A106 Developing and Validating a Method to Analyze Components of Bank Dye Packs With HPLC and GC-MS

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After attending this presentation, attendees will see the importance of having both a presumptive and confirmatory test for detecting bank dye pack components. It will be demonstrated that the presumptive test developed in this study, utilizing HPLC, successfully separates and detects all three bank dye pack components. Additionally, the GC-MS method that was developed is a successful confirmatory test for all three components. Incorporating these two methods together provides an efficient and easy protocol for analyzing bank dye pack evidence.

This presentation will impact the forensic science community by providing a presumptive test for detecting bank dye pack components that has the potential to replace the previously used technique. TLC has been previously used to screen for bank dye pack components. However, TLC testing often has limitations. Some of these include solvent expense, solvent waste, operator time, and analysis time. HPLC is an efficient technique that can be used instead. Additionally, HPLC has the potential to be automated, which makes it even more appealing than TLC.

A common type of evidence encountered with bank robberies is exploding bank dye packs. These are used to aid in the investigation process and sometimes deter the criminal from completing the crime. The dye pack not only contains a red dye, 1-(methylamino) anthraquinone (MAAQ), but two tear gases as well, ortho-chlorobenzylidene malononitrile (CS), and chloroacetophenone (CN). The packs are often submitted to the local crime laboratory with subsequent pieces of evidence (i.e., a suspects clothing) that may have encountered the dye pack. It is the job of a trace chemist to determine whether or not the dye pack came in contact with the submitted evidence. In this project, an extraction method was developed for evidence exposed to bank dye components. The best solvent for extraction was determined to be a 50:50 mixture of ethanol and isopropanol and the extraction was performed at room temperature using an ultrasonic tank. A presumptive test was also developed using reverse phase High Performance Liquid Chromatography (HPLC) that incorporates a UV detector. The HPLC instrument used was an Agilent 1120 LC with EZChrom Software version
3.3 and the column was a Zorbax Eclipse Plus C18, 4.6 x 150 mm, 5- Micron. The mobile phase incorporated methanol as the organic phase and 0.1% trifluoroacetic acid in deionized water as the aqueous phase. All three of the components present in bank dye packs are successfully separated by gradient elution. Ibuprofen was used as an internal standard because its retention time falls among the bank dye components. The linear range for MAAQ, CS, and CN was found to be 0.001 mg/ml – 0.1 mg/ml, with r^2 values of 0.9999 for all components. The robustness, specificity, accuracy, and precision of this method were also tested and found to be acceptable. A confirmatory test was developed using Gas Chromatography-Mass Spectrometry (GC-MS). The GC-MS instrument used was an Agilent 6890 GC and 5973N MS with Chemstation Software 1701DA. The injection mode was splitless at an initial temperature of 250˚C. The method incorporates an initial oven temperature of 125˚C which then ramps at 35˚C/min up to 265˚C. The method provides good separation and resolution of all three bank dye components as well as the internal standard. A full internal validation was completed for this method.

High Performance Liquid Chromatography, Gas Chromatography - Mass Spectrometry, Bank Dye Packs

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