B82 The Power of Knowing Now: Rapid Drug Screening Using Atmospheric Solids Analysis Probe/Mass Spectrometry (ASAP/MS)

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Learning Overview: After attending this presentation, attendees will understand the technique of ASAP/MS. Discussion will include a presentation of alternative ionization mechanisms together with demonstration of how collision-induced dissociation can improve the specificity of drug identification. Principles will be illustrated with data for common drug substances. Attendees will gain an appreciation of the simple workflow and, importantly, understand the performance of this alternate screen with seized drug samples. The findings for a series of drugs collected by the authorities from music events will also provide insight into drugs used in this particular cohort.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating how an alternative rapid drug screen can improve laboratory efficiency and reduce sample backlog.

The increase in number, diversity, and potential toxicity of drugs is a major concern; it also presents significant challenges for the forensic laboratories that are involved in the analysis of seized substances and are under pressure to produce results quickly. Most forensic drug chemistry laboratories follow Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) recommendations that stipulate that two independent techniques should be used to analyze a drug sample. Typical workflows may include colorimetric or Thin-Layer Chromatography (TLC) presumptive analysis followed up by a more selective method such as Gas Chromatography/Mass Spectrometry (GC/MS). However, for many drugs, colorimetric tests are not be available or result in a high rate of false positives and TLC analysis can be time-consuming. This can lead to too many samples requiring analysis by GC/MS leading to sample bottlenecks and sample backlogs. Consequently, methods that can facilitate a fast, but accurate, screening of drugs are of interest.

The aim of this study was to evaluate the performance of RADIAN-ASAP, a compact device based on ASAP/MS for rapid drug screening and to compare data with an established screening method based on High-Resolution Mass Spectrometry (HRMS).

Samples (certified reference material, pills, powders, resin) were analyzed following a simple dilution with methanol and subsequent "dipping" of a glass capillary into the sample. Following insertion of the capillary into the device, mass detection was performed using full scan MS *m/z* 60650. The ASAP ionization process is similar to atmospheric pressure chemical ionization, whereby a heated desolvation gas is used to volatilize the sample and a corona discharge to ionize; this typically results in protonation for most polar drugs (i.e., $M+H^{+)}$. To further enhance specificity, the analysis was acquired simultaneously at four differing cone voltages (i.e., 15, 25, 3,5 and 50V), which resulted in the generation of both precursor and product ions. Data was processed by LiveID™ software that provided real-time matching of acquired data to a spectral library and calculated an average match factor.

The study assessed various samples, including 40 Certified Reference Material (CRM), 20 pharmaceuticals, 10 natural supplements/herbal medications, and more than 60 unknown samples that had been confiscated at various music events/venues by the local police. A small library was generated from ASAP/MS of the CRM. Analysis of the other preparations (e.g., pharmaceutical and seized samples) demonstrated very good qualitative agreement when compared with this library. For the samples acquired from music events, ASAP/MS indicated that 40% of the samples contained ketamine, 30% contained MDMA, and 20% contained cocaine. Other drugs identified included mixtures of these three drugs, MDMA/MDEA, novel psychoactive substances, sildenafil, etc. Confirmatory analysis by HRMS showed excellent agreement (> 95%) with the major components identified by ASAP/MS.

The technique is quick, easy-to-use, and is very promising for a rapid identification of drug substances. Results were obtained within two minutes and showed very good qualitative agreement with the comprehensive HRMS screening method.

Direct MS, Rapid Drug Screening, Seized Drug Analysis