# 2ND ANNUAL ONLINE SYMPOSIUM:

# CURRENT TRENDS IN FORENSICS & FORENSIC TOXICOLOGY

**MAY 13-17, 2019**

**Learn Through Live Access to Leaders in their Field!**

Experience best practices in forensic toxicology such as sample preparation, method development, and forensic method validation. Learn from dedicated sessions on seized drug and trace analysis. Interact with the experts in a panel discussion at the close of each day. Learn from sponsored presentations introducing new products, services, and educational opportunities and take advantage of the week-long poster session! This online symposium will provide you with ready access to some of today's leading researchers and practitioners without ever having to leave the laboratory.

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**2019 Online Symposium: Current Trends in Forensics & Forensic Toxicology**

Welcome to the 2nd annual Online Symposium on Current Trends in Forensics & Forensic Toxicology that is being hosted for RTI's ForensicED. On May 13th – 17th 2019, hundreds of attendees will be joining us online to learn from leading researchers and practitioners on extremely important issues facing laboratory professionals today.

## Why Should You Attend?

- Insights from leading researchers and practitioners spanning 5 different countries on two continents
- Free registration and no travel costs. Learn without leaving the laboratory.
- On-demand access for content review
- Potential for continuing education credit (see registration page for details)
- Accompanying virtual poster session
- Symposium e-book with abstracts, slides, and presentation summary

We are excited to coordinate and present this amazing Symposium to the Forensic Toxicology Community, and we cannot wait to see you there!

## Special Thanks to our Sponsors Who Made this Event Possible!

- Agilent Technologies
- Florida International University
- Forensic Magazine
- GERSTEL
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## Day 1: Sample Preparation

**Monday - May 13th, 2019**

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|---|---|
| **9am ET – 10am ET / 3pm CEST – 4pm CEST** | *Sample Preparation: A Review of Current Practice*<br><br>Lt. Robert M. Sears, MS, F-ABFT, Forensic Services Laboratory, South Carolina Law Enforcement Division, USA |
| **10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST** | *Completely Automated Hydrolysis, Extraction and Analysis of Opioids in Urine using a New Robotic Autosampler and LC/MS/MS Platform (Sponsored)*<br><br>Dr. Fredrick Foster, GERSTEL, Inc. |
| **10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST** | *A Novel Technique for Simple and Fast Pulverization of Hair Samples*<br><br>Dr. Jochen Beyer, Institute of Forensic Medicine, St. Gallen, Switzerland |
| **11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST** | *Simplify Urine Drug Testing with "Flash Hydrolysis" using a New Recombinant Glucuronidase Enzyme (Sponsored)*<br><br>Tania A. Sasaki, Ph.D., Chief Scientific Officer, Northwest Physicians Laboratories |
| **11:30am ET – 12pm ET / 5:30pm CEST – 6pm CEST** | *Panel Discussion with All Presenters* |

## Day 2: Instrumental Method Development

**Tuesday – May 14th, 2019**

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|---|---|
| **9am ET – 10am ET / 3pm CEST – 4pm CEST** | *Analytical strategies to Identify Analytes of Forensic Interest in Routine Pharmacotoxicology Laboratories*<br><br>Dr. Simona Pichini, Unit Head, Analytical Pharmacotoxicology, National Centre on |

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| | Addiction and Doping, National Institute of Health, Rome Italy |
| **10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST** | *Strategy for Your Forensics Sample Preparation Workflow to Improve Sample Cleanup Efficiency, Method Performance, and Sample Test Productivity (Sponsored)*<br><br>Alexander Ucci, Application Engineer, Agilent Technologies, Inc. |
| **10:15am ET – 11:15m ET / 4:15pm CEST – 5:15pm CEST** | *Methods for the High Throughput, non-FUDT, Forensic Toxicology Laboratory – The Past, The Present and the Future*<br><br>Robert A. Middleberg, Ph.D., F-ABFT, DABCC(TC), Laboratory Director, & Sr. V/P of Quality Assurance and Operations, NMS Labs |
| **11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST** | *Robustness of an Ultivo LC/TQ with Standard ESI Ion Source for High-throughput Testing of Drugs in Serum (Sponsored)*<br><br>Theresa Sosienski, Ph.D. Agilent Technologies, Inc |
| **11:30am ET – 12pm ET / 5:30pm CEST – 6pm CEST** | *Panel Discussion with All Presenters* |

## Day 3: Forensic Toxicology Method Validation

**Wednesday – May 15th, 2019**

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|---|---|
| **9am ET – 10am ET / 3pm CEST – 4pm CEST** | *A Consensus Based Approach to Method Validation in Forensic Toxicology*<br><br>Marc A. LeBeau, PhD, F-ABFT, Senior Scientist, FBI Laboratory, Quantico, Virginia, USA |
| **10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST** | *Advancing GC Intelligence to Improve Forensic Analyses (Sponsored)*<br><br>Rebecca Veeneman, PhD, Applications Chemist Manager, Agilent Technologies |
| **10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST** | *Practical Aspects of Forensic Method Validation*<br><br>Priv.-Doz. Dr. Frank T. Peters, Head of Forensic & Clinical Toxicology, Institute of Forensic |

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| | Medicine, Jena University Hospital Jena, Germany |
| **11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST** | *FIU Programs and Research in Forensic Science (Sponsored)*<br><br>Anthony P. DeCaprio, Ph.D., F-ABFT, Associate Professor, Department of Chemistry & Biochemistry, Florida International University |
| **11:30am ET – 12pm ET / 5:30pm CEST – 6pm CEST** | *Panel Discussion with All Presenters* |

## Day 4: Seized Drugs

**Thursday – May 16th, 2019**

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|---|---|
| **9am ET – 10am ET / 3pm CEST – 4pm CEST** | *Collaborative Forensic Strategies for Examining Emerging Drug Trends*<br><br>Agnes D. Winokur, Associate Laboratory Director, DEA Southeast Laboratory, USA |
| **10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST** | *Sub-minute Screening Analysis using QuickProbe GC/MS (Sponsored)*<br><br>Luis A. Cuadra-Rodriguez PhD, R&D Chemist, Agilent Technologies |
| **10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST** | *Electronic Cigarettes and Cannabinoids – The Tangle of Unregulated Industries and Public Demand*<br><br>Michelle Peace, Associate Professor, Department of Forensic Science, Virginia Commonwealth University |
| **11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST** | *Through-barrier and trace analysis of hazardous materials (Sponsored)*<br><br>Dr. Robert Stokes, Head of Detection and Security Business, Agilent Technologies |
| **11:30am ET – 12pm ET / 5:30pm CEST – 6pm CEST** | *Panel Discussion with All Presenters* |

