B137 The Evaluation of Portable Hand-Held Raman Systems for the Presumptive Identification of Narcotics

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After attending this presentation, attendees will understand the advantages and limitations of portable Raman spectroscopy and its potential as a supplemental approach for the field testing of narcotics.

This presentation will impact the forensic science community by demonstrating the potential applicability of using portable hand-held Raman spectroscopy systems to detect illegal substances quickly and accurately using a single test, either within a laboratory system or as a field test by law enforcement.

Historically, presumptive testing for narcotics has involved colorimetric tests, otherwise known as spot tests. These tests are fast, sensitive, and can categorize a suspected illegal substance to a particular class of drugs; however, the interpretation of the color change is subjective and false positives and negatives are possible. Hand-held Raman devices have been developed for forensic application to eliminate the need for colorimetric testing. These user-friendly systems offer a non-destructive means to detect potential controlled substances, precursors, and cutting agents quickly and accurately either within a laboratory system or as a field test by law enforcement.

The goal of this research was to evaluate two portable hand-held Raman systems to determine their ability to accurately analyze narcotic samples. The Thermo Scientific TruNarc® and Chemring Detection Systems PGR-1064® were used to test more than 100 case samples by colorimetric and Gas Chromatography/Mass Spectrometry (GC/MS) analysis in the Palm Beach County Sheriff's Office Chemistry Unit. Case samples, which included opiates, stimulants, hallucinogens, and pharmaceutical tablets, were scanned in triplicate on three consecutive days in order to determine reproducibility. Results of the Raman scans were compared to the laboratory results. The TruNarc® successfully detected the target drug in 77% of the case samples and generated reproducible results in 84% of the case samples when the results were compared to the rescans on days two and three. An added benefit to the TruNarc® system is the Type H kit, which utilizes Surface Enhanced Raman Spectroscopy (SERS) to increase Raman scattering and fluorescence quenching, allowing drugs in low concentration or those with high fluorescence to be detected successfully. The PGR-1064® successfully detected the target drug in 36% of the case samples and generated reproducible results in 60% of the case samples when the results were compared to the rescans on days two and three.

These Raman detection systems exhibited the potential to provide accurate and reproducible results for single-component samples through certified reference standards; however, there are intrinsic challenges to the technology of Raman spectroscopy when dealing with mixtures. Case sample's homogeneity was unpredictable when adulterants, diluents, and other components were found within the samples. As a result, the laser was likely not always focused on the target drug within a sample. Additionally, limited sample quantities resulted in inconclusive or unidentified results. The ability to detect forensic narcotic samples likely depends on sample purity, amount, and where on the sample the laser is focused.

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The data presented suggest that hand-held Raman systems have the potential to detect substances of abuse depending on the specific sample, although further evaluation is necessary for implementation within a laboratory and as a field test.

The opinions, findings, conclusions, and recommendations stated in this presentation are those of the authors and do not necessarily reflect the vendors or the Palm Beach County Sheriff's Office.

Presumptive Testing, TruNarc®, PGR-1064

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