

LIVER FUNCTION TESTS

The term "liver function tests" and its abbreviated form "LFTs" is a commonly used term that is applied to a variety of blood tests that assess the general state of the liver and biliary system. Routine blood tests can be divided into those tests that are true LFTs, such as serum albumin or prothrombin time, and those tests that are simply markers of liver or biliary tract disease, such as the various liver enzymes. In addition to the usual liver tests obtained on routine automated chemistry panels, physicians may order more specific liver tests such as viral serologic tests or autoimmune tests that, if positive, can determine the specific cause of a liver disease.

There are two general categories of "liver enzymes." The first group includes the alanine aminotransferase (ALT) and the aspartate aminotransferase (AST), formerly referred to as the SGPT and SGOT. These are enzymes that are indicators of liver cell damage. The other frequently used liver enzymes are the alkaline phosphatase and gamma-glutamyltranspeptidase (GGT and GGTP) that indicate obstruction to the biliary system, either within the liver or in the larger bile channels outside the liver.

The ALT and AST are enzymes that are located in liver cells and leak out and make their way into the general circulation when liver cells are injured. The ALT is thought to be a more specific indicator of liver inflammation, since the AST may be elevated in diseases of other organs such as heart disease or muscle disease. In acute liver injury, such as acute viral hepatitis, the ALT and AST may be elevated to the high 100s or over 1,000 U/L. In chronic hepatitis or cirrhosis, the elevation of these enzymes may be minimal (less than 2-3 times normal) or moderate (100-300 U/L). Mild or moderate elevations of ALT or AST are nonspecific and may be caused by a wide range of liver diseases. ALT and AST are often used to monitor the course of chronic hepatitis and the response to treatments, such as prednisone and interferon.

The alkaline phosphatase and the GGT are elevated in a large number of disorders that affect the drainage of bile, such as a gallstone or tumor blocking the common bile duct, or alcoholic liver disease or drug-induced hepatitis, blocking the flow of bile in smaller bile channels within the liver. The alkaline phosphatase is also found in other organs, such as bone, placenta, and intestine. For this reason, the GGT is utilized as a supplementary test to be sure that the elevation of alkaline phosphatase is indeed coming from the liver or the biliary tract. In contrast to the alkaline phosphatase, the GGT tends not to be elevated in diseases of bone, placenta, or intestine. Mild or moderate elevation of GGT in the presence of a normal alkaline phosphatase is difficult to interpret and often caused by changes in the liver cell enzymes induced by alcohol or medications, but without causing injury to the liver.

Bilirubin is the main bile pigment in humans which, when elevated, causes the yellow discoloration of the skin and eyes called jaundice. Bilirubin is formed primarily from the breakdown of a substance in red blood cells called "heme." It is taken up from blood processed through the liver, and then secreted into the bile by the liver. Normal individuals

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have only a small amount of bilirubin circulating in blood (less than 1.2 mg/dL). Conditions which cause increased formation of bilirubin, such as destruction of red blood cells, or decrease its removal from the blood stream, such as liver disease may result in an increase in the level of serum bilirubin. Levels greater than 3 mg/dL are usually noticeable as jaundice. The bilirubin may be elevated in many forms of liver or biliary tract disease, and thus it is also relatively nonspecific. However, serum bilirubin is generally considered a true test of liver function (LFT), since it reflects the liver's ability to take up, process, and secrete bilirubin into the bile.

Two other commonly used indicators of liver function are the serum albumin and prothrombin time. Albumin is a major protein which is formed by the liver, and chronic liver disease causes a decrease in the amount of albumin produced. Therefore, in liver disease, particularly more advanced liver disease, the level of the serum albumin is reduced (less than 3.5 mg/dL). The prothrombin time, which is also called protime or PT, is a test that is used to assess blood clotting. Blood clotting factors are proteins made by the liver. When the liver is significantly injured, these proteins are not normally produced. The prothrombin time is also a useful LFT, since there is a good correlation between abnormalities in coagulation measured by the prothrombin time and the degree of liver dysfunction. Prothrombin time is usually expressed in seconds and compared to a normal control patient's blood.

Finally, specific and specialized tests may be used to make a precise diagnosis of the cause of liver disease. Elevations in serum iron, the percent of iron saturated in blood, or the storage protein ferritin may indicate the presence of hemochromatosis, a liver disease associated with excess iron storage. In another disease involving abnormal metabolism of metals, Wilson's disease, there is an accumulation of copper in the liver, a deficiency of serum ceruloplasmin and excessive excretion of copper into the urine. Low levels of serum alpha₁-antitrypsin may indicate the presence of lung and/or liver disease in children or adults with alpha₁-antitrypsin deficiency. A positive antimitochondrial antibody indicates the underlying condition of primary biliary cirrhosis. Striking elevations of serum globulin, another protein in blood, and the presence of antinuclear antibodies or antismooth muscle antibodies are clues to the diagnosis of autoimmune chronic hepatitis. Finally, there are specific blood tests that allow the precise diagnosis of hepatitis A, hepatitis B, hepatitis C, and hepatitis D.

In summary, blood tests are used to diagnose or monitor liver disease. They may be simply markers of disease (e.g., ALT, AST, alkaline phosphatase, and GGT), more true indicators of overall liver function (serum bilirubin, serum albumin, and prothrombin time) or specific tests that allow the diagnosis of an underlying cause of liver disease. Interpretation of these liver tests is a sophisticated process that your physician will utilize in the context of your medical history, physical examination, and other tests such as X-rays or imaging studies of the liver.