**Desorption Ionization of Illicit Drugs from Solid Phase Microextraction Fibers at Increasing Temperature**

Joseph LaPointe, Robert Goguen, Emily Dunn, and Brian D. Musselman
IonSense, Inc., Saugus, MA, USA

**Introduction**

Direct desorption ionization of drugs from solid phase microextraction (SPME) fibers using a direct analysis in real time (DART) source facilitates rapid analysis of urine for narcotics and pesticides. The SPME extraction is used to isolate these analytes while decreasing matrix effects that are present during direct ionization of biological fluids. The utility of analyzing SPME fibers is increased by analyzing a fiber with gas heated to different temperatures. Exposure of different regions of the fiber to the gas enables detection of different substances which can be used to generate a chemical attribute signature for that specific drug without any other sample preparation via a DART ambient ionization source.

**Methods**

C18 SPME: Extraction of urine samples spiked with illicit materials and cutting agents is achieved with C-18 coated SPME fibers. Positioning the SPME fiber in the heated gas exiting a DART-SVP ambient ionization source results in the generation of protonated molecules of the illicit materials. The use of different ionizing gas temperatures permits desorption of different substances from the same SPME fiber reducing matrix effects associated with strong ionizing molecules. The heated gas exiting a DART-SVP permits desorption of different substances from the same SPME fiber while decreasing matrix effects associated with strong ionizing molecules. The utility of analyzing SPME fibers is an excellent approach for reducing or eliminating inhibiting effects when working with biological matrices.

**Experimental**

In order to complete a full temperature profile of three temperatures (100, 200, and 300 °C) a manual module was utilized so that each section of the fiber could be analyzed at a unique temperature.

A DART-SVP was used for all the experiments shown in Figure 3. The manual module has a grooved edge that fits into the track of the linear rail for simple, reproducible sample introduction.

**Results**

For this research project, five different synthetic urine brands were used: Magnum Detox, G-whiz, Golden Flask, Quick Fix, and Number One. Each urine provided different spectra when analyzed directly. These matrix effects made it very difficult to identify any illicit drugs or pesticide contaminants in the biological sample.

As the spectra above shows, the LSD in the urine is not present when analyzed by DART directly. The other illicit drugs and pesticides showed similar responses, where the analyte of interest was either not detected or suppressed by the matrix effects. The utility of SPME fibers is an excellent approach for reducing or eliminating these inhibiting effects when working with biological matrices.

**Conclusions**

- C18 SPME fibers enhance and concentrate illicit drugs and pesticides present in synthetic urines that cannot be detected by traditional DART.
- Temperature profiles containing three separate temperature increments can be conducted on a single SPME fiber, conserving the amount of fibers required for a comprehensive analysis of a single sample aliquot.

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**Figures**

- **Figure 1**: A benchtop place mat with the SPME analysis protocol.
- **Figure 2**: Temperature profile of three temperatures on a single SPME fiber.
- **Figure 3**: Manual version of the DART-SPME module.
- **Figure 4**: DART analysis of synthetic urines with matrix effects preventing any analyte detection.
- **Figure 5**: Comparison of Quick Fix Urine analyzed directly (bottom) and with C-18 SPME analysis (top).
- **Figure 6 & 7**: Show the results of the temperature profile analysis of the C-18 SPME fiber. It clearly shows that both the illicit drugs only desorb at the 300 °C. Conversely, the pesticides desorbed more reproducibly in addition to exhibiting a greater signal intensity at 200 °C. Examining three separate temperatures on a single fiber facilitates detection of multiple analytes and compound classes without the need of multiple fibers, saving time and money.

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