT is felt to be a more specific indicator of liver inflammation as AST is also found in other organs such as the heart and skeletal muscle. In acute injury to the liver, as in viral hepatitis, the level of the ALT and AST may be used as a general measure of the degree of liver inflammation or damage. In chronic liver disease, this is not the case, for these enzymes may be entirely within the normal range even in the presence of cirrhosis (liver scarring).

Alkaline phosphatase

The alkaline phosphatase is the most frequently used test to detect obstruction in the biliary system. Elevation of this enzyme may be found in a large number of disorders as common as gallstone disease, alcohol abuse, and drug-induced hepatitis, or in less common disorders such as primary biliary cholangitis (PBC) or biliary tumors. Although this enzyme is found both in the liver and bile, and leaks into the bloodstream in a manner similar to that described for the ALT and AST, alkaline phosphatase is also found in other organs such as bone, placenta, and intestine. For this reason, it is often useful to measure another enzyme not found in these organs, either the gamma-glutamyl transpeptidase (GGT) or 5'-nucleotidase (5'-NT), along with the alkaline phosphatase when the origin of the elevated alkaline phosphatase is not clear. Abnormalities of the 5'-NT or GGT would then suggest liver or biliary tract disease.

Liver Function Tests

Bilirubin

Bilirubin is the main bile pigment in humans which, when elevated causes the yellow discoloration of the skin called jaundice. Bilirubin is formed primarily from the breakdown of a substance called heme found in red blood cells. It is taken up from the blood, processed, and then secreted into the bile by the liver. There is normally a small amount of bilirubin in the blood in healthy individuals ($<17\mu\text{mol/L}$). Conditions which cause increased formation of bilirubin, such as destruction of red blood cells, or decrease its removal from the blood stream as in liver dysfunction, may result in an increase in the level of bilirubin in the blood. Levels greater than $50\mu\text{mol/L}$ usually are noticeable as jaundice. Since the bilirubin may be elevated in many forms of liver or biliary disease, it is relatively non-specific. It is, however, generally useful as a true liver "function test", since it reflects the liver's ability to take up, process, and secrete bilirubin into the bile.

Albumin

Albumin is a major protein which is formed by the liver. Although there are many factors which can affect the level of albumin circulating in the blood, chronic liver disease causes a decrease in the amount of albumin produced, and therefore the level of albumin in the blood is reduced. Albumin is also part of most automated chemistry screening panels (normal $> 35\text{ g/L}$).

Prothrombin time and INR

The prothrombin time (also called the "protime" or PT) and the INR are tests used to assess blood clotting. Blood clotting factors are proteins made by the liver. When the liver is significantly injured, these proteins are not produced normally. The PT and INR are also useful liver function tests since there is a good correlation between abnormalities in coagulation measured by these tests and the degree of liver dysfunction. The values for the PT are usually expressed in seconds and compared to a control patient's blood (normal ± 2 seconds of control).

Other Liver Tests

Highly specialized tests may be used to indicate more specifically the presence of certain liver diseases. For example:

- Specific antibodies, proteins, and nucleic acids may be used to indicate the presence of viral hepatitis B (HBsAg, HBV DNA) or C (eg. anti-HCV antibodies, HCV RNA).
- Elevations in the serum iron, transferrin saturation and ferritin may indicate the presence of hemochromatosis.
- A deficiency of ceruloplasmin is usually seen in patients with a copper metabolism disorder called Wilson disease.
- A low level of alpha-1-antitrypsin may indicate the presence of lung and/or liver disease in children and adults due to alpha-1-antitrypsin deficiency.



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- Immunologic tests such as the antimitochondrial antibody may suggest the presence of primary biliary cholangitis (PBC). Antinuclear and/or anti-smooth muscle antibodies may indicate the presence of autoimmune hepatitis.

Liver tests provide a useful tool for beginning the investigation of disorders of the liver and biliary system. Interpretation of these tests is a sophisticated process that your physicians place in the context of your history, physical exam, and other tests available to them.

This information is current for February 2016.