Serum Liver Enzymes

In summary, liver enzyme tests commonly used to determine liver health and function are categorized in two camps: enzymes released during liver damage and functional liver markers. AST is an enzyme released from a variety of tissues, including hepatocellular, kidney, skeletal and cardiac cells undergoing cell lysis. ALT is an enzyme more specific than AST to the liver with lesser amounts found in the kidneys, heart, and skeletal muscle tissue. A useful ratio to differentiate liver disease from other sources is the AST:ALT Ratio. GGT is the final enzyme outlined in Picmonic used as a marker for liver damage. Serum elevations of these enzymes could indicate hepatic damage such as cirrhosis, hepatitis, or pancreatitis.Functional liver markers include Total Bilirubin, the byproduct of heme catabolism produced in the liver and other tissues, Albumin, the body's main transport protein synthesized in the liver, Platelets, cells used in coagulation and tied to liver function, and Prothrombin Time, a test used to evaluate the tissue factor pathway and affected by liver health.



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Enzymes Released in Liver Damage

AST: 12-38 U/L

Ass-Tea's (12) Dozen to (30) Dirty (8) Ball

Aspartate aminotransferase (AST) is an enzyme found in a variety of tissues, including the liver, brain, kidney, cardiac muscle, skeletal muscle, pancreas, and others. When detected, it is less specific for liver disease compared to other tests, like ALT or GGT. The amount of elevation is directly proportional to the severity of the number of cells affected. The normal range for AST is 12-38 U/L. Increased AST levels can be a sign of acute liver damage or disease, possibly attributable to chronic alcohol use, along with conditions such as cirrhosis, hepatitis, or pancreatitis. Levels may also increase after heart procedures, surgery, seizures, or deep burns.

ALT: 10-40 U/L

Aladdin-Tea's (10) Tin to (40) oz

Alanine aminotransferase (ALT) is an enzyme found predominantly in the liver, with lesser amounts found in the kidneys, heart, and skeletal muscle tissue. The normal range of ALT is 10-40U/L. Increased serum levels often indicate liver disease and may be due to conditions such as cirrhosis, hepatitis, or pancreatitis.

Alkaline Phosphatase

Elk-P

Alkaline phosphatase (ALP) is an enzyme found in the hepatobiliary cells, bone (osteoblasts), intestines, and placenta. It can be elevated in the blood when these tissues are damaged, inflamed, or undergoing increased activity (e.g., bone growth or liver cholestasis). The normal adult reference range is approximately 40–129 U/L, though it may vary slightly by laboratory and sex.

AST/ALT Ratio

Ass-Tea to Aladdin-Tea with Ratio-radio

This calculation is often used to assist in the differentiation of liver diseases. Most causes of hepatocellular injury are represented by an ALT greater than AST, or ALT>AST. Increased in alcohol-associated liver disease: AST>ALT (ratio usually >2:1, (AST does not typically exceed 500 U/L in alcohol-associated hepatitis). AST > ALT in non-alcohol-related causes of liver disease suggests progression to advanced fibrosis or cirrhosis.

GGT

Goat

Glutamyltransferase, also known as GGT, assists with the reabsorption of amino acids and peptides from the glomerular filtrate and intestinal lumen. Large amounts are found in hepatobiliary, renal tubular, and pancreatic tissues. It is released when damage or inflammation affects any or all of these areas. The normal range for GGT in adults is 0-30 U/L for males and 0-24 U/L for females.

Functional Liver Markers

Total Bilirubin

Belly-ribbon-dancer

Total bilirubin is the sum of unconjugated or indirect bilirubin, monoglucuronide and diglucuronide, conjugated or direct bilirubin, and albumin-bound delta bilirubin. Bilirubin is the byproduct of heme catabolism from aged RBCs and is primarily produced in the liver, spleen, and bone marrow. Total bilirubin

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levels can increase when the liver is damaged or inflamed. The normal range of total bilirubin in adults depends on the sum of its components, but a level greater than 15mg/dL is considered a critical finding.

Albumin

Album-man

Most of the body's total protein is a combination of albumin and globulins, and the highest concentration of albumin is present in the serum or bloodstream. It is the main transport protein in the body for hormones, therapeutic drugs, calcium, heme, and others. Before being used as a transport protein, it is synthesized in the liver. If disease or inflammation is present in the liver, albumin synthesis can decrease and lead to lower serum levels. Serum albumin levels can naturally decrease as a person ages, and a standard range for an adult aged 20-40 years old is 3.7-5.6 g/dL or 3.4-4.8 g/dL for an adult aged 41-60 years.

Platelets

Plates

Platelets are non-nucleated, cytoplasmic, round or oval disks formed by the budding off of large cells called megakaryocytes. They are essential for coagulation, hemostasis, and thrombus formation. The normal adult reference range is 150–400. Hepatic conditions can affect platelet number through multiple mechanisms. Alcohol-related liver disease can cause thrombocytopenia via bone marrow suppression, splenic sequestration, or reduced thrombopoietin production, even in the absence of malnutrition. Splenomegaly secondary to portal hypertension increases platelet destruction, leading to thrombocytopenia. Disseminated intravascular coagulation (DIC) consumes platelets along with clotting factors, and liver carcinoma may also result in thrombocytopenia through bone marrow suppression or splenic sequestration.

Prothrombin Time

Pro PT-hourglass

Prothrombin time or PT is a coagulation test performed to measure the time it takes for a firm fibrin clot to form after tissue thromboplastin (factor III) and calcium are added to a sample of plasma. It evaluates the tissue factor pathway (extrinsic pathway of the coagulation sequence) and is dependent on the presence of vitamin-K availability. Examples of hepatic conditions affecting prothrombin time include cirrhosis (prolonging PT), disseminated intravascular coagulation (increased consumption of clotting factors resulting in prolonged PT), and fibrin-related coagulation conditions (insufficient levels of fibrinogen leading to prolonged PT).

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