The Role of Forensic Toxicology

- With the uncontrolled use of drugs becoming more and more of a worldwide problem, the role of toxicology has gained new significance.
- Toxicologists detect and identify drugs and poisons in body fluids, tissues, and organs.
- Toxicologists can work in forensic science but also in the general medical field.
- *Forensic* toxicologists deal with matters that pertain to the violation of criminal law only.
- Many forensic toxicology systems work with or are a part of the medical examiner’s office.
- Forensic toxicologists handle frequent and numerous cases dealing with the presence of alcohol in the body.
- Beyond alcohol, the job of the forensic toxicologist is an extremely complicated web of poisons and drugs.
- The toxicologist is presented with body fluids and organs and must determine what drugs and poisons are present.
- There are thousands upon thousands of possibilities.
- The substances will be present in extremely tiny concentrations.
- Many drugs immediately change form chemically upon entering the body.
  - For example, heroin is immediately converted to morphine in the human body.
- From living persons, blood and urine are collected for toxicological testing.
- From deceased persons, the medical examiner will decide what biological specimens will be sent for toxicology testing.

Toxicology of Alcohol

- Testing for alcohol is one of the most common responsibilities of the forensic toxicologist.
- To understand the toxicology of alcohol, you must understand how alcohol is processed by the body.

Metabolism of Alcohol

- *Metabolism* is how the body breaks down and transforms chemicals into other chemicals that are easier to eliminate.
- There are 3 steps to metabolism: absorption, distribution, and elimination.
- Alcohol (ethyl alcohol) is a colorless liquid usually diluted with water and consumed as a beverage.
- Alcohol appears in the blood within *minutes* of being consumed and continues to increase in concentration as it is absorbed from the stomach and small intestine.
- During *absorption and distribution*, alcohol enters the bloodstream and is carried to all parts of the body.
- Many factors determine the rate at which alcohol is absorbed, including:
  - Alcohol content of beverage
  - Amount consumed
  - How much food is in the stomach
  - What type of food is in the stomach
- As the alcohol is circulated by the bloodstream, the body begins to eliminate it.
- Alcohol is eliminated by *oxidation* and *excretion*.
- 95-98% of the alcohol consumed is eventually oxidized by the liver to carbon dioxide and water.
- The remaining 3-5% of the alcohol consumed is excreted unchanged through the breath, urine, and perspiration.
- The alcohol exhaled in the breath is in direct proportion to the blood alcohol concentration.

Alcohol in the Circulatory System

- Blood-alcohol levels have become the accepted standard for relating alcohol intake to its effect on the body.
- To understand the meaning and results of blood alcohol levels, the movement of alcohol through the circulatory system must be understood.
• 20% of alcohol consumed is absorbed through the walls of the stomach.
• The other 80% is absorbed through the small intestine.
• After being absorbed, the alcohol is pumped through the liver, to the heart, the lungs, back to the heart, and out to all the tissues of the body.

Analysis of Blood for Alcohol
• Gas chromatography is the most widely used approach for determining alcohol levels in blood samples.
• Using this technique, the alcohol can be separated from the rest of the blood sample and measured.

Alcohol and the Law
• Every state in the U.S. must establish and enforce laws regulating the operation of motor vehicles.
• The blood alcohol standards are relatively uniform across all 50 states.
• The initial recommendation for legal blood-alcohol concentration for operating a vehicle was 0.15%.
• This was eventually lowered due to further testing to 0.08%.
• In 1992, 0.08 was recommended as the legal measure of drunk driving, and was officially enacted in 2000.
• Currently, a person is considered legally intoxicated with a BAC level of 0.08.
• No other qualifications are necessary.
• Other countries, such as Ireland, Japan, the Netherlands, and Norway, have stricter legal limits, at 0.05% BAC.
• At the 0.08 level, you are 4 x more likely to be in an accident compared to a sober person.
• As 0.15, you are 25 x more likely to be in an accident compared to a sober person.

REVIEW
___1. 95-98% of alcohol in the body is oxidized to what two substances?
   A. Carbon dioxide and dehydrogenase
   B. Water and acetic acid
   C. Acetaldehyde and acetic acid
   D. Water and carbon dioxide

___2. Which of the following individuals would have the lowest Blood Alcohol Concentration?
   A. John, 200 lbs, has had 8 drinks on a full stomach.
   B. Frank, 170 lbs, has had 4 drinks on an empty stomach.
   C. Gary, 240 lbs, has had 6 drinks on an empty stomach.
   D. Stephen, 180 pounds, has had 6 drinks on a full stomach.

___3. With a blood alcohol level of 0.15, the chances for involvement in an accident are
   A. 50 times greater
   B. 25 times greater
   C. 10 times greater
   D. 75 times greater