A178 Spectral Analysis of the of Gamma- Hydroxybutyrate (GHB) and Gamma- Butyrolactone (GBL) Using Near Infrared Spectroscopy in Varying Beverage Matrices

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After attending this presentation, attendees will have a better understanding of the use of Near Infrared Spectroscopy (NIRS) to study the chemistry and equilibrium of gamma-hydroxybutyrate (GHB) and gamma-butyrolactone (GBL) in different beverage matrices.

This presentation will impact the forensic science community by serving to provide a critical understanding how GHB and GBL behave in typical sample matrices of common beverages that may be involved in a drug-facilitated sexual assault.

GHB is a central nervous system depressant classified as a sedative-hypnotic and abused for its euphoric, sedative, and anabolic effects. GHB can be studied using the spectroscopic technique of NIRS because it is a quick non-destructive technique that allows for the measurement of organic compounds with vibrational overtones between 700nm and 2500nm, similar to mid-IR. GHB is classified as a federal Schedule I drug as an illicit substance, but can also be obtained in prescription form. GHB commonly cyclizes into a lactone, GBL, with the equilibrium dependent on the matrix conditions. The equilibrium ratio between GHB and GBL can vary with the pH of the medium as well as the temperature of the matrix. The equilibrium reactions can be measured accurately using NIRS in the transmittance mode. Due to the solutions being essentially clear and colorless, the transmittance mode is most appropriate for this beverage study. The unique changes in the carbon-hydrogen groups can be used as the main parameter of comparison in shape, size, and intensity of each spectrum resulting in an understanding of how GHB and GBL behave in beverage matrices. All beverage samples were spiked with GHB or GBL at a concentration of 3.00g per serving. Either GHB or GBL was dissolved directly in the beverage, and measured in a cuvette (2mm) using NIRS. Thirty two scans for each sample were taken and the intensity was measured as it occurred at a given concentration. To standardize the spectral data all spectra were analyzed using multivariable mathematical software provided with the instrument.

The results show that GHB and GBL can be correctly identified in spiked samples versus unadulterated samples. When GHB or GBL is added to the beverage matrix, temperature controlled, there is a clear distinction between the two. Calibration curves of each of the eight beverages yield a straight line with R^2>0.98 for each beverage. A calibration curve made from similar beverages using spectral correction has been shown to accurately yield concentration information. A similar beverage composition can be used to quantitate the GHB in solution; the exact beverage is not needed. The GHB and GBL in a beverage matrix has also been shown to be stable in concentration and composition over a period of greater than ten days, even after freezing the sample and defrosting it. Confirmation of concentration of GHB in the beverage matricides was achieved using LC/MS. Results from an equilibrium study was also completed for GHB and GBL coupled with the beverage study yielding data consistent with Ciolino.[1] All relative percentages and equilibrium times using GHB and GBL in buffered solutions agree with previous reports.[1]

Reference:

[1.] Ciolino L.A., Mesmer M.Z., Satzger R.D., Machal A.C., McCauley H.A., Mohrhaus A.S. The chemical interconversion of GHB and GBL: forensic issues and implications. J Forensic Sci 2001 **46**(6):1315–1323.

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