

## Ethanol (Part 2)

**Dr. Joseph E. Graas, Scientific Director**  
**Dr. Edward Moore, Medical Director**

The consumption of alcohol affects or can affect the majority of the tests found in a comprehensive metabolic panel (CMP). Other than a brief overview, a comprehensive discussion is beyond the scope of this article.

Alcohol affects most organ systems of the body including electrolyte balance, glucose metabolism, renal function and lipids. The most widely thought of organ which alcohol effects is the liver. The basic tests on the CMP and on a Hepatic (liver) Panel that are associated with liver function are aspartate transaminase (AST), alanine transaminase (ALT), gamma-glutamyltransferase (GGT), alkaline phosphatase (ALKP), albumin, total bilirubin, direct and indirect bilirubin. It is also necessary to understand that all of these tests can be abnormal for a variety of causes and disease states. Although they can be helpful in clinical diagnosis, they are by no means definitive in their interpretation and must be elevated in the clinical context of the patient as whole.

The first four tests (AST, ALT, GGT, and ALKP) are all enzymes that are localized within liver cells as well as other tissues. AST in liver, heart and skeletal muscle; ALT in

liver; GGT in liver, kidney, bile duct, heart and pancreas; and ALKP in liver, bile duct, and bone. When cells are damaged, the cell membranes become "leaky" and these enzymes are released into the blood and become elevated on test results. The most common toxin which causes this is alcohol. The degree in which the cells are damaged, will result in greater or lesser degrees of elevation. The two enzymes most commonly referred to in the context of alcohol are AST and ALT. Their values can range from being within normal range (AST: 0-48 U/L, ALT: 0-52 U/L) in casual, social or minor alcohol use to the thousands in the face of alcoholic hepatitis or hepatic necrosis. Although not entirely specific, an AST/ALT ratio of greater than 2:1 is most often seen in alcoholic liver disease especially when associated with an elevated GGT.

Some other generalities can also be noted:

- Alcoholic Fatty Liver Disease usually has AST levels of less than 8x normal and ALT levels less than 5x normal.
- Non-alcoholic Liver Disease usually has both AST and ALT levels less than 4x normal.
- Acute Viral Hepatitis or Toxin related (e.g. Alcohol) Hepatitis frequently has AST and ALT levels greater than 25x normal.
- Chronic Hep B and C usually have levels less than 10x normal.

- GGT is commonly raised in alcohol ingestion and can be indicative of excess alcohol ingestion 3-4 weeks previous. It is generally more sensitive to elevation than the other enzymes.

- ALKP is found in most tissues of the body, but is often raised with chronic alcoholic liver disease.

As with the interpretation of all laboratory tests, it is important to emphasize that there are many disease states and clinical conditions that can cause these abnormalities and clinical correlation is mandatory to arrive at determining their relevance. For the purposes of this discussion, only the manner in which alcohol can affect these parameters is considered.

The remaining serum tests of interest, as related to acute and chronic alcohol ingestion, include albumin, bilirubin (total and direct), prothrombin time and partial thromboplastin time (PT/PTT), triglycerides, glucose and electrolytes. The first three are affected by chronic alcohol ingestion and usually associated with alcoholic liver disease. The triglyceride changes are more indicative of intermediate changes in metabolism, and glucose and electrolyte more as acute changes mediated by alcohol.

Part 3 will discuss the remaining chemistry tests

### ??? Did You Know ???

The problem of prescription drug abuse and overdose is complex, involving insufficient oversight to curb inappropriate prescribing, insurance and pharmacy benefit policies, and a belief by many people that prescription drugs are not dangerous. The 2014 National Drug Control Strategy serves as the blueprint for reducing drug use and its consequences in the United States. The new strategy reviews the progress made over the past four years and looks ahead to continuing efforts to reform, rebalance, and renew the national drug control policy to address the public health and safety challenges of the 21st century.

Source: SAMHSA

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### Question of the Month

**Question:** What serum methadone values are considered "normal"?

**Answer:** A rough rule of thumb is that a patient's serum value is usually four times the dose amount. As an example, a patient with a dose of 80 milligrams per day would have an average serum value of 320 ng/mL. If the serum value exists at a value different than this ratio, the patient is most likely consuming more/less than their prescribed dose, there is an issue with storage of methadone in the liver/tissue, or they are a fast/slow metabolizer. SDRL uses 1000 ng/mL as a toxic upper level and will call the clinic as a "warning" to notify of the possible toxic values. Conversely, a much lower than four-to-one serum-to-dose ratio could indicate dose diversion.