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## Day 5: Trace Analysis

**Friday – May 17th, 2019**

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| **9am ET – 10am ET / 3pm CEST – 4pm CEST** | *Standardization of Forensic Chemical Methods for the Examination and Comparison of Trace Evidence*<br><br>Jose Almirall, Professor of Chemistry and Biochemistry and Director, Center for Advanced Research in Forensic Science (CARFS), Florida International University |
| **10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST** | *Emerging Applications in Forensics for ICP-MS (Sponsored)*<br><br>Bert Woods, Ph.D. ICP-MS Applications Scientist, Agilent Technologies |
| **10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST** | *Analysis of Paint Evidence Using Infrared and Raman Spectroscopies*<br><br>Edward M. Suzuki, PhD, Supervising Forensic Scientist. Washington State Crime Laboratory. Washington State Patrol |
| **11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST** | *Infrared Microscopy for Forensic Applications (Sponsored)*<br><br>Louis G. Tisinger, Ph.D., Molecular Spectroscopy Application Scientist, Agilent Technologies |
| **11:30am ET – 12pm ET / 5:30pm CEST – 6pm CEST** | *Panel Discussion with All Presenters* |

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## |Monday - May 13th, 2019|

### Day 1: Sample Preparation

**9am ET – 10am ET / 3pm CEST – 4pm CEST**

***Sample Preparation: A Review of Current Practice***

Lt. Robert M. Sears, MS, F-ABFT, Forensic Services Laboratory, South Carolina Law Enforcement Division, USA

**Abstract:** Sample preparation techniques are designed to remove unwanted endogenous compounds or interferences (matrix components) in an effort to minimize ion suppression, ion enhancement or background noise, concentrate the analyte of interest (improve limit of detection or limit of quantitation), and/or improve chromatographic performance.

Sample preparation techniques may be grouped into the following categories:

Pretreatment – i.e. glucuronide hydrolysis, protein precipitation, centrifugation, dilution

Extraction – i.e. liquid/liquid extraction (LLE), solid phase extraction (SPE), phospholipid removal, supported-liquid extraction, solid-phase microextraction (SPME)

Derivatization – chemical modification of analytes of interest i.e. silylation, acylation, alkylation

This presentation attempts to provide an overview of commonly utilized forensic sample preparation methods while providing some general information about a few less frequently utilized techniques.

**Detailed Learning Objectives:**

- Understand the purpose of sample preparation in forensic toxicological analysis.
- Identify and understand commonly employed sample preparation techniques utilized in forensic toxicological analysis.
- Identify advantages or disadvantages to various sample preparation techniques for use in forensic toxicology.

**10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST**

***Completely Automated Hydrolysis, Extraction and Analysis of Opioids in Urine using a New Robotic Autosampler and LC/MS/MS Platform (Sponsored Presentation)***

Dr. Fredrick Foster, GERSTEL, Inc.

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**Abstract:** The Opioid Epidemic continues to increase throughout the United States. According to the CDC, 66% of all drug overdose deaths in 2016 involved an opioid. This calculates to roughly 116 deaths every day from opioid related overdoses. After becoming addicted to prescription opioids, users may unfortunately turn to illicit alternatives such as heroin. To compound the issue further, heroin has increasing been found to be mixed with other synthetic opioids such as fentanyl, which is 100 times more potent than morphine. There is a critical need for forensic, heath care, and law enforcement scientists to be able to quickly assess and monitor which opioid is involved, to effectively respond to this epidemic.

Automating the entire hydrolysis, extraction, and subsequent analysis by LC/MS/MS provides the critical high throughput analysis for opioids in urine. Using the new GERSTEL MPS robotic autosampler, syringe transfer of all liquids involved in the enzymatic hydrolysis procedure, controlled incubation of the samples for a defined period of time, as well as extractions of the subsequent hydrolyzed urine samples using dispersive solid phase extraction were performed. The resulting eluents from the automated extractions were then introduced into the new Agilent Ultivo LC/MS/MS instrument.

We will show that an automated enzymatic hydrolysis and subsequent clean-up method was successful using the GERSTEL MPS robotic sampler for a variety of opioid compounds in urine. Using this method, opioid analytes can be rapidly and reproducibly isolated from hydrolyzed urine samples using an automated cleanup procedure coupled to LC/MS/MS analysis using the Agilent Ultivo Triple Quadrupole Mass Spectrometer, allowing their respective limits of detection to be met. Coupling the solid phase extraction to the LC/MS/MS provides high throughput and minimizes matrix interference from these biological samples.

**Detailed Learning Objectives:**

The audience should gain insight into the automation of enzymatic hydrolysis, dispersive solid phase extraction, and sample preparation techniques as well as their use during the analysis of urine samples for opioids.

### 10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST

### *A Novel Technique for Simple and Fast Pulverization of Hair Samples*

Dr. Jochen Beyer, Institute of Forensic Medicine, St. Gallen, Switzerland

**Abstract:** The importance of hair analysis is progressively increasing all over the world. However, the sample preparation is a tedious process, mainly due to the pulverization of the hair samples which has been shown to increase the extraction yields. In many laboratories the hair strand is cut into small pieces prior to the pulverization in a ball mill. It has been shown that the time-consuming hair cutting can be avoided when using the Fast Prep-24 automated homogenizer. However, this method is limited to hair amounts of approx. 75 mg. In the present work the OMNI Bead Ruptor 24 is presented as a novel technique for the simple and fast pulverization of entire hair strands. The efficiency and performance is compared with other techniques such as cutting of hair samples, pulverization by a ball mill and the FastPrep 24 homogenizer.

**Detailed Learning Objectives:**

- Understand the need of pulverization in hair analysis.

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- Have knowledge on a simple sample preparation technique for pulverization.
- Have insight in different hair analysis methods used in Switzerland.

**11:15 ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST**

***Simplify Urine Drug Testing with "Flash Hydrolysis" using a New Recombinant Glucuronidase Enzyme (Sponsored Presentation)***

Tania A. Sasaki, Ph.D., Chief Scientific Officer, Northwest Physicians Laboratories, President, Sasaki Errett Consulting, LLC

**Abstract:** Because of the increased use/misuse of prescription (and illicit) drugs, the prevalence of urine drug testing (UDT) has increased significantly over the past decade and LC-MS/MS is the gold standard for detecting and quantifying drugs in UDT. One ongoing debate in LC-MS/MS testing is whether to measure glucuronides directly in the method or hydrolyze the sample and measure the combined total concentration (glucuronide plus free). Each of these protocols has its advantages and disadvantages.

Direct detection of glucuronide conjugates is useful because of the quick and easy sample preparation, therefore reduced consumable and labor costs versus hydrolysis preparations. Furthermore, eliminating the hydrolysis incubation step makes sample preparation more conducive to preparation and analysis as the sample is received instead of batch analysis. However, glucuronide standards can add significant cost to the test, not only due to the price of the standard, but also the overhead of maintaining appropriate QC and documentation for the additional compounds in the test.

