K29 Alcohol Extrapolations: Scientific, Legal, and Ethical Considerations

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After attending this presentation, attendees will better understand the various methods for performing alcohol extrapolation, issues with using only the Widmark formula, and the scientific and legal expectations when performing alcohol extrapolations.

This presentation will impact the forensic science community by discussing a more scientifically robust approach for performing alcohol extrapolations by accounting for individual differences in volume distribution and elimination rates, thus representing Blood Alcohol Concentration (BAC) extrapolations as a range of values rather than a single point estimate.

Forensic science laboratories are often faced with Driving Under the Influence of Drugs (DUID) and Drug-Facilitated Sexual Assault (DFSA) cases involving alcohol. Forensic toxicologists and the justice system are frequently faced with questions pertaining to the BAC, or level of intoxication, experienced by an individual at a particular time in which an incident occurred. Direct measurements of the blood are typically taken at a time after the incident occurred and forensic toxicologists are frequently tasked with the determination (estimation) of the actual BAC at the time the incident occurred using a combination of chemical analyses of the blood or breath and any of the various empirically derived extrapolation methods. Many experts attest to BAC extrapolations using the original Widmark factor for estimating volume distribution without consideration for successive improvements to the formulas by Watson, Forrest, Ulrich et al., and Seidl et al., as well as assumptions that all of the alcohol had been absorbed at the time of the incident and the individual exhibits an average rate of elimination.[1-5] These simplistic assumptions and use of a single coefficient by Widmark are likely due to perceptions of the complexity to employ the more complicated algorithms, which account for gender, age, weight, height, water content, and Body Mass Index (BMI) as well as typical variations in absorption and elimination rates.

While simplistic, the single-point BAC result derived by limiting the calculation to a single method does not reflect the entire range of possible values at the time of the incident. Limiting the calculation to an average of the physiological ranges without consideration of a bounded interval of possible BAC values does not address individual differences and, therefore, could present incomplete and potentially misleading information to a fact-finder when evaluating whether a specific individual's BAC was greater than a statutory level at a particular time prior to the direct measurements. A more scientifically robust approach to alcohol extrapolations by expressing the full range of possible BAC values not only does provide a more thorough representation of the BAC, it provides a standardized framework for evaluating results across different laboratories, and cases in which assumptions and input parameters may otherwise vary. In *State v. Read*, the courts ruled that evidence is inadmissible if unfairly prejudicial — if it has the capacity to skew the truth or prejudice the truth finding process itself.[6] In "The Admissibility of Novel Scientific Evidence: *Frye v. United States*, a Half Century Later," Giannelli states that "the major danger of scientific evidence is its potential to mislead a jury; an aura of scientific infallibility may shroud the evidence and thus mislead the jury to accept it without critical scrutiny."[7] In *State v. Fausto*, the court asserted that, "When a witness is sworn in, he or she most often swears to 'tell the truth, the whole truth, and nothing but the truth.' In other words, a witness may make a statement that is true, as far as it goes. Yet there is often more information known to the witness, which if provided, would tend to change the impact of the information already provided."[8]

A review of court rulings clearly demonstrates the expectation, albeit the requirement, for clear expert testimony that in no way misleads a jury. The ANSI-ASQ (American National Standards Institute-American Society of Quality) National Accreditation Board's (ANAB's) document, *The Guiding Principles of Professional Responsibility for Forensic Service Providers and Forensic Personnel*, also speaks to the use of clear communications and the presentation of expert testimony that is not misleading to the judge or jury.[9] This presentation will discuss the methods for performing alcohol extrapolation, issues with using only the Widmark formula, and scientific and legal expectations when performing alcohol extrapolations.

Reference(s):

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4. Ulrich, L., Y. Cramer, P. Zink. Relevance of Individual parameters in the circulation of blood levels relative to volume intake. *Blutalkohol.* 24, no. 3 (1987): 192-198.
5. Seidl, Stephan, Uwe Jensen, and Andreas Alt. The calculation of blood ethanol concentrations in males and females. *International Journal of Legal Medicine.* 114, nos. 1-2 (2000): 74-77.
6. State of Washington v. Jeremy Mark Read. WA Supreme Court. (2002).
7. *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923).
8. *United States v. Fausto*, 484 U.S. 439, 445 (1988).
9. ANSI-ASQ National Accreditation Board. The Guiding Principles of Professional Responsibility for Forensic Service Providers and Forensic Personnel." (2016).

Alcohol Extrapolations, Legal, Scientific Formula