**LIVER FUNCTIONS TESTS**

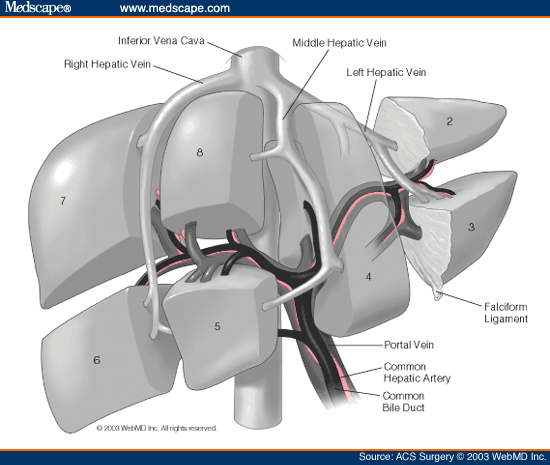
**Hepatic physiology:**

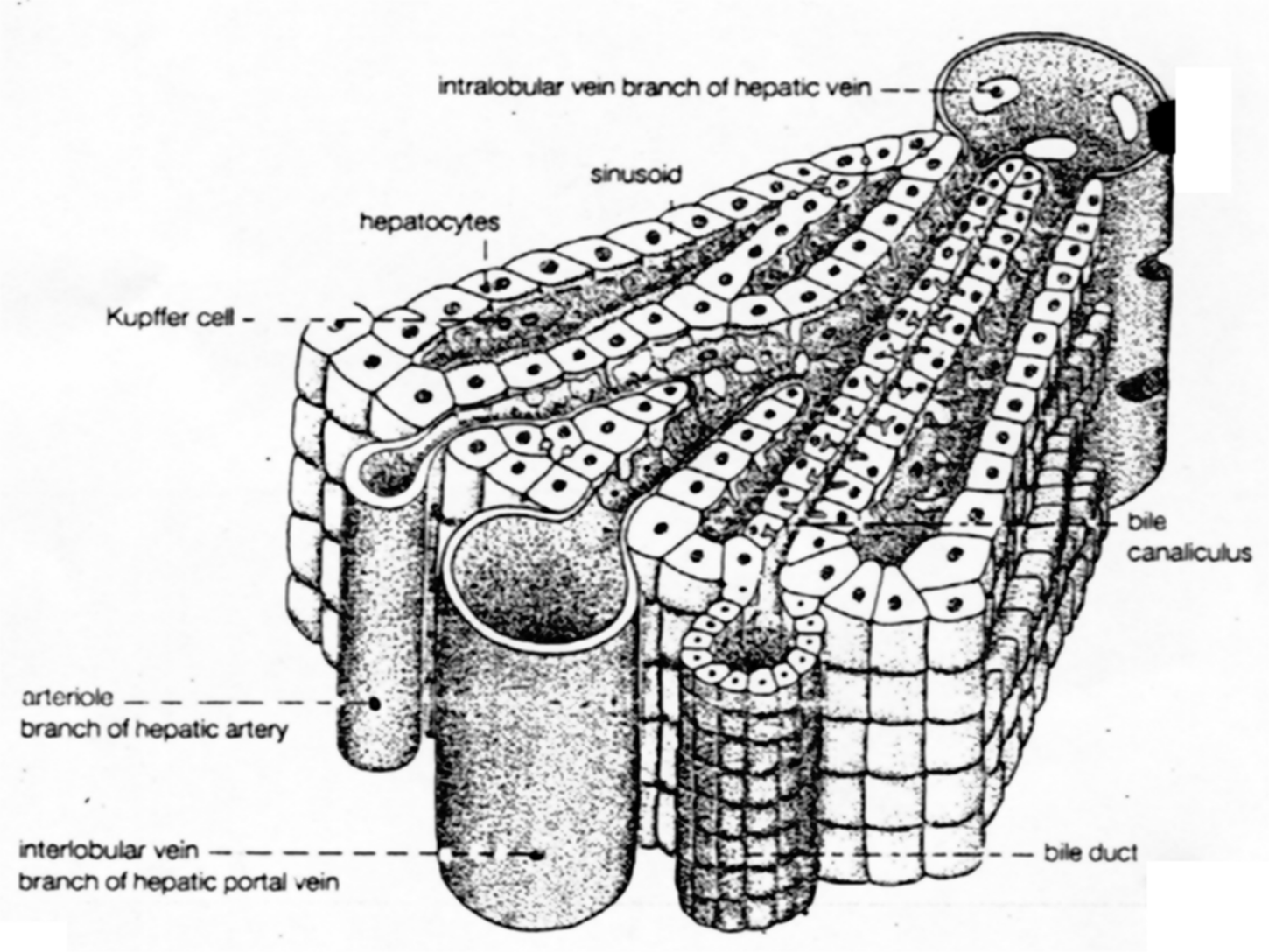
Liver is a largest solid organ in the body, performs over 500 chemical processes produced over 160 different proteins. The liver is located in the right upper portion of the abdominal cavity just beneath the right side of the rib cage. The liver has many functions that are vital to life. Briefly, some of the important functions of human liver are:

* Detoxification and excretion of drug, toxin, bilirubin, and steroid hormones.
* Synthetic functions such as production of important clotting factors, albumin, and many other important proteins.
* Metabolizing (processing) medications and nutrients.
* Storing of vitamins, fat, cholesterol and bile.
* Production of glucose (gluconeogenesis/release during starvation).

**Notes:**

1. The working cells of the liver are known as hepatocytes, which have a unique capacity to produce in response to liver injury.
2. Liver regeneration can occur after surgical removal of a portion of the liver or after injuries that destroy parts of the liver.
3. Although the liver's ability to react to damage and repair itself is remarkable repetitive insults can produce liver failure and death.



****

**Liver functions tests:**

Liver function tests (LFTs) are one of the most commonly requested screening blood tests.

(LFTs) are groups of blood tests that give information about the state of a patient's liver, these tests include:

* Liver enzymes such as, transaminases (AST or SGOT) and (ALT or SGPT), alkaline phosphatase (ALP) and Gama glutamyl transferase (GGT).
* Albumin.
* Prothrombin time (PT).
* Bilirubin.

**Classification of liver functions test:**

Classified based on the major functions of liver:

* **Excretion:** measurement of bilirubin.
* **Serum enzyme:** transamination (ALT, AST), alkaline phosphatase (ALP), 5, nucleotidase, LDH isoenzyme.
* **Synthetic function:** prothrombin time and serum albumin.

These tests used to investigate hepatic disorder, which can be further divided into three groups:

1. **Liver cell or hepatocyte damage:** is characterized by increased ALT and AST activities.
2. **Cholestasis:** is characterized by increasing bilirubin concentration and increase ALP synthesis at the sinusoidal surface.
3. **Reduced mass of hepatocytes:** is characterized by reduced albumin and prothrombin synthesis, the plasma albumin concentration is reduced but prothrombin time is prolonged.

**Liver enzymes:**

Changes in plasma enzymes activity generally indicate liver cell membrane damage rather than hepatic function capacity. Because these enzymes are also present in other tissue, change in plasma activities may reflect damage to those tissues rather than to the liver. These enzymes are:

1. **Alanine transaminase (ALT), also called serum glutamate pyruvate transaminase (sGPT).**

Alanine + Oxoglutarate Pyruvate + Glutamate

1. **Aspartate aminotransferase (AST) or serum glutamate oxaloacetate transaminase (sGOT).**

Aspartate + Oxoglutarate Oxaloacetate + Glutamate

ALT and AST are in the different distribution of the hepatocytes. ALT exists primarily in the cytoplasm of liver cell. While AST present in cytoplasm and mitochondria but the concentration of ALT higher than AST in cytosol. If there is slight liver cell damage, ALT firstly leak into the bloodstream, so that the serum ALT increased more than AST.

In addition to that ALT is present in high concentration in liver, while AST present in high concentration in cells of cardiac, liver, and skeletal muscle, in addition to kidney and erythrocytes, damage of any these tissues may increase plasma AST level. From that we concluded that ALT is a specific enzyme of liver disease, while AST is a sensitive enzyme for liver disease.

In inflammatory or infective conditions, such as viral hepatitis, the cytoplasmic membrane sustains the main damage; leakage of cytoplasmic contents causes a relatively greater increase in ALT than AST activities. In infiltrative disorders in which there is damage to both mitochondrial and cytoplasmic membranes, there is a proportionally greater increase in plasma AST than ALT activity. The relative plasma activities of ALT and AST may help to indicate the type of cell damage.

Note: therefore, when the liver is injured, ALT and AST are release into the bloodstream. The plasma levels may be 10-20 times the upper limit of normal (ULN).

**Elevated levels of ALT may indicate:**

1. Acute hepatitis or inflammation of the liver.
2. Alcoholic liver disease.
3. Cancer of the liver.
4. Cirrhosis or scaring of the liver with loss of function.
5. Use of medicines or drugs toxic to the liver.

**Elevate level of AST may indicate:**

1. Hepatitis.
2. Cirrhosis of the liver.
3. Acute hemolytic anemia.
4. Acute pancreatitis or inflammation of the pancreas.
5. Acute renal failure or loss of kidney function.
6. Heart attack.
7. Primary muscle disease.