Hydrolysis of samples has historically been time consuming, requiring incubation times of up to two hours. Over the past 3-4 years, manufacturers have introduced "second-generation" recombinant □-glucuronidase enzymes that reduce the incubation time to <60 minutes, and even <15 minutes. Although 30-60 minutes may be required for complete hydrolysis of all conjugated metabolites, data show that the majority of the glucuronides are actually hydrolyzed when the enzyme is added to the sample. As a result, these new enzymes can simply be added as a "reagent" and the sample analyzed using this "flash hydrolysis" preparation, i.e. without the (semi-)lengthy incubation.

**Detailed Learning Objectives:**

- Advantages/Limitations of direct glucuronide analysis for LC-MS/MS urine drug testing
- Information regarding newer b-glucuronidase enzymes
- Use of a novel quick, room temperature hydrolysis sample preparation for urine drug testing

**11:30 ET – 12:00pm ET / 5:30pm CEST – 6:00pm CEST**

***Panel Discussion with All Presenters***

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## |Tuesday – May 14th, 2019|

## Day 2: Instrumental Method Development

### 9am ET – 10am ET / 3pm CEST – 4pm CEST

***Analytical strategies to Identify Analytes of Forensic Interest in Routine Pharmacotoxicology Laboratories***

Dr. Simona Pichini, Unit Head, Analytical Pharmacotoxicology, National Centre on Addiction and Doping, National Institute of Health, Rome, Italy

**Abstract:** Over the past decades, the efforts in the detection and identification of analytes of forensic interest in non-biological samples and in conventional and non-conventional matrices of consumers have emerged as a global analytical challenge involving both classical psychotropic drugs and a large range of new psychoactive substances (NPS).

Generally, the detection and identification of psychotropic drugs in conventional and non-conventional matrices include two analytical steps: a preliminary screening to maximize the sensitivity for target analytes in order to identify all "presumptive positives" (even at the cost of including "false positives"), followed by a confirmation step to maximize the analytical specificity in order to selectively identify, among the presumptive positives, the "true positives".

This latter analysis is the only one owing a legal medical value. The forensic screening step can include colorimetric and immunoassay methods on one hand and chromatographic mass spectrometric screening on the other. Whereas several colorimetric and immunoassay methods are in place for "classical" drugs of abuse (eg. opiates, cocaine, cannabinoids ad amphetamines) there are fewer for rapid and specific detection of NPS. In these latter cases, chromatographic/mass spectrometry screening techniques have been investigated and developed for the rapid identification of NPS

Chromatographic assays coupled to mass spectrometric detection proved to be more suitable due to high flexibility, sensitivity and selectivity for identification of both classical drugs of abuse and NPS and/or their metabolites, even at low doses in different biological matrices. Moreover, many of the new compounds are very potent, and low doses ingested will lead to low concentrations in biological matrices. Blood, urine, hair and oral fluid are still the most commonly used matrices, but also post mortem matrices (eg. vitrous humor, central blood, bile, gastric content) may have considerable interest in cases of fatalities. A number of rapid and sensitive methods for the determination of classical drugs NPS in conventional and non-conventional biological matrices have been developed; the vast majority of the latter techniques in forensic toxicology laboratories use liquid chromatography-tandem mass spectrometry (LC-MS/MS) or ultra-high-performance liquid chromatography-tandem mass spectrometry (UHPLC–MS/MS). Anyway, liquid chromatography-quadrupole-time of flight-mass spectrometry (LC-QTOF-MS), liquid chromatography–high-resolution mass spectrometry (LC-HRMS) and gas chromatography-mass spectrometry (GC-MS) have also been utilized. Although UHPLC-MS/MS may represent the elective technique in studying NPS, a combination of both GC-MS and LC-MS/MS techniques is useful in creating a complete toxicological image.

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**Detailed Learning Objectives:**

- How to identify analytes of forensic interest in routine pharmacotoxicology laboratories, where typical instruments (GC-MS and LC/MS or LC-MS/MS) are available.
- Extraction procedures used in the systematic forensic toxicological analysis devoted to extract most possible compounds present in conventional and non-conventional biological matrices.
- How to couple GC_MS with LC-MS/MS assays to identify most possible analytes of forensic interest.

### 10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST

***Strategy for Your Forensics Sample Preparation Workflow to Improve Sample Cleanup Efficiency, Method Performance, and Sample Test Productivity (Sponsored Presentation)***

Alexander Ucci, Application Engineer, Agilent Technologies, Inc.

**Abstract:** A typical forensics laboratory workflow comprises of sample collection, sample preparation, introduction to the instrument, analysis, data review, and finally, data reporting, where sample preparation has always been considered the bottleneck and rate-limiting step. Current advanced instrumentation greatly increase your capability to analyze various samples, considering the required analytical sensitivity, selectivity, reliability, and feasibility of complex sample testing. Therefore, the sample preparation step has been minimized to reduce time, cost, and complexity, improve the universal applicability, and it has been reduced to be just good enough.

There are several hidden dangers in sub-optimal sample preparation, such as wasted time, instrument maintenance/failure issues, and inaccurate data, that can arise and affect your overall success. These hidden dangers can be eliminated or greatly minimized by proper sample preparation workflow strategies. This improvement can be realized without having to retrain your scientist, making large capital expenditures, or having to rewrite your standard operating procedures (SOPs). This presentation will discuss how samples with high lipid content are prepared with a simplified sample prep workflow for drugs of abuse utilizing Captiva EMR-Lipid.

**Detailed Learning Objectives:**

- The importance of matrix removal and the impact of lipids on your workflow
- A simple workflow for drugs of abuse in whole blood

### 10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST

***Methods for the High Throughput, non-FUDT, Forensic Toxicology Laboratory – The Past, The Present and the Future***

Robert A. Middleberg, Ph.D., F-ABFT, DABCC(TC), Laboratory Director, & Sr. V/P of Quality Assurance and Operations, NMS Labs

**Abstract:** Traditional specimens analyzed in non-forensic urine drug testing (FUDT) laboratories performing human performance, general poisoning and postmortem testing are varied and complex. The challenges presented by these specimens, ranging from body fluids (blood, bile, vitreous humor, urine) to tissues (solid organs, hair, bone, etc.), require analytical tools that are both highly selective and

capable of handling vast concentration ranges (from ppt to ppm). Equally important to the measuring tool is sample preparation; and, while very significant advances in analytical tools have been made over the last 50 years, sample preparation techniques have not advanced as readily. Traditional sample preparation techniques ranging from liquid-liquid extraction to solid phase extraction to 96-well plate technology are often laborious and solvent -intensive. All of these issues are compounded when considering the needs of high throughput, such as thousands of cases per week encompassing hundreds of analytes of interest. Of further consideration are the ever-increasing demands of regulatory requirements.

