E88 The Effects of Surface Composition and Time Intervals on the Stability of Explosive Residues

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After attending this presentation, attendees will understand how delayed collection and various surface compositions affect the stability of explosive residues.

This presentation will impact the forensic science community by allowing attendees to better understand the degradation curve of three explosive residues when deposited on three specific surfaces, which will enable the prioritization of evidence collection and analysis in order to aid in investigations of explosion scenes.

As a result of the increased terrorism occurring around the world, the attacks by Improvised Explosive Devices (IEDs) are rising, which leaves them as a constant threat. These devices are not produced for traditional use and are synthesized with home-made components, which makes them unstable and unpredictable. Therefore, additional investigative and analytical efforts are required to identify the explosive elements in IEDs. Both pre- and post-blast residues can be used to identify the explosive element of the IED. Determining the explosive element can aid in the identification of a suspect, which is vital to investigations. These residues can be found at both clandestine laboratories and explosion sites on and around the IED, and various swabbing techniques can be employed to collect them from these locations. It is known that explosive residues will degrade over time; however, it is unknown how the time before collection and different surface compositions affect this degradation. Understanding the degradation curve of explosive residues can be crucial to an investigation. Additionally, this information can allow analysts to prioritize the analysis of evidence that is more likely to yield an identification.

During this research, an alcohol wipe was used as a universal swabbing method to collect explosive residues from multiple surfaces that could be found on an IED or around a clandestine laboratory. These surfaces included galvanized steel, Poly Vinyl Chloride (PVC), and packing tape. Common explosive residues, Royal Demolition eXplosive (RDX), Trinitrotoluene (TNT), and Pentaerythrite Tetranitrate (PETN) were deposited on these surfaces in the form of a liquid standard. These samples were prepared in triplicate to ensure reproducibility, then stored in air-tight containers for the following time intervals: immediate, three days, one week, two weeks, three weeks, and four weeks. Overall, 84 samples per residue were analyzed, generating a total of 252 samples. An optimized method was developed for Liquid Chromatography/Triple Quadrupole/Mass Spectrometry (LC/QqQ/MS) in Atmospheric Pressure Chemical Ionization (APCI) negative ion mode to identify the explosive compounds. All samples were compared to the immediate time interval to calculate a percent recovery of the explosive residue, then the data was analyzed to see if a trend was observable in the degradation rates. The results of this experiment show the degradation effects of surface composition and delayed collection.

Explosive Residues, LC/MS/MS, Universal Swab