A187 Comparison of Organic Components of Pre- and Post-Blast Smokeless Powders by HPLC

Justin Owens, BS, Marshall University, Forensic Science, 1401 Forensic Science Drive, Huntington, WV 25701; Rebeca L. Haught, Marshall University, Chemistry Department, 1 John Marshall Drive, Huntington, WV 25755; and J. Graham Rankin, PhD, Marshall University, Forensic Science Program, 1401 Forensic Science Drive, Huntington, WV 25701*

After attending this presentation, attendees will gain an understanding of the analysis of smokeless powders using HPLC. Also, attendees will understand the significance of pre- and post- blast analysis of explosive debris.

This presentation will impact the forensic science community because it provides a way for comparing pre- and post- blast samples of smokeless powders. Since smokeless powders are being used more now than various black powders, it is important for the community to understand the analysis of smokeless powders.

This presentation aims to show how a simple gradient high performance liquid chromatography (HPLC) system can lead to the identification of several of the explosive and stabilizing components of many common smokeless powders. The smokeless powders can be extracted using a single solvent and injected directly into the HPLC system.

Black powder was once the frontrunner for use in homemade explosive devices, but now more smokeless powder substitutes are being used in place of black powder. The main advantage of using a smokeless powder rather than black powder is that several stabilizing components have been added to the smokeless powder. Gas chromatography followed by mass spectroscopy was the initial method studied for the examination of smokeless powders. However, several components found in smokeless powders have low thermal stability. HPLC can be used as an effective way of separating the different components found in a smokeless powder.

Smokeless powders can be analyzed using high performance liquid chromatography after a simple extraction process using a solution that is 25% butanol and 75% methanol and sonication in an ultra sonic bath. Methanol and an internal standard of *beta-naphthol* were added to the extracts before being analyzed using HPLC. A gradient HPLC system, using a reverse phase octyl (C8) column, and UV detection can show separation of many components including: Nitroglycerin; Dimethyl phthalate; TNT; 2,4-Dinitrotoluene; 2,6-Dinitrotoluene; Dibutyl phthalate; Diphenylamine; 2-Nitrodiphenylamine; 4- Nitrodiphenylamine; and N-Nitrosodiphenylamine. The wavelength of maximum absorbance was determined for each component listed above and each component was then analyzed at this maximum wavelength. The extracted smokeless powders were analyzed over a range of 210-400 nm, separating the range into five different channels of analysis.

Also, using this system a comparison can be made between pre-blast and post-blast samples taken from an explosion. It is essential in bomb debris analysis to be able to compare smokeless powders before and after the blast has occurred. Unburned and partially burned powder found among the bomb debris can be compared to samples of powder before the blast occurred. This can link the powder in the debris to the brand of powder, lot, or even a single can of powder based on morphology and specific component concentrations.

High Performance Liquid Chromatography (HPLC), Pre- and Post- Blast Comparison, Smokeless Powder Analysis

 ** Presenting Author*