Modern forensic toxicological analyses have evolved from non-specific detection, e.g., GC-FID, to exquisitely specific detectors, e.g., HRMS. Sample preparation techniques have at least progressed from using multiple milliliters of liquid specimens and >50g of solid organs to much smaller quantities of biological material. Earlier instrumental and sample preparation techniques did not enable high throughput capabilities. Ideally, sample preparation and analysis would be combined in a relatively seamless process for complex analyses with total run times of less than 5 minutes. While multiple promises of such have been made, practically, no such nirvana exists today to address the myriad specimen types encountered in the forensic toxicology laboratory.

This presentation explores the progression of analytical processes available for high throughput forensic toxicological analyses from the 1960s to its current state. Additionally, exploration of potential future technologies will be discussed that facilitate large case volumes, while meeting the stringent regulatory requirements of such work.

**Detailed Learning Objectives:**

- Explain the challenges facing high throughput forensic toxicology laboratories.
- Identify past, present and future sample preparation strategies for addressing specimens in forensic toxicology.
- Identify past, present and future analytical schema for high throughput forensic toxicological analyses.

### 11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST

### *Analysis of Drugs in Serum and Urine using the Ultivo LC/TQ (Sponsored Presentation)*

Theresa Sosienski, Ph.D. LC/MS Marketing Applications Scientist, Agilent Technologies, Inc

**Abstract:** Analyzing drugs in urine and serum are common high-throughput analyses for forensic toxicology laboratories, where reducing cost per sample and instrument downtime is key. Presented here is a sensitive and robust method for analyzing >100 drugs and labeled internal standards in human serum and urine using the small and robust Ultivo LC/TQ with new electrospray ionization feature. Drug classes analyzed were opiate/opioids, stimulants and benzodiazepines, among others. Drug compounds and internal standards were spiked into human urine and serum prior to sample preparation. Urine samples were diluted prior to analysis, and serum samples were prepared using an acetonitrile crash and then also diluted. Analytes were separated using a Poroshell C-18 column, 2.1 × 100 mm, 2.7 µm. Compounds were analyzed in dynamic MRM mode on the Ultivo LC/TQ with new ESI capability. Total analytical runtime was 7 minutes for this method. Excellent analytical sensitivity was observed, with all compounds meeting required quantitation limits in their respective matrices. Exceptional precision was

also observed, with RSD% <10% for all compounds analyzed at their quantitation limit. The system robustness of the Ultivo LC/TQ system with a standard ESI source was also evaluated for 26 drugs in human serum matrix for a six-day continuous run analyzing 1625 individual injections. Average RSD% for both raw peak area and calculated concentration of 1400 QC samples were 4.3 and 4.4% respectively for the 26 analytes. The exceptional robustness of Ultivo along with its small size and reduced downtime for maintenance makes it an excellent tool for the high throughput forensic toxicology laboratory.

**Detailed Learning Objectives:**

- Understand a comprehensive method for the analysis of drugs in serum and urine using the Ultivo LC/TQ
- Know about new innovative features of the Ultivo LC/TQ, which suit the instrument to the forensic analysis space.
- Be certain that the Ultivo coupled to a standard ESI source is a robust instrument, well matched to the high throughput forensic laboratory.

**11:30 ET – 12:00pm ET / 5:30pm CEST – 6:00pm CEST**

***Panel Discussion with All Presenters***

# |Wednesday – May 15th, 2019|

## Day 3: Forensic Toxicology Method Validation

**9am ET – 10am ET / 3pm CEST – 4pm CEST**

***A Consensus Based Approach to Method Validation in Forensic Toxicology***

Marc A. LeBeau, PhD, F-ABFT, Senior Scientist, FBI Laboratory, Quantico, Virginia, USA

**Abstract:** Validation is the process of performing a set of experiments that reliably estimates the efficacy, reliability, and reproducibility of an analytical method. The goal of conducting validation experiments is to establish evidence which demonstrates that a method is capable of successfully performing at the level of its intended use and to identify the method's limitations under normal operating conditions.

In 2012, the Scientific Working Group for Forensic Toxicology (SWGTOX) released a minimum standard of practice for the validation of analytical methods used in forensic toxicology. A year later, this standard was published in the Journal of Analytical Toxicology to increase awareness of the document. Over the next few years, two important things occurred: a) SWGTOX was disbanded so that the forensic toxicology discipline could participate in the joint effort of the Organization of Scientific Area Committees (OSAC) and 2) as the forensic toxicology field began to use the method validation document, they recognized that parts of the document created confusion.

The last official action of SWGTOX was to transfer ownership of all current and draft documents to the OSAC Toxicology Subcommittee. This subcommittee decided to incorporate a minor update to the SWGTOX method validation document based on the comments received from colleagues. Part of the

process of developing a document through the OSAC involves the use of a standards development organization (SDO) that ensures public review of documents and use of a balanced "consensus body" to resolve all comments received on documents. The OSAC Toxicology Subcommittee decided to use the American Academy of Forensic Sciences Standards Board (ASB) as its SDO. The ASB is an ANSI-accredited SDO.

In late 2017, the revised draft of the SWGTOX/OSAC Method Validation document was released to the general public through the ASB. Over the next few months, those comments were reviewed and resolved through the expertise of the ASB Toxicology Consensus Body. It is currently being reviewed for publication as an American National Standard.

This session will provide an abbreviated explanation of the above process and then discuss the key elements of the revised document. These include a) establishing a validation plan based on the intended use of the forensic method, b) designing experiments for critical validation parameters (bias and precision, calibration model, interferences, limit of detection and limit of quantitation), and c) knowing when revalidation is needed.

Names of commercial manufacturers are provided for identification purposes only, and inclusion does not imply endorsement of the manufacturer, or its products or services by the FBI. The views expressed are those of the author and do not necessarily reflect the official policy or position of the FBI or the U.S. Government.

**Detailed Learning Objectives:**

- Differentiate between forensic method validation requirements for screening, qualitative, and quantitative methods.
- Be able to explain the importance of a validation plan.
- Make critical decisions as to what variable require revalidation when a forensic method is revised.

