K25 DART® AccuTOF™: A New Drug Screening Protocol for Biological Specimens

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After attending this presentation, attendees will learn how the DART® AccuTOF's™ technology can be utilized as a comprehensive screening technique of whole blood.

This presentation will impact the forensic science community by expanding the scope of analysis of whole blood drug screening to include targets not covered by traditional immunoassay techniques.

The field of forensic toxicology is never stagnant; preferences for a specific drug and/or drug combination fluctuate within the population. Meanwhile, scientists in the field are charged with providing timely, comprehensive, and accurate results while enduring dwindling personnel and financial resources, which often necessitates a limited scope covering only the staples. In order to comply with the duty of identifying both conventional and emerging drugs that are problematic in society, new methodology must be adopted in the screening of biological samples.

Current drug screening practices utilize both traditional immunoassay methodology and Gas Chromatography/Mass Spectrometry (GC/MS) technology. Immunoassays have been successful for the analyses of conventional drugs; however, immunoassays are costly, making scope expansion outside common drugs of abuse monetarily impractical. Additionally, immunoassays are limited for their ability to adapt quickly in the analysis of new and/or additional compounds due to kit production and/or validation. The GC/MS has less scope limitations when compared to the immunoassay but is a great deal more costly with respects to time. GC/MS technology requires tedious sample preparation prior to data collection and consumes multiple days of a scientist's time to complete the extraction, collection, and analysis of the data. Moreover, when used for drug screening purposes, any positive findings must then be confirmed by repetition. The Direct Analysis in Real Time (DART®) ionization source coupled to an AccuTOF™ mass spectrometer offers a solution to the restricted budget, available personnel, and drug screening limitations currently faced. Furthermore, DART® AccuTOF™ technology offers a second methodology for the screening of targets that have been traditionally identified and confirmed by repetitive GC/MS analyses. The robust, open air DART® ionization allows for comprehensive analysis by producing protonated molecular ions for all mode specific (positive mode) ionizable components of the specimen sampled via surface ionization, while the AccuTOF™ mass spectrometer allows for continuous data collection.[1,2] This hybrid instrumentation allows for the putative identification of both parent and metabolite compounds alike via a molecular formula database search with a total instrument analysis time of a couple of minutes per sample.

The application of the DART® AccuTOF™ technologies in the field of toxicology for the screening of whole blood, an exceedingly complex matrix, has realized the necessity for sample preparation prior to analysis.[3] To combat the complexity of the whole blood matrix, Disposal Pipette Extraction (DPX™) tips utilizing a cationic sorbent, featuring sulfonic acid groups, were employed for analysis of basic drugs spiked into porcine whole blood.[4] The amount of blood needed for the analysis was based upon the Limit Of Detection (LOD) study performed with neat standards. Porcine blood was screened for 35 different targets spanning a multitude of drug classes. Detected target coverage included basic and amphoteric compounds in the following classes: cathinones; sympathomimetic amines; select opiates; select benzodiazepines; dextromethorphan; carbamazepine; carisoprodol; select barbiturates; zolpidem; cocaine metabolite; citalopram; tapentadol; and, select tricyclic antidepressants. These detected targets were identified at therapeutic levels ranging from 10ng/mL to 400ng/mL.

Based on the experimental data collected, comprehensive screening can be accomplished with DART® AccuTOF™ technology. This study expanded the current drug screening scope of whole blood beyond the classical impairing drugs and even identified emerging select cathinones (bath salts). In conclusion, DART® AccuTOF™ technology has provided a promising solution to the current drug screening limitations encountered by forensic toxicologists.

References:

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2. Tamura, Jun; and Osuga, Junichi "New Generation LC-TOF/MS "AccuTOF™" Application & Research Center, JEOL Ltd.
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Whole Blood, DART® AccuTOF™, DPX tips

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