**WS10: Recent Advances in MS-based Forensic Toxicology: Achieving Efficiency, Selectivity, and Sensitivity**

**Date:** Tuesday, October 28, 2025  
**Time:** 8:00 am – 12:00 pm

**Audience Knowledge:** Intermediate – Involves more advanced concepts requiring some technical working knowledge or prior exposure to the subject matter

**Workshop Chairs:**  
Laura Friederich

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**Abstract**

In forensic science, the accuracy and reliability of analytical techniques are paramount to solving complex cases, from drug-facilitated crimes (DFC) to driving under the influence (DUI) incidents to post-mortem investigations. Liquid chromatography–mass spectrometry (LC-MS) and gas chromatography-mass spectrometry (GC-MS) play crucial roles in the analysis of evidence from crime scenes, including trace levels of drugs, toxins, and blood alcohol content. With recent technological advances, quantifying or screening many analytes of interest has become faster, easier, and more efficient.  
  
This workshop will cover a wide range of contemporary LC-MS and GC-MS workflows and applications for forensic toxicology, with a focus on high-resolution accurate mass (HRAM) Orbitrap technology. We will highlight hardware and software features that enable comprehensive and efficient toxicology workflows in urine, blood, and oral fluid for targeted screening, confirmation, and retrospective analysis.  
  
The workshop will include method details for the use of the Orbitrap MS in untargeted screening with an initial processing method for a panel of 94 therapeutic and illicit drugs in post-mortem blood samples, supported by case studies from a medical examiner’s office. We will then demonstrate the fast quantification of 31 drugs and metabolites in Quantisal™-collected oral fluids using a hybrid quadrupole–linear ion trap MS, Thermo Scientific Stellar™ MS. In addition, we will highlight automated sample preparation using the Hamilton Microlab® STAR liquid handler and Dispersive Pipette XTRaction™ (XTR) SCX/WAX mixed-mode INTip™ solid-phase extraction (SPE) tips. Lastly, we will showcase the different applications of ethanol and related volatiles analysis, highlighting the application of HS/GC/MS and its benefits.

This session is designed for professionals who are seeking to enhance their understanding of advanced LC-MS and GC-MS analytical techniques and solutions for accurate and reliable toxicological analysis. By the end of the workshop, participants will be equipped with the knowledge and skills necessary to effectively apply the highlighted LC-MS and GC-MS workflows in their forensic work, ensuring high precision and reliability in their analysis.

**Learning Objectives:**

1. Understand Orbitrap technology and its usage in the targeted quantification, targeted screening, and retrospective analysis of drug and metabolite detection in complex matrices
2. Learn the advantages of the hybrid quadrupole-linear ion trap MS and its applications in forensic toxicology
3. DPX Technologies provides novel technologies that increase sample preparation efficiencies, and create automated solutions for laboratories that are easy to customize and implement with any workflow or method. With products such as XTR INTip SPE and ToT INTip Filtration, a wide range of drugs of abuse can be extracted from urine, plasma, oral fluid, blood, etc. using Hamilton robotic automation.
4. Understand the advantages of headspace gas chromatography-mass spectrometry (HS/GC/MS) for the analysis of ethanol and related volatiles, interpret survey data to identify common laboratory practices, and explain the implementation of forensic standards.

**Speakers**

Courtney Patterson

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Product Applications Specialist III

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Forensic Scientist, Associate

Alabama Department of Forensic Sciences

**Workshop Agenda**

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| **Time** | **Topic** | **Speaker** |
| 8:00 am - 8:15 am | Introductions | Laura Friederich & Brittany Friedman |
| 8:15 am - 9:00 am | Utilizing HRAM Orbitrap MS for Targeted Screening and Retrospective Analysis of Drugs and Metabolites | Courtney Patterson |
| 9:15 am - 10:00 am | Orbitrap MS Applications in NC OCME | Laura Friederich & Brittany Friedman |
| 10:00 am - 10:30 am | Break |  |
| 10:30 am - 11:00 am | Revolutionizing Targeted Small Molecule Quantitation Using a Hybrid Quadrupole – Linear Ion Trap Mass Spectrometer | Courtney Patterson |
| 11:10 am - 12:00 pm | Advancing Forensic Volatile Analysis with HS/GC/MS *Applications, Survey Insights, and Standards* | Morgan Appenrott |