### 10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST

### *Advancing GC Intelligence to Improve Forensic Analyses (Sponsored Presentation)*

Rebecca Veeneman, PhD, Applications Chemist Manager, Agilent Technologies

**Abstract:** You can't be everywhere, and with an intelligent GC system, you don't have to. Agilent now offers a portfolio of intelligent systems providing a tremendous amount of information, tracking, diagnostics and help that's programmed into them and accessible anytime, anywhere. On-board diagnostics identify potential issues and provide step-by-step instructions on how to quickly remedy the situation. In addition to the on-board help, the intelligent features result in more consistent temperatures and flows, that are critical for quality data. With the full portfolio of intelligent GC systems from Agilent – Intuvo 9000, 8890 and 8860, reliable and quality data can be achieved the first time, every time. By implementing the guard chip technology in the direct heating system of Intuvo, forensic drug screening can be achieved just over 12 minutes with repeatable retention times regardless of maintenance. The advanced thermal and pneumatic control of the 8890 enables the use of high efficiency columns forensic analysis of drugs of abuse.

Forensic evaluation of blood alcohol can also be achieved with the portfolio of intelligent GC system. For core and routine analysis forensic blood alcohol, the 8860 gas chromatograph provides a robust and reliable system. However, if simplicity and ease of use is required, the flow chip technology of Intuvo delivers equivalent splitting for dual column dual detector forensic analysis of blood alcohol concentration. Furthermore, these intelligent GC systems can log user configurable maintenance counters, diagnostic events, and other system parameters, providing another layer of confidence for both targeted and screening forensic analyses. Advanced chromatographic functions such as the detector evaluation and blank run analysis can also aid in improving the integrity of results by ensuring the system is free of carry over and the detector is performing to specification. Through the instrument's touchscreen or browser interface, the GC user can monitor sample runs, know when maintenance is needed and learn the 'how to's' of GC maintenance. Lastly, remote connectivity through the browser interface provides access to the instrument anywhere you can access your network.

**10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST**

***Practical Aspects of Forensic Method Validation***

Priv. Doz. Dr. Frank T. Peters, Head of Forensic & Clinical Toxicology, Institute of Forensic Medicine, Jena University Hospital Jena, Germany

**Abstract:** Several validation guidelines have been published in the field of forensic toxicology and related fields. They generally define which validation parameters have to be evaluated for which type of analysis (screening/ qualitative, quantitative) and which acceptance criteria should be applied. They also include guidance on the (minimum) number of replicate experiments needed for statistical data analysis.

However, practical aspects like

- when to take the step from method development to forensic method validation,
- how to streamline validation experiments in the validation study to reduce workload and time,
- how to derive the most appropriate calibration function and weighting factor,
- how to assess total error from bias and precision data,
- how to handle situations where stable-isotope-labelled internal standards are not available,
- how to handle very large calibration ranges

are generally not covered in detail, although they are one of the keys to successful forensic method validation.

This presentation will therefore discuss such practical aspects including explanations what can be read from forensic validation results (and what not). It will also address situations where additional validation experiments may be reasonable and where the standard validation protocols laid out in the guidance documents may not be applicable.

**Detailed Learning Objectives:**

- Be able set up an efficient experimental design for a forensic method validation study.

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- Understand the process of selecting an appropriate calibration model.
- Be able to handle situations where standard guidance documents may not be fully applicable.

**11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST**

***FIU Programs and Research in Forensic Science (Sponsored Presentation)***

Anthony P. DeCaprio, Ph.D., F-ABFT, Associate Professor, Department of Chemistry & Biochemistry, Florida International University

**Abstract:** Forensic science doesn't belong to just one nation but is critical to the global community. In the U.S., we are fortunate to have a strong understanding and history of utilizing investigative principles and emerging technologies to serve our communities. The newly established preeminent center at Florida International University (FIU), the Global Forensic and Justice Center (GFJC), is a university-wide forensic science and justice initiative coordinating all of the ongoing forensic science efforts at FIU. GFJC includes four components; the National Forensic Science and Training Center (NFSTC), the International Forensic Research Institute (IFRI), the Center for the Administration of Justice (CAJ), and the Center for Advanced Research in Forensic Science (CARFS). These components build upon four established focus areas: Academia, Industry, Technology and International Justice, to dramatically expand FIU's footprint in the forensic/justice/training arenas, providing unparalleled opportunities for students, postdocs, faculty, practitioners and agencies worldwide. GFSC is working to create a benchmark both academically and professionally by establishing international partnerships in India, Central America, the Middle East and North Africa, and elsewhere.

Classroom and laboratory based academic programs in forensic science at FIU include the FEPAC-accredited undergraduate Certificate in Forensic Science and Master of Science in Forensic Science (MSFS) programs, a PhD in Chemistry and Biochemistry with Forensic Science Track, and a combined MSFS/PhD in Biology. In addition, FIU offers an online Professional Science Masters in Forensic Science (PSMFS) degree specifically targeted to forensic professionals currently working in federal, state or private crime laboratories, medical examiner's laboratories, or law enforcement agencies who are interested in pursuing advanced training in the forensic sciences while also developing highly valued management skills.

Through IFRI, the FIU Global Forensic and Justice Center also operates three university laboratory recharge facilities to support both FIU and external forensic research projects. Together, these facilities offer expertise, training, and laboratory services in all aspects of forensic biology, chemistry and toxicology:

- The Forensic DNA Profiling Facility, under the supervision of Dr. DeEtta K. Mills, provides state of the art DNA analysis services for both human and non-human DNA. Coordinating with various lab facilities at FIU, the facility supports cutting edge research and teaching and also provides services for local crime labs.

- The Trace Evidence Analysis Facility (TEAF), under the supervision of Dr. Jose Almirall, provides elemental and organic analyses of paint, glass, fibers, fire debris, seized drugs, and other evidentiary materials recovered at crime scenes.

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- The Forensic & Analytical Toxicology Facility (FATF), under the direction of Dr. Anthony P. DeCaprio, provides screening, qualitative, and quantitative analyses and method development and validation services for target drugs and other xenobiotics using state-of-the-art chromatographic and mass spectrometric instrumentation. FATF maintains a library of more than 1500 analytical standards for licit and illicit drugs, including novel psychoactive substances and drug metabolites.

- The National Forensic Science Technology Center (NFSTC) provides training to law enforcement, laboratory and military forensic practitioners, as well as technology evaluation, research and consulting.

These facilities support numerous forensic science research efforts funded by NIH, NIJ, DOD, DHS, DOS, and other federal agencies, and private sector entities.

**Detailed Learning Objectives**

- Become familiar with the structure and purpose of the FIU Global Forensic and Justice Center and its contributions to forensic science.
- Learn about FIU's extensive academic program portfolio in the forensic sciences, including those at the undergraduate, graduate, and professional levels.
- Learn about the capabilities and services offered by the forensic DNA, trace evidence, and toxicology laboratory recharge facilities at FIU.

