B111 Potential Degradation Problems Associated With Analysis of Heroin With GC-MS

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After attending this presentation, attendees will have learned about the potential detection and quantitative problems associated with the degradation of heroin into 6-acetyl-morphine and morphine after being exposed to humid conditions. Such information will help drug chemists more accurately determine the age and water content of the heroin sample.

This presentation will impact the forensic community by developing a method to quantify the degradation process of heroin exposed to different amounts of water. By determining the degradation rate of heroin in water, a more accurate heroin concentration in drug samples can be calculated.

Heroin is known to degrade into 6-monoacetylmorphine (6-MAM) and morphine via first order hydrolysis. The original concentration of heroin originally in a sample can be estimated by determining the rate of degradation of heroin without the presence of water.

Heroin has been extensively explored with the intention of monitoring the change in concentration by varying conditions. Previous experiments have been performed analyzing the effects of temperature, pH, organic matrices, and containers. Development of a quantitative decay curve will prove useful for real case insights. Liquid chromatography and electrophoresis, typically used for heroin analysis, can not quantitate the amount of water present in the sample, preventing accurate degradation times. Gas chromatography (GC) with mass spectrometry (MS) provides quantitative information about the drug, its degradation products, possible adulterants present, and the amount of water present in the sample.

Weather conditions, humidity, and packaging all influence the degradation of heroin. Previous experiments have confirmed a first order degradation of heroin under these conditions. However, these studies did not analyze heroin mixed with water. For this experiment, 100 ppm heroin was mixed with 5, 10, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, and 700 micro-liters of water. Internal standards of 20 ppm caffeine and 25 ppm deuterated heroin were used for all sample analysis. Acetonitrile was used to dilute sample to 1.0 mL final volume. Samples were kept at room temperature throughout the experiment and analyzed every 15 minutes for 3 hours.

As expected, the degradation of heroin is proportional to the amount of water added, initially. Small water amounts showed elevated degradation products. As the amount of water increased, the concentration of heroin remains relatively constant. This pattern could be the result of chromatographic conditions, water still present in the MS, column degradation, or interactions between water and heroin. While the degradation of heroin may still be first order, the direct proportionality between the amount of water and the decrease in heroin is cause to re-evaluate how heroin is quantitative for forensic purposes.

The goal of this project was to develop a method to quantify the degradation process of heroin exposed to different amounts of water. By determining the degradation rate of heroin in water, a more accurate heroin concentration in drug samples can be calculated.

Heroin, Degradation, GC-MS

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