A42 Optimization of Solid Phase Micro Extraction - Gas Chromatography/Nitrogen Phosphorous Detector (SPME - GC/NPD) for the Detection of Methyl Centralite and Ethyl Centralite From Gun Shot Residues

Jorn Chi Chung Yu, PhD, and Brittney C. Gonzalez, Sam Houston State University, 1003 Bowers Boulevard, Huntsville, TX 77340*

After attending this presentation, attendees will have had the opportunity to discuss a method for detecting small amounts of methyl centralite and ethyl centralite with a novel extraction scheme of using solid phase micro extraction. The ease of adaptation of this technique to forensic labs from other chemistry - focused areas will be shown. Discussion of similar efforts towards advances in science being applied to forensics will be encouraged.

This presentation will impact the forensic community by explaining the many compounds that are specific to gun powder primers and stabilizers. For the purposes of uniqueness, methyl centralite and ethyl centralite were reported as highly significant to GSR. Detection of trace amount of methyl centralite and ethyl centralite has been a challenging task. This investigation of a novel extraction technique has created an alternative way to detect these GSR signature molecules. This new method will have a great impact on the determination of molecular marks of those GSR samples that couldn't be easily determined by conventional analytical procedures.

Methyl centralite (MC) and ethyl centralite (EC) are two signature molecules highly associated with gunshot residues (GSR). The objective of this work was to find a sensitive analytical method for extracting and identifying trace amount of EC and MC from GSR related samples.

A sensitive extraction scheme to extract MC and EC from the samples has been successfully developed, such as gun powders, un-burnt gun powder residues collected near the target. The extraction was achieved using a solid phase micro extraction (SPME) technique. The SPME fiber was exposed to the headspace in a 2.0-mL vial that contained the sample. The vial was also dipped in an oil bath maintained at 80 degrees Celsius during extraction. After extraction, the extracts were then desorbed in a GC injection port at 280 degree Celsius for 5 mins and splitlessly injected to a gas chromatography (GC) coupled to a nitrogen phosphorus detector (NPD) for analysis. The gun powder (or un-burnt) particle samples were removed from disassembled unfired ammunition cartridges, and the burnt particle samples were taken from gun shot residue deposits near the target areas. Organic components from only one single gun powder particle, either burnt or un-burnt, were successfully extracted and analyzed by the SPME-GC-NPD. No interference peaks were overlapped with EC peak at retention time of 16.7 mins. Unfortunately, one interference peak slightly overlapped with MC at retention time 15.8 mins. Results confirm that the new extraction procedure is capable of extracting trace amount of MC and EC, as well as many other organic components from a single gun powder particle with no derivatization. This method will offer an incredible potential to identify explosives, plasticizers, and trace amount of additives from gunshot residue (GSR) evidence for forensic applications. This new method is a highly dependable, rapid and inexpensive way of identifying GSR. The Limit of Detection can vary, but it was as small as a nanogram. Found within this work was the optimal conditions of SPME-GC-NPD for the detection of EC and MC for GSR. **SPME, GC-NPD, MC and EC**

 ** Presenting Author*