**11:30 ET – 12:00pm ET / 5:30pm CEST – 6:00pm CEST**

***Panel Discussion with All Presenters***

## |Thursday – May 16th, 2019|

## Day 4: Seized Drugs

**9am ET – 10am ET / 3pm CEST – 4pm CEST**

***Collaborative Forensic Strategies for Examining Emerging Drug Trends***

Agnes D. Winokur, Associate Laboratory Director, DEA Southeast Laboratory, USA

**Abstract:** According to the Centers for Disease Control and Prevention (CDC) more than 700,000 people have died due to a drug overdose from 1999 to 2017. In 2017, approximately 68% of the drug overdoses involved an opioid. CDC reports that on average 130 Americans die every day from an opioid overdose. Forensic scientists, in both the United States and internationally, struggle in their ability to identify and report new psychoactive substances (NPS), especially fentanyl related substances, newly emerging synthetic cathinones, synthetic cannabinoids, and synthetic opioids. To circumvent existing regulations, many illicit manufacturers turn to manipulating the chemical structure of a synthetic drug (e.g. fentanyl) creating a wide array of analogs. For example, there are currently over 30 fentanyl analogs scheduled under DEA or the United Nations. However, to complicate matters, there is an estimated 1,900 potential structural analogs. These analogs are often difficult to detect and identify with traditional analytical schemes. Both nationally and internationally, laboratories are initiating method development and validation procedures to address and overcome analytical challenges. The

need and potential benefits for real-time communication tools is unprecedented. Dialogue across forensic disciplines is no longer a desired benefit, but a necessity to ensure accurate reporting.

The rapid change in drug trends and the emergence of novel substances result in analytical challenges that, if not quickly addressed, can lead to under-reported substances. Having a collaborative effort to address those challenges associated with the detection, identification, and reporting language of these substances is the key to effectively collecting forensic data that illustrate the ever-changing drug patterns in the United States.

**Detailed Learning Objectives:**

- Obtain a clearer understanding of emerging seized drug trends in the United States.
- Obtain a clearer understanding in how early communication of real-time drug analytical challenges and data impacts response strategies to emerging new psychoactive substances.
- Obtain a sense of existing gaps in the collective interagency response efforts.

### 10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST

***Sub-minute Screening Analysis using QuickProbe GC/MS (Sponsored Presentation)***

Luis A. Cuadra-Rodriguez PhD, R&D Chemist, Agilent Technologies

**Abstract:** The need for fast analysis for the identification of compounds in a variety of forensic samples have been steadily increasing over the last one to two decades, especially for seized drugs. Positive identification of drugs and other chemicals in bulk samples is critical during screening in crime laboratories. Conventional drug analysis often requires sample preparation that includes dissolution, dilution and several reagent-based assays to classify the type of drugs followed by gas chromatography-mass spectrometry (GC/MS) analysis and/or other techniques for confirmation. A simple and fast analysis workflow that does not require sample preparation is demonstrated with QuickProbe GC/MS. This system was equipped with 1.5mx0.25mm (0.1µm 100% dimethylpolysiloxane film) and 0.8mx0.18mm (0.18µm 100% dimethylpolysiloxane film) restrictor columns using a ~600 °C/min temperature ramp that allowed for chromatographic separation in under 1 minute. Individual samples (liquid, solid, powder) were touched with a glass probe and introduced into the QuickProbe GC/MS system for 3-6 seconds for vaporization prior to data acquisition. Correct compound identification of drugs in liquids and solids is achieved through NIST library search.

A variety of drug samples were analyzed, including drug mixtures (40-75 ng/µL) in solvent, tablets (oxycodone (whole), a hydrocodone-acetaminophen (pulverized), dyphenhydramine, sildenafil) and seized drugs from criminal cases including: black tar heroin, magic mushrooms and a marijuana edible. The fast chromatographic separation, direct sample introduction and short acquisition (< 1 min.) allows for rapid and high throughput analysis of different types of samples - liquid, solid, powder - containing drugs. Drug compounds in a solution containing caffeine, methadone, codeine and 6-monoacetylmorphine (6-MAM) were all identified with match scores greater than 800 when using a SQ mass spectrometer. Similarly, positive identification of tablets was achieved without sample preparation with resulting library matches greater than 850. For a pulverized tablet (5 mg hydrocodone-300 mg acetaminophen) tablet, acetaminophen and hydrocodone were also confidently identified, regardless of hydrocodone accounting for only 1% of the tablet mass. Additionally, the relative content

(1.6%) of hydrocodone-to-acetaminophen was accurately determined by the peak area ratios of the compounds.

Analysis of real case samples resulted in the correct identification of the main drugs as well as secondary components without performing any sample preparation. Black tar heroin analysis showed diacetylmorphine, noscapine and papaverine whereas dronabinol, cannabichromene, cholesterol and squalene were observed in a marijuana edible. The fast analysis did not require sample preparation and allowed for a simple workflow to expedite screening in a forensics application and included the following steps: 1) run system blank, 2) run probe blank, 3) run sample and 4) run system blank. This analysis workflow resulted in overall screening < 5 minutes for target analysis of drugs. This technique can also be expanded to other fields that require fast screening and identification such as homeland security and organic synthesis.

**Detailed Learning Objectives:**

- Be familiarized with the fast screening analysis using QuickProbe GC/MS.
- Learn about little to no sample preparation and sample handling when doing fast analysis with Quick Probe GC/MS.
- Understand the analysis workflow, including data analysis, when using QuickProbe GC/MS as a screening instrument.

### 10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST

### *Electronic Cigarettes and Cannabinoids – The Tangle of Unregulated Industries and Public Demand*

Michelle Peace, Associate Professor, Department of Forensic Science, Virginia Commonwealth University

**Abstract:** E-cigarettes were created as an alternative nicotine delivery system, but the designs evolved to facilitate the aerosolization of drugs other than nicotine. Currently five generations of e-cigs are on the market: cig-a-likes, mid-size electronic cigarettes, advanced personal vaporizers, innovative regulated mods, and devices that are popular for concealment. As the e-cigs evolved, they became more powerful and easier to manipulate, enabling the user to more easily inhale drugs other than nicotine, (DOTN) . Additionally, the new generations allow for products to be used in the e-cigs such as plant materials, waxes, crystals, and dabs. While moderately regulated, the e-cig market has been driven predominantly by user demands. Combined with the unregulated cannabinoid market in the United States, the opportunity for nefarious activity and danger to public health and public safety has escalated. Illicit and/or potentially dangerous substances are sold in products online and in retail outlets from sources that are purportedly safe and quality tested. Online drug use forums are the venue for product warnings. As such, the number of poisonings in the unknowing and trusting general public searching for what they believe are safe, non-addictive options for ailments such as pain, anxiety, and seizures will increase. The symbiotic relationship between the unregulated cannabinoid industry and the lightly regulated e-cigarette industry creates a significant risk to public health and public safety.

**Detailed Learning Objectives:**

- Be able to evaluate e-cigarette models for type and functionality.

