B173 Utilization of Purge and Trap-GC-MS to Analyze GHB, GHV, GVL, and GBL in Beverages

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The goal of this presentation is to discuss the investigation of purge and trap gas chromatography-mass spectrometry (PT GC-MS) as a quick and sensitive method for the detection of gamma-hydroxybutyrate (GHB), gamma-hydroxyvalerate (GHV), and their respective analogs, gamma-butrolactone (GBL) and gamma-valerolactone (GVL), in complex matrices such as beverages. Attendees will become familiar with this application of PT GC-MS and how the different matrices affect detection capabilities.

This presentation will impact the forensic community and/or humanity by providing a physical method of detection for the highly controlled drug GHB, uncontrolled drug GHV, and their precursors GBL and GVL in beverages. This technique may be a potential tool for other polar drug molecules in similar matrices.

GHB and its lactone, GBL, have been a wide spread drug of abuse since the 1980's. Originally available over the counter, GHB was used for its euphoric, sedative, and anabolic effects. As with many central nervous system depressants, dependency syndrome can occur with prolonged use. Co-consumption of GHB with other drugs such as ethanol or methamphetamine increases the level of toxicity and can lead to death. The United States of America's National Institute of Drug Abuse classifies GHB as a controlled substance. Date-rape and other sex crimes often involve GHB due to its colorless, odorless properties, and its high solubility in drinks. Accurate detection from urine can be difficult due to rapid metabolism and excretion. Chemical analysis of hair can also indicate the presence of such drugs, but only months after administration.

Many of the chemical and physical properties of GHV and its precursor GVL are similar to GHB. To have the same toxicity and lethality, GHV has to be taken in higher dosages. Due to the fact that GHV is not classified as a controlled substance and is readily available on many websites, drug abusers may be more prone to use GHV over GHB. GHV has a longer duration of action when ingested, and can also be used as a date rape-drug.

Since GHB and GHV are small, polar molecules, efficient extraction from polar solvents, such as drinks, is challenging. Physical separation can be done by a change in volatility. Using purge and trap, the molecules can be driven out of the liquid phase into the head space. The trap absorbs molecules from the headspace which allows the analytes to be concentrated before being sent to the GC-MS.

The GC was operated in a 5:1 split ratio mode with an injector port temperature of 250°C. The carrier gas (helium) flow rate was set at 1.5 mL/min. An initial oven temperature of 50°C was ramped at 25°C/min to 235°C followed by a 20 minute hold. A solvent delay of 0.10 minute was employed and total analysis time was 27.90 minutes. The column used in this experiment was a thick film (60m x 0.320 mm i.d, 1.80 µm) column was used for chromatographic analysis.

Purge and Trap, GC-MS, GHB

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