Superintendent's Report on Calculating Blood Alcohol Concentration (BAC)

The following shows how RoadSafetyBC calculates blood alcohol concentration (BAC) at the time of driving in a review of a person's administrative driving prohibition. In a review, the applicant may lead evidence and make submissions on the extrapolation of the applicant's BAC.

Elimination of Alcohol

The body begins to eliminate alcohol as soon as it is consumed. The elimination rate is about the same for all people regardless of height, weight, sex or amount of fatty tissues. Alcohol is eliminated, on the average, at a rate of 15 milligrams of alcohol in 100 millilitres of blood (15 mg%) per hour. The normal range of values for this rate is 10 to 20 mg% per hour.

Calculating BAC at Time of Driving from Breath or Blood Sample Readings

The following formula shows the calculations that are made to determine BAC values at the time of driving where:

S = Breath or Blood Sample Reading (mg%)
E = Elimination Rate (ranges between 10 and 20 mg%)
T = Time between the time of driving and time of breath or blood samples (minutes)

BAC at time of driving = S + (E x T ÷ 60)

Example:

A person is driving a motor vehicle at 23:17 hours. Subsequently, at 01:09 hours, the driver provides a breath sample to a breath test analysis instrument that reads a BAC of 110 mg%. Calculate the minimum and maximum BAC at the time of driving.

S = 110 mg%
E_{min} = 10 mg% per hour (minimum elimination rate)
E_{max} = 20 mg% per hour (maximum elimination rate)
T = 112 minutes

Minimum BAC at time of driving = 110 + (10 x 112 ÷ 60) = 129 mg%
Maximum BAC at time of driving = 110 + (20 x 112 ÷ 60) = 147 mg%

Other Considerations

Values and calculations pertaining to alcohol consumption and absorption are described below.

Absorption of Alcohol

Alcohol is absorbed into the bloodstream as soon as it comes into contact with the tissues of the mouth and throat. Typically, about 30% of all consumed alcohol is absorbed from the stomach, whereas 70% is absorbed through the small intestine. Absorption rates are affected by the type and amount of food in the stomach, the alcohol concentration of the beverage, the rate of alcohol consumption, and the presence of certain drugs, diseases or emotional states.

As alcoholic beverages are normally consumed over a period of time, absorption occurs and the person's BAC continuously rises. The peak BAC usually occurs within 20 to 40 minutes after the completion of the last drink. With a single large dose of alcohol, the majority is absorbed within 15 minutes, and more than 90% of the alcohol is absorbed within one hour. With food in the stomach, complete absorption can take up to two to three hours.

Alcohol Consumption and BAC

The following formula calculates the maximum BAC for males after consuming a specific quantity of alcohol. In cases where a person consumes beverages of different sizes, alcohol contents, or both, repeat the following calculation for each combination, and then sum the results.

W = Body weight (pounds)
AC = Alcohol content for each drink (alcohol percentage by volume)
V = Volume of each drink (ounces)
n = Number of drinks consumed

BAC_{max} for a male = (150 ÷ W) x (AC ÷ 2) x V x n

To calculate the maximum BAC for a female, use the above formula and multiply the final result by 1.17.

BAC_{max} for a female = (150 ÷ W) x (AC ÷ 2) x V x n x 1.17

Example:

A 170-pound person consumes the following:
- Three 12-ounce bottles of beer containing 5% alcohol by volume
- Two rum and coke, each drink containing one ounce of rum with 40% alcohol by volume
- Two 16-ounce pints of draught beer containing 5% alcohol by volume

For the bottles of beer: W = 170; n = 3; AC = 5; V = 12; and the corresponding BAC_{max} is 79 mg%
For the rum and coke: W = 170; n = 2; AC = 40; V = 1; and the corresponding BAC_{max} is 35 mg%
For the draught: W = 170; n = 2; AC = 5; V = 16; and the corresponding BAC_{max} is 71 mg%

For a male, the total BAC_{max} is calculated by adding 79, 35, and 71. The result is 185 mg%.
For a female, multiply the 185 mg% result for males by 1.17, and the total BAC_{max} is 216 mg%