K1 Alcohol Elimination Rate Variability and Subject-Altered General Consumption of Alcohol

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Attendees of this presentation will learn about variability in alcohol (ethanol) elimination rate after alteration, if any, of the general consumption of alcohol claimed by the human test subjects.

This presentation will impact the forensic community by providing a better qualified expert opinion concerning alcohol elimination rate variability and subject-altered general consumption of alcohol beverages to assist in judicial processes.

A decrease in a person's general consumption of alcohol may decrease their rate of elimination of alcohol; conversely an increase in such consumption may increase their elimination rate. Environmental changes in general consumption of alcohol may contribute additional variability to other biological and analytical variability inherent in the alcohol elimination rate of a person.

Test subjects were obtained from a forensic population of motor vehicle drivers under direction of their legal counsel. Informed consent excluded persons seeking, or having received, counseling and/or medical treatment concerning alcohol, and those with limiting physical or mental health. Some subjects consumed a similar light breakfast hours prior to their arrival for testing and initiating alcohol dosing. After consumption of their alcohol beverages on two separate days, suitable breath samples from subjects in the elimination phase were analyzed about every 20 minutes for their alcohol (ethanol) concentration using an Intoxilyzer instrument. Volume and duration of subject breath samples were concomitantly monitored by spirometry. Instrument calibration was confirmed using forensic alcohol standards from different manufacturers with differing concentrations and commercial simulators. The alcohol elimination rate from the second test day was multiplied by the inverse of relative instrument response to that of the first day for further data analysis. Dialogue with test subjects occurred on more than one occasion, with an embedded impromptu query involving change, if any, to their general consumption of alcohol beverages.

Test subjects (65 males and 11 females) had a median age (with range) of 38 years (19–70) and were tested twice with a median of 91 (28–924) days apart. The alcohol elimination rate (mg/210 dL/hr) on the first day had a median of 17.9 (11.6–24.4). For further data analysis, subjects were divided by response to their indicated altered general consumption of alcohol into: group "zero" (51 persons that claimed no change), group "minus" (21 persons claimed decreased consumption), and group "plus" (4 persons claimed increased consumption). Some subjects in group zero were hesitant to inform of a decreased consumption from concern about an adverse inference. One subject who initially claimed a decrease indicated a contrary increase in a later discussion. The alcohol elimination rates (mg/210 dL/hr) for these groups had a respective median of: -0.07 (-3.2–2.4), -2.9 (-5.4–0.7) and 2.3 (0.4–3.2). The relative change in alcohol elimination rate had a range from -23.1% to 27.4%: the subject with the largest relative decrease had an initial high rate of 21.3 in group "minus" and occurred 56 days apart; the subject with the largest relative increase in group "plus" had the lowest initial rate of all subjects and occurred 84 days apart. Adjustments of the alcohol elimination rate for interassay variability had a median of -0.03 (-0.47–0.34). The standard deviation of alcohol elimination rate for group "zero" was 1.38 mg/210 dL/hr, with no correlation between rate variability and delay to second test.

Variability of alcohol elimination rate (mg/210 dL/hr) for subjects divided into no change (0), decreased (-) and increased (+) general consumption of alcohol with the respective group shift of 0, -2.4 and +2.4, with a subject therein with an additional inherent variability of ±3, would describe 96.0% (73 of 76) of test subjects herein: if a decrease in consumption occurred for the two exception subjects in group "zero" and no change for the one exception subject in group "minus", contrary to those subject claims, then all subjects of this study would be described. If additional rate variability of ±2 was alternatively considered, then 86.9% of subjects are described.

Alcohol, Elimination, Variability

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