SDRL Laboratory

TOXICOLOGY TIMES

SDRL Laboratory

(800) 677-7995 **www.sdrl.com**

Volume 5, Issue 3 ***A FREE Monthly Newsletter for Substance Abuse and Opioid Treatment Programs from San Diego Reference Laboratory*** **March, 2015**

ETHANOL

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

Ethanol (alcohol) is a very small molecule that is completely soluble in all biological fluids and, when consumed, it is distributed throughout the body. When alcohol is consumed in a responsible fashion (males 2 drinks and females 1 drink per day) the concentration in the body does not exceed the legal limit of .08%. It is, however, measurable in voided urine samples. The amount of alcohol found is correlated to the amount in blood. The blood alcohol concentration (BAC) is determined by dividing the urine value by 1.3. A urine concentration of 0.08% would be equivalent to a 0.06% BAC. The units of measure for % are 0.05grams in 100 milliliters of blood or urine or stated differently 50mg/dL. The stated clearance of alcohol through breathing and metabolism is roughly 0.015% per hour. This would mean that a BAC of 0.15% would take 10 hours to become completely eliminated from the body. Drinking coffee, exercising, taking showers and similar behaviors have no effect on alcohol metabolism. The elimination of consumed ethanol only occurs with time. The human body produces ethanol on a continuous basis. The endogenous ethanol produced is somewhat dependent on diet and has been reported in the literature to be on the order of 3 grams up to one ounce in a 24 hour period. The values measured in blood and urine contains the amount consumed and the amount produced endogenously. No correction factors are applied to this sum total.

Laboratory analysis of ethanol consists of a screening test, which is a chemical test for the exact amount of the drug in the urine or blood sample. This test determines the presence of small molecular weight alcohols. Methanol and isopropanol will react with laboratory reagents, along with the ethanol present, to give the total concentration of alcohol. If the specimen becomes contaminated with microorganisms, fermentation could occur resulting in the formation of ethanol. The alcohol from fermentation and the alcohol from consumption become indistinguishable, and it will be impossible to determine the amount from consumption only. Sodium fluoride added to the sample will inhibit this fermentation reaction (glycolysis) and completely prevent this problem. Some patients are moderate to severe diabetics and will have glucose in the urine sample. It is good practice to collect the specimen with the sodium fluoride in the collection container or added immediately after collection. Confirmation of the ethanol is usually performed by a second method that is different, and is usually a chromatographic method. This method will separate the alcohol from all other components and quantify the amount when compared with an internal standard of known value. When alcohol is consumed, ethyl glucuronide (EtG) is formed in the liver along with ethyl sulphate (EtS) as soluble metabolites. These two metabolic compounds (EtG, EtS) have a longer biological half-life in the body and will follow the concentration of the alcohol consumed. The glucuronides will be present for up to five days and often are present when the amount of ethanol is negative. This merely indicates past consumption of ethanol. As of yet no correlation exists for the glucuronide value in terms of the amount of ethanol consumed. The suggested screening level for EtG has a higher cutoff of 500 ng/ml to prevent the alcohol present in hand sanitizers, after shave, etc from causing a positive. The presence or use of these products may cause a positive result but generally at a concentration less than 500 ng/ml.

There are two principle routes of ethanol metabolism in the liver: The first (and primary) is the metabolism of ethanol by alcohol dehydrogenase to acetaldehyde. This oxidation occurs in the cytosol. The second is by the microsomal ethanol oxidizing system (MEOS), which also oxidizes the ethanol to acetaldehyde. This buildup of acetaldehyde causes toxic action on the liver tissue and can also enter the blood system, which exerts toxic effects on other tissue. The final oxidation to a non-toxic compound acetate occurs with the enzyme acetaldehyde dehydrogenase. The acetate is activated to acetyl-CoA and metabolized in the tricarboxylic acid (TCA) cycle. It is the chronic and episodic use of ethanol that causes the buildup of acetaldehyde and hydroxyethyl radical by the MEOS, which can result in alcohol-induced liver disease, fatty liver, alcohol-induced hepatitis and cirrhosis.

??? Did You Know ???

Substance use disorders occur when the recurrent use of alcohol and/or drugs causes clinically significant impairment, including health problems, disability, and failure to meet major responsibilities at work, school, or home. In 2012, about 22.2 million Americans ages 12 and older (8.5%) were classified with a substance use disorder in the past year. Of those, 2.8 million had problems with both alcohol and drugs, 4.5 million had problems with drugs but not alcohol, and 14.9 million had problems with alcohol only. Source: SAMHSA

Question of the Month

Question: Are there factors that can influence serum methadone values?

Answer: Yes. Two patients taking the same methadone dose can, and most likely will, produce different serum values. Factors such as metabolism, the patient's physical condition, diet, body weight, absorption rates, and even pregnancy can influence the values. Ultimately, the serum values are used as objective individual patient baselines. However, subjective patient input is required to ensure that both cravings and withdrawal symptoms are being suppressed at the prescribed dose. A correlation can then be made between the objective and subjective data to ensure an adequate dosage is being prescribed or if the patient's dose needs to be modified.