- Understand the variability and impact of chemical compositions of substances used in e-cigarette devices.
- Know how e-cigarettes are manipulated and adulterated with illicit and/or dangerous substances.

**11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST**

***Through-barrier and trace analysis of hazardous materials (Sponsored Presentation)***

Dr. Robert Stokes, Head of Detection and Security Business, Agilent Technologies

**Abstract:** Raman spectroscopy is an accurate, specific and rapid technique for detection and identification of chemical substances. Agilent has developed a unique variant of Raman spectroscopy, Spatially Offset Raman Spectroscopy (SORS) which enables new capabilities in the rapid identification of materials concealed by a wide variety of non-metallic sealed containers. This capability is particularly important given the continuing threat of illicit drugs worldwide, specifically the rise in the prevalence of hazardous narcotics and new psychoactive substances (NPS). Narcotics and NPS are hazardous by inhalation, ingestion, eye or, in rare cases, skin contact. An example is the fentanyl family of synthetic opioids, reportedly 10 – 1000 times more potent than heroin, with fatal doses in some cases comparable to a few grains of sugar. This material presents a high risk in more concentrated forms (as it is often smuggled or transported), therefore through barrier ID capability is highly advantageous, it can reduce the risk of exposure to the operator when compared to other techniques. The optical system also has advantages for other sample types such as explosives and hazardous chemicals.

Our SORS instrument, Resolve, performs very well with narcotics in concentrations from 100 % down to ~10 % w/w, such as those typical of smuggling operations and the raw material used in street product manufacture. However, the concentrations of active component in some street samples is very low. This is especially true of fentanyl samples. The SORS measurement is non-destructive, hence we propose to follow up this measurement with Resolve Trace Test. In some instances, only trace (a few grains) of sample are readily available. This is not enough material to obtain a high-quality Raman signal, therefore the sample must be concentrated, or the Raman scattering must be enhanced or intensified. One method which enhances the Raman effect is surface enhanced Raman scattering (SERS). For samples which have too low concentration for both conventional backscattered Raman and SORS, the Resolve Trace Test will allow identification by amplifying the Raman signal. The Trace Test can also analyse highly fluorescent samples which may pose a challenge to conventional Raman and SORS.

**Detailed Learning Objectives:**

- Raman spectroscopy and its applicability in narcotic and explosive and hazardous chemical identification.
- The advantages of using a through barrier identification technique (SORS) for the detection of very potent narcotics, NPS substances, explosive and hazardous materials.
- The Trace Test capability (SERS) to detect low concentrations of fentanyl and heroin in street samples

**11:30 ET – 12:00pm ET / 5:30pm CEST – 6:00pm CEST**

***Panel Discussion with All Presenters***

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## |Friday – May 17th, 2019|

## Day 5: Trace Analysis

### 9am ET – 10am ET / 3pm CEST – 4pm CEST

***Standardization of Forensic Chemical Methods for the Examination and Comparison of Trace Evidence***

Jose Almirall, Professor of Chemistry and Biochemistry and Director, Center for Advanced Research in Forensic Science (CARFS), Florida International University

**Abstract:** Elemental analysis of glass using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) has been a standard method for the analysis and comparison of glass evidence for some time and is considered the "Gold Standard" in forensic glass examinations. The ASTM E2927 method for LA-ICP-MS of float glass describes the analytical measurement and recommends a (match) criterion when comparing the multi-element data derived from this method. This presentation describes the evolution of glass evidence examinations over the last 2 decades concluding with a collaborative effort to establish an objective and quantitative calculation of the weight of the evidence in the comparison of glass fragments when no differences in the multi-element analysis of glass are found, using a likelihood ratio (LR). The use of a continuous LR provides a quantitative measure of the strength of the evidence (source level) and accounts for the rarity of an elemental profile through the use of a glass database. In the present study, two glass databases were used to evaluate the performance of the LR; the first database comprised 420 vehicle windshield samples, while the second database comprised 398 known glass samples from casework. The two-level model proposed by Aitken, Zadora, and Lucy was used for the calculation of the LR. However, this model led to unreasonable (too high or too low) LRs. A Pool Adjacent Violators (PAV) algorithm post-hoc calibration step was necessary in order to improve the accuracy of the likelihood ratio. The results of the calibrated LR, and a comparison to the match criteria currently in use is presented as a viable alternative for the reporting of the weight of glass evidence that is both objective and quantitative.

**Detailed Learning Objectives:**

- Understand the standards development process within ASTM E30 committee on Forensic Science.
- Become familiar with the progress that the OSAC Committee on Chemistry and Instrumental Analysis is making to promote standards within the forensic chemistry disciplines. Become aware of the more than 45 documentary standards in the process of approval within the ASTM E30 and the OSAC Chemistry committee.
- Learn a detailed evolution of how forensic glass analysis has progressed from the research stage into routine practice in more than 25 forensic laboratories around the world that have elected to adopt the ASTM E2927 standard method for analysis and comparison of glass evidence, now an OSAC approved standard.

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### 10am ET – 10:15am ET / 4pm CEST – 4:15pm CEST

***Emerging Applications in Forensics for ICP-MS***

Bert Woods, Ph.D. ICP-MS Applications Scientist, Agilent Technologies

**Abstract:** ICP-MS is a type of mass spectrometry that is capable of detecting most elements of the periodic table to very low detection limits (ppt) by ionizing samples and looking at an element's isotopes.

One of the growing fields for ICPMS usage is forensics, and forensic toxicology. ICPMS can be instrumental in these fields because of its ability to run numerous types of samples in various matrices using many front end techniques from LC-ICPMS, LA-ICPMS and so-on.

From the analysis of biological fluids, hair, foods, gun powder residue, and many other sample types and their state, ICPMS play a critical role in today's forensics lab.

**Detailed Learning Objectives:**

- Gain an understanding of the ICP-MS technique
- Learn about example applications where ICPMS has been and can be used in the forensics industry
- Learn about various examples where ICPMS in the forensics lab has been critical

### 10:15am ET – 11:15am ET / 4:15pm CEST – 5:15pm CEST

***Analysis of Paint Evidence Using Infrared and Raman Spectroscopies***

Edward M. Suzuki, PhD, Supervising Forensic Scientist. Washington State Crime Laboratory. Washington State Patrol

**Abstract:** Paint is typically submitted as evidence to forensic science laboratories to address two types of investigator inquiries: Could the known and questioned paint samples have a common origin; and, for a recovered paint chip in a hit-and-run investigation, what type of vehicle did this unknown paint originate from? The first question entails a comparative analysis and usually arises from a paint transfer, as may occur when a crowbar or hammer is used for forced entry against a painted surface; graffiti or hate messages are compared to paint from a spray can seized from the suspected perpetrator; or paint is transferred when a vehicle strikes another vehicle, a building or road structure (such as a guard rail), or an individual. The properties of coatings that forensic paint examiners rely upon to characterize, differentiate, compare, and identify them include their colors, layer structures, and chemical compositions. Infrared spectroscopy, and to a lesser extent Raman spectroscopy, play very important roles in determining paint compositions. Infrared spectroscopy is the method of choice for the identification of paint binders and inorganic pigments, and this is a particularly important task when seeking to identify an unknown automotive finish. The paint compositions listed in the search database normally used for this, the Canadian Paint Data Query (PDQ) system, were obtained using infrared spectroscopy. For the identification of certain organic pigments used in very low concentrations, Raman spectroscopy is the best means to accomplish this, although it is limited to those pigments that produce a resonance Raman enhancement effect. This presentation will describe how these two spectroscopic

methods are used to identify paint binders and pigments, and how the two methods played important roles in the case examples discussed.

**Detailed Learning Objectives:**

- Understand factors to be taken into consideration during comparative analysis arising from paint transfer.
- Learn the properties of coatings that forensic paint examiners rely upon to characterize, differentiate, compare, and identify them include their colors, layer structures, and chemical compositions.
- Learn how FTIR and Raman spectroscopy are used to identify paint binders and pigments, and the roles these techniques played in case examples presented.

### 11:15am ET – 11:30am ET / 5:15pm CEST – 5:30pm CEST

***Infrared Microscopy for Forensic Applications (Sponsored Presentation)***

Louis G. Tisinger, Ph.D., Molecular Spectroscopy Application Scientist, Agilent Technologies

**Abstract:** Combined with general ease of use, feature-rich IR spectra, availability of IR spectral data bases, IR microscopes have become very common tools in forensic laboratories. IR microscopy is very flexible, enabling analysts to collect identifying spectra on almost any sample type on a micrometer-scale. Some common sample types include hair, fibers, paint chips, trace drugs, etc. Typical modes of analyses include transmission, direct reflectance, and attenuated total reflectance (ATR); the mode of analysis is dependent on sample format, e.g., a fiber might be analyzed in transmission.

For common sample types, such as isolated particles, single-point analyses might be employed, where particles are isolated under high magnification and spectra are collected. Alternative analyses might be used for structured materials, like paint chips, where an automated stage is programmed to translate in discrete steps, collecting spectra as a function of depth into a sample; such analyses are referred to as “line scans”. Additionally, when the analysis of a whole region is desired, spectra may be collected from a programmed grid, enabling the generation of a chemical image. Finally, specially-designed systems, referred to as chemical imagers, may be used to collect infrared images from large regions of complex samples, producing plots that contain highly spatially-resolved chemical data. In this presentation, the different sampling modes (i.e., transmission, reflectance, and ATR) will be described and data will be provided. Finally, the different analysis modes (i.e., single-point, line scans, grids, and chemical imaging) will be discussed.

**Detailed Learning Objectives:**

- Understand how IR spectroscopy is used and the information it provides
- Recognize benefits of using a microscope and when and to use one.
- Understand the basic modes of microscopic analysis.

### 11:30 ET – 12:00pm ET / 5:30pm CEST – 6:00pm CEST

***Panel Discussion with All Presenters***

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# Presenter Bios

**Lt. Robert M. Sears**

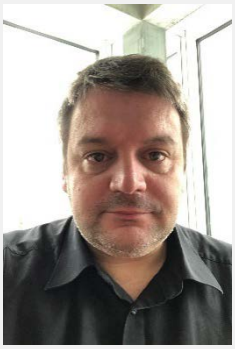
**MS, F-ABFT, Forensic Services Laboratory, South Carolina Law Enforcement Division, USA**

Lieutenant Sears has been employed by SC Law Enforcement Division (SLED) since 1988 serving as a Forensic Toxicologist 1988-2016 and Toxicology Technical Leader 2006-2016. Robert's current responsibilities include oversight of the Forensic LIMS system and associated software and hardware. Robert continues to be active in toxicology providing training for new employees and providing assistance in method development, validation, instrument maintenance and troubleshooting.

**Dr. Fredrick Foster**

**GERSTEL, Inc.**

Fredrick D. Foster received his B.S in Chemistry from Juniata College and his M.S. in Biotechnology from Johns Hopkins University. Mr. Foster has more than 25 years' experience in analytical and bio-analytical method development and analysis, working closely with industry and various U.S. Federal and State agencies. Application fields include clinical, food safety and environmental analysis, mainly based on HPLC and LC-MS/MS. Mr. Foster currently works as an Applications Scientist for GERSTEL, Inc. located in Baltimore, MD, helping to develop, demonstrate and train customers on automated sample preparation methods coupled to either HPLC or LC/MS/MS.



**Dr. Jochen Beyer**

**Institute of Forensic Medicine, St. Gallen, Switzerland**

Dr. Jochen Beyer currently works as the head of forensic toxicology at the institute of Forensic Medicine in St. Gallen, Switzerland. After completion of a pharmacy degree, Dr. Beyer finished his PhD at the University of Saarland in the Prof. Maurer lab. He then worked as a post-doc scientist and senior applications chemist at the institute of forensic medicine in Melbourne, Australia before moving to the current position.

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**Dr. Tania A. Sasaki**

**Ph.D, Chief Scientific Officer, Northwest Physicians Laboratories**

Dr. Tania Sasaki received her B.A. in chemistry from Pomona College and her Ph.D. in chemistry from the University of California-Riverside. Her extensive experience in both LC-MS/MS and toxicology is demonstrated through the articles she has authored, presentations at national and international conferences, and invitations to instruct training courses and webinars. Dr. Sasaki currently oversees two toxicology laboratories in Bellevue, WA, as well as has her own consulting company.

**Dr. Simona Pichini**

**Unit Head, Analytical Pharmacotoxicology, National Centre on Addiction and Doping, National Institute of Health, Rome, Italy**

Dr. Simona Pichini is an Italian Pharmacotoxicologist working at the National Centre on Addiction and Doping at Italian National Institute of Health. She is the Head of Analytical Pharmacotoxicology Unit, dealing with analysis of psychoactive substances and/or metabolites in conventional and non-conventional matrices by GC-MS, GC-MS/MS, LC-MSMS and LC-MS/MS. She is an expert of pharmacokinetics and toxicokinetics of drugs, drugs of abuse, ethanol biomarkers and doping agents in biological matrices associated with clinical outcomes.

**Alexander Ucci**

**Application Engineer, Agilent Technologies, Inc.**

In his current position at Agilent, Alex provides application assistance and technical support for sample preparation products and GC consumables. Before he joined Agilent in 2014, Alex was a graduate student at the Pennsylvania State University researching the morphology and surface properties of aerosol particles using a wide variety of analytical techniques. He has an MS degree in chemistry.

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**Dr. Robert A. