



K39 Quantitative Analysis of Endogenous Levels of Gamma-Hydroxybutyric Acid (GHB) in Hair Samples Using Different Extraction Techniques

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After attending this presentation, attendees will understand how a series of freeze/thaw cycles can be used to extract Gamma-Hydroxybutyric Acid (GHB) from human hair samples. Attendees will learn how freeze/thaw cycles can be a quick and reliable method for the analysis of hair samples from individuals suspected of illicit drug use.

This presentation will impact the forensic science community by providing a quick extraction method to use for hair analysis of GHB. It is thought that in the future this extraction method can be used to extract other drugs from human hair samples. This extraction method will help to decrease the analysis time of hair samples when they are encountered in the forensic science community.

GHB is a short chain fatty acid that was originally used for medicinal purposes such as the treatment of alcoholism and clinical depression. In 2005, GHB was approved under the trade name Xyrem[®] to treat narcolepsy and cataplexy. Despite its approved medicinal applications, GHB is primarily associated with being a recreational drug and drug of abuse. Within the forensic science community, GHB is most often observed in cases of drug-facilitated sexual assaults. Due to its synergistic effects with alcohol and quick onset of amnesia, GHB is an attractive drug of abuse for criminals attempting sexual assault.

The half-life of GHB in a healthy individual is only 20 – 53 min, which leaves a narrow and abrupt window for detection. Urinalysis, a conventional technique for detecting illicit drug use, is difficult to use because GHB is undetectable in urine within twelve hours after ingestion. This presents an additional obstacle for forensic scientists because many sexual assaults are not reported within this twelve-hour time window. Hair analysis of GHB may prove useful in the detection of drug-facilitated assaults involving GHB by allowing for a longer detection window. Most current hair extraction techniques are time-consuming and require a significant amount of sample preparation. Extraction using freeze/thaw cycles requires less time and less sample preparation. The freeze/thaw cycles consist of first washing the hair and then placing the hair into ethanol, which is used to extract the GHB from the hair. Once the hair is placed into the ethanol, the samples are then placed in liquid nitrogen until the ethanol is frozen (about 30 sec). The sample is then left to thaw, which usually takes about 2 min. This process is repeated for a total of five times. Once the sample is dried down, it is then derivitized and reconstituted in acetonitrile and then analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). Quantitation of GHB extracted from hair was accomplished using a pulsed-splitless GC/MS method, which had a pulse pressure of 30.0psi that was held for 1.75 min. This method was determined to be sensitive and robust for analysis of GHB.

The current research indicates that freeze/thaw cycles are comparable to other extraction techniques. The freeze/thaw extraction has worked on multiple types of hair and has allowed for efficient detection and quantitation of endogenous levels of GHB in human hair samples. This method has been shown to detect endogenous levels of GHB at 0.1ng/mg of hair. This method should also prove useful in the analysis of hair samples where illicit GHB use is suspected.

Endogenous GHB, Hair Analysis, Freeze Thaw