B156   Forensic Analysis of Hoax Powders Using Morphologically Directed Raman Spectroscopy

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After attending this presentation, attendees will understand the advantages of using Morphologically Directed Raman Spectroscopy (MDRS) for the identification of hoax powders commonly employed in white powder attacks. In addition, attendees will better understand MDRS and how it can benefit the forensic science community.

This presentation will impact the forensic science community by providing criminalists with a new analytical tool for the identification of white powders commonly used in fake bioterrorism attacks.

In the wake of the September 11th terrorist attacks, there was an influx of white powder events, both real and hoax, throughout the United States. The most infamous of these white powder events was the Amerithrax attacks in the fall of 2001 that left 17 people sick and five dead from anthrax sent via anonymous letters containing white powders. Since these attacks, the Federal Bureau of Investigation and the United States Postal Inspection Service have responded to thousands of white powder events. More often than not, the attacks do not contain any toxic materials and are carried out for the sole purpose of causing terror and damaging infrastructure. These fake bioterrorism agents consist of white powders that come from a variety of common commercial sources and can be blended to further complicate the analysis and identification of these samples.

Artificial sweeteners are commonly employed hoax powders. These blends are simple mixtures of a sweetening agent and bulking material. Sweetening agents are several times sweeter than a comparable amount of table sugar. Consequently, artificial sweeteners require a bulking agent or filler such as dextrose to increase the volume of the blend and to mitigate any undesirable taste brought on by the sweetening agent. Flour, chalk, table sugar, and other colorless powders are also commonly used in these attacks. In addition to the chemical differences of the sample, there are size/shape variations that can be used to differentiate the powders from one another at the particle level.

MDRS is an ideal tool for the investigation of suspicious white powders because it combines chemical identification with particle size and shape analysis. Raman spectroscopy is a useful technique in forensic science for determining molecular chemistry because it is rapid, reliable, does not require contact with the sample, and is non-destructive. Thus, Raman spectroscopic analysis is ideal for the analysis of suspicious white powders; however, the high volume of the filler in sugar substitutes has a tendency to drown out the Raman signature of the sweetening agent when doing a traditional bulk analysis, making detection of the sweetening agent and identification of the brand of sweetener impossible. Raman microspectroscopy can be used to overcome this by analyzing and identifying individual particles of the white powder. Particle morphology and size information are also valuable for differentiating artificial sweeteners that are mixtures of the same components. Automatic image analysis takes the subjective element out of the measurement of particle size and morphology. It also makes the process more rapid than counting and measuring the individual particles within a greater mixture. When Raman microspectroscopy is paired with automatic image analysis of the particles, physical and chemical information about the components of the mixture can be obtained which can be used for discrimination and brand identification.

This presentation details the use of MDRS for the analysis for hoax powders. MDRS can be used for analysis at the individual particle level, making it ideal for identifying compounds that are mixed with bulking agents or in a blend. MDRS is capable of comparing both the concentrations and identities of samples in addition to collecting data on size distribution of the particles. Individual size and shape distributions can also provide information based on excipient particles that could be used for source attribution. MDRS is a useful tool for the analysis of hoax powders at the particles level that enables criminalists to rapidly and reliably determine the composition of these mixtures to aid in the investigation of white powder attacks.

Morphologically Directed Raman, Particle Size Distribution, Hoax Powders

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