K12 Performing Retrograde Extrapolation of Blood Alcohol in Driving Under the Influence (DUI) Trials

Jennifer O. Rattanaprasit, MS, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Michael P. Stypa, MS*, Las Vegas Metropolitan Police Department, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Marlissa Collins, MSFS, Las Vegas Metropolitan Police Department, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Denise K. Heineman, BS, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Darby A. Lanz, MSFS, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Christine Maloney, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Nastasha Ortiz, BS, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Dana C. Russell, BS, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Theresa A. Suffecool, BS, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; Nicole L. Van Aken, BS, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118; and Stacy A. Wilkinson, Las Vegas Metropolitan Police Department, Forensic Laboratory, 5605 W Badura Avenue, Ste 120B, Las Vegas, NV 89118*

After attending this presentation, attendees will understand the need to consider relevant factors before performing retrograde extrapolation in DUI trials.

This presentation will impact the forensic science community by increasing awareness that retrograde extrapolation must be performed with caution to ensure that a reliable calculation is obtained. Data from a Las Vegas Metropolitan Police Department (LVMPD) drinking study will be used to illustrate this point.

In the Illinois case of *People v. Floyd*, the defendant was convicted of aggravated DUI and resisting arrest.[1] The defendant's DUI conviction was later reversed and remanded for a new trial by the appellate court. The decision to reverse the conviction was due to an assumption made by the State's expert witness while performing retrograde extrapolation that the defendant was in the post-absorptive phase without considering all relevant factors. Although the ruling recognizes that it does not "[create] a blueprint or a bright-line rule for the admissibility of retrograde extrapolation evidence," it emphasizes the fact that retrograde extrapolation must be carefully conducted.[1]

To demonstrate this point, a drinking study involving 12 subjects (6 males and 6 females), between the ages of 23-35 years, was conducted. Nine of 12 subjects consumed food within 2.5 hours of the start of drinking. Two subjects consumed food more than four hours prior to the start of drinking, and the time of the last meal was not provided for one subject. Hard liquor was consumed over 1.5-3 hours. Three blood draws were taken from each subject approximately 1, 2, and 3 hours following the end of drinking.

Each blood sample was collected in a 10mL gray-stoppered glass blood tube and was stored at 2ºC-8ºC from the time of collection to the time of analysis. The blood samples were analyzed using a dual column headspace gas chromatograph with two flame ionization detectors. The method was validated following the Scientific Working Group for Forensic Toxicology (SWGTOX) standard practices.

A plot of Blood Alcohol Concentration (BAC) as a function of time was generated for each subject, and the elimination rate was determined through linear regression analysis. Of the 12 subjects, 2 appeared not to be in the post-absorptive phase at the time of the first blood draw. Elimination rates for these 2 subjects were determined through linear regression analysis using only second and third blood draw data. Mean elimination rates of 0.020g/100mL/h (range: 0.015g/100mL/h-0.024g/100mL/h) and 0.018g/100mL/h (range: 0.007g/100mL/h-0.027g/100mL/h) were obtained for male and female subjects, respectively.

For retrograde extrapolation, the elimination rate and rate range considered were 0.015g/100mL/h and 0.010g/100mL/h-0.035g/100mL/h.[2] Assuming that each subject was in the post-absorptive phase at the time of the first blood draw, extrapolating to that time using the second blood draw data overestimated the BAC of one subject. This was the case whether the 0.015g/100mL/h or 0.010g/100mL/h-0.035g/100mL/h elimination rate/rate range was used. Furthermore, retrograde extrapolation to the time of the first blood draw based on the third blood draw data, using the 0.015g/100mL/h elimination rate, marginally overestimated BACs of 2 subjects; however, similar retrograde extrapolation using the 0.010g/100mL/h-0.035g/100mL/h elimination rate range did not overestimate any BAC.

Based on the LVMPD drinking study data and the *People v. Floyd* appellate ruling, it may not always be appropriate to assume that a subject is in the post-absorptive phase at the time of the incident. The BAC may be overestimated if relevant factors, such as the drinking scenario, food consumption, and circumstances surrounding the incident, are not considered. Retrograde extrapolation is an effective tool in determining the BAC at an earlier time when it is carefully conducted.

Reference(s):

1. *People v. Floyd*. 2014 IL App (2d) 120507.
2. Jones A.W. Evidence-based survey of the elimination rates of ethanol from blood with application in forensic casework. *Forensic Sci Int.* 200 (2010): 1–20.

Forensic Toxicology, Retrograde Extrapolation, DUI

*Presenting Author