Determination of serum ALT and AST activities

Aspartate aminotransferase (AST) or glutamate oxaloacetate transaminase(GOT) catalyzes the formation of glutamic acid form α-ketoglutarate through transfer of the aspartate ammo group. These are different molecular species, separable by electrophoresis or chromatography, with the same substrate specificity.

Alanine aminotransferase(ALT ) or glutamate pyruvate transaminase (GPT ) catalyzes the formation of glutamic acid from α- ketoglutarate through transfer of the alanine amino group. There is only one molecular species known at present. Pyridoxal -5- phosphate and its amino analog, pyridoxamine-5-phosphate, functions as coenzymes in the amino transfer reactions. Transamination is the term given for the process in which the amino group is transferred from an alpha-ammo acid to an alpha-keto acid. As a result a different amino acid and different alpha-keto acids are produced. All naturally. occurring alpha-amino acids can take part in such reactions, different enzymes being involved,, these enzymes are referred as mentioned above to as transaminases, two clinically important examples are GOT and GPT which are the old abbreviation of AST and ALT and are still remain in general use.

Aspartate aminotransferase activity is widely distributed in human tissues, heart, liver, skeletal muscle and kidney being the richest source, but smaller amount are found in the pancreas, spleen and lung. The greatest amount of alanine amino transferase is found in the liver.
Clinical significance:

GOT is found in highest concentration in the liver and heart muscle, and it is also abundant in skeletal muscle, kidney and pancreas. Its clinical usefulness is largely restricted to the diagnosis of the heart and liver diseases. The most information is gained if this enzyme is measured simultaneously with other enzymes, particularly, GPT, CPK, LDH and ALP.

In liver diseases, large amount of GOT may be released into the blood. Very high levels are observed in acute diseases, while lesser elevation are seen in chronic liver diseases. The most common disease entities are listed below:

1. infectious hepatitis.
2. Toxic hepatitis.
3. Infectious mononucleosis.
4. Liver cirrhosis.
5. Obstructive bile ducts.
6. Spread of carcinoma from other organ.

The concentration of GOT in heart muscle is equal to or slightly higher than in liver cells. Therefore, certain disease of the heart produce increases of GOT, but never to the degree seen in acute hepatitis (which is reached at a peak levels between 10-100 times the normal levels).

Serum GOT was increased in heart diseases especially after myocardial infarction (GOT begin to rise 6-8 hrs after a MI occurs, and return to normal levels usually follows in 4-5 days and the peak activity occurs at 24-36 hrs), also SGOT was increased in skeletal muscle diseases such as muscular dystrophy, the central nervous system diseases
causes an increase in SGOT activity. Renal disease do not significant alter the serum GOT, but may instead produce and increase in GOT levels in the urine.

The GPT activity in tissues is generally much less than GOT. It is found in a highest concentration in the liver. Significant elevation of SGPT occur only in diseases of the liver. Large amounts of GPT (and GOT) are released into the circulation in sever acute hepatitis. The GPT level is usually equal to or slightly higher than the GOT level.

In obstructive jaundice, both GOT and GPT are moderately increased. The levels of GOT in obstructive jaundice are of about the same magnitude as those seen after a myocardial infarct (coronary or heart attack), so an associated rise in GPT may help to differentiate these two condition. In cirrhosis of the liver, the GPT is usually elevated to a lesser extent than the GOT. Some physicians use the ratio of GOT: GPT to aid in diagnosing the nature of the liver diseases, this ratio is usually about 2.5 in liver cirrhosis, also SGPT was increased after myocardial infarction. Slight elevation of GPT may occur if the infarct destroys a very large volume of heart muscle.

The following table show the relation of micro mole (µM) of pyruvate per minute per liter in the colorimetric reaction as mentioned, and the international unit (IU.) of SGOT and SGPT activities : measured by this method at 25 C°.