B173 Detection of Drugs in Pharmaceutical Preparations Where Diversion Can Occur by Direct Analysis in Real-Time AccuTOF™-Mass Spectrometry (DART®-MS)

Amanda J. Mohs, BA, VCU Department of Forensic Science, PO Box 84307, Richmond, VA 23284; Justin L. Poklis, BS, Virginia Commonwealth University, Dept of Pharmacology & Toxicology, 410 N 12th Street, Rm 746, PO Box 980613, Richmond, VA 23219-0613; Carl E. Wolf II, PhD, PO Box 980165, Richmond, VA 23298-0165; Michelle R. Peace, PhD, VA Commonwealth University, 1015 Floyd Avenue, PO Box 843079, Richmond, VA 23284; and Alphonse Poklis, PhD, Virginia Commonwealth University, Dept of Pathology-Toxicology Laboratory, Box 98-165 MCVH/VCU Station, Richmond, VA 23298-0165*

The goal of this presentation is to inform the forensic community about a novel use of Direct Analysis in Real-Time AccuTOF™-Mass Spectrometry (DART®-MS) for screening of pharmaceutical preparations in cases of suspected drug diversion or where diversion may easily occur.

This presentation will impact the forensic science community by providing a technique for rapid identification of the contents of pharmaceutical preparations where drug diversion can occur.

Drug diversion in healthcare facilities is a multi-victim crime. Harm can come to patients, the healthcare worker, and the employer. Absence or dilution of an intended drug could result in patients receiving substandard care from their healthcare provider and may cause undue pain or anxiety in their treatment.

DART®-MS is a relatively new ionization technique that is being used to analyze a wide variety of compounds and matrices. DART®-MS offers the advantages of direct sample examination without the need for a vacuum system, minimal or no sample preparation, and high sample throughput. The use of a time-of-flight mass analyzer allows for accurate mass measurements for compounds present in or on the substrate.

A DART®-MS library was created using 20 common parental pharmaceutical preparations. These included typical surgical analgesic and anesthetic mixtures of controlled substances. Two hundred randomly selected pharmaceutical preparations were obtained from the Forensic Industrial Environmental Research and Metabolism (FIRM) Laboratory at Medical College of Virginia Hospitals at Virginia Commonwealth University. Specimens for this study were pharmaceutical preparations from "show cause testing" and routine analyses for possible diversion. These pharmaceutical preparations were screened using a DART® ion source coupled to a JEOL JMS T100LC AccuTOF™ MS operating in positive-ion mode with the following parameters: the ion source was helium gas, operated at a flow rate of 2.0L/min, a gas heater temperature of 300°C, a discharge electrode needle at 4,000V, electrode 1 set at 150V, and electrode 2 set at 250V. The resolving power of the MS was 6,000FWHM. Measurements were taken with the ion guide peak voltage at 800V, reflectron voltage at 900V, orifice 2 set at 5V, ring lens at 3V, and orifice 1 temperature at 300°C. The measurements were taken using the function switching method, allowing for collection every 0.25 seconds at the orifice 1 voltages of 20V, 30V, 60V, and 90V. The measured mass range was from 40Da to 1,000Da. The DART®-MS results were compared to both the created pharmaceutical preparations library and the National Institute of Standards and Technology library. The drug or drugs detected in each specimen was then confirmed by High-Performance Liquid Chromatography (HPLC) using a previously published method.[1]

The DART®-MS was determined to have the ability to screen for and identify the main active drug or drugs in these pharmaceutical preparations by using the created pharmaceutical preparations library. The DART®-MS was also able to identify many of the excipients in the preparations. The DART®-MS analysis of the 200 pharmaceutical preparations versus the HPLC analysis of the drugs found in the pharmaceutical preparations resulted in an excellent correlation.

Reference:

1. Wolf CE and Poklis A. A rapid HPLC procedure for analysis of analgesic pharmaceutical mixtures for quality assurance and drug diversion testing. *J. Anal. Toxicol*. 2005;29:711-714.

DART®-MS, Diversion, Pharmaceutical Preparations