B16 Multiple Transfers of Drug-Contaminated Fingerprints and Their Analysis With Raman Spectroscopy

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Learning Overview: After attending this presentation, attendees will understand how substrate, enhancement technique, and multiple transfers affect the detection and identification of drugs in fingerprints using Raman Spectroscopy

Impact on the Forensic Science Community: This presentation will impact the forensic science community by evaluating the use of Raman Spectroscopy as a sensitive and non-destructive method that can confirm the contents of an unknown illicit substance detected in a fingermark friction ridge deposit even after multiple contacts.

Trace amounts of illicit materials within fingermark friction ridge deposit have been identified from single, secondary transfers using various substrates and enhancement techniques. However, questions remain about the amount of transfers drug contaminated fingerprints can leave on different substrates. In examining how illicit materials are retained in multiple transfers of fingerprints, additional probative value can be awarded.

Raman spectroscopy has been greatly utilized in the forensic field for a wide range of sample identification including confirming the presence of substances in fingermark friction ridge deposits. Its ability to differentiate distinct features between other substances and those of a crystalline nature makes Raman a powerful tool in identification of trace amounts drug materials. Benchtop Raman Spectroscopy-identification of drug-contaminated prints is possible over multiple transfers. However, there are considerable limitations in its application to casework. Further, portable Raman Spectrometers have been useful for rapid in-situ analysis of drugs, explosives, and other materials. Although greatly beneficial for on-site analysis of these materials, limitations of small spot size and reduced sensitivity were observed when used for testing transfers of drug-contaminated prints.

This research examined the number of multiple transfers of drug contaminated fingerprints where cocaine was detected using Raman spectroscopy. Ten participants planted 20 successive drug-contaminated prints on a series of 5 different substrates (glass, tile, plastic bags, firearm casings, and firearm magazines) with specific enhancement techniques that are most commonly seen at crime scenes (cyanoacrylate, black powder, and fluorescent powder). Portable and Benchtop Raman spectrometers were employed to assess the number of successive transfers from which drug-contaminated prints can be detected from different substrates with enhancement. Results varied based on the substrate and enhancement technique. It was concluded that although enhancement with ninhydrin prohibited the detection of cocaine in any fingerprints on paper, cocaine was detected in as many as the 20th successive fingerprint after substrates were enhanced with cyanoacrylate or enhanced with black or fluorescent powder and lifted.

By understanding how these illicit materials transfer between individuals and substances handled and the associated limitations with its identification, a level of certainty can be provided in the identification of the substance present based on the spectra obtained. Associating illicit drugs with a specific fingermark places the drugs in the hands of a specific individual, aiding forensic scientists in two ways.

Fingerprint Analysis, Multiple Transfers, Illicit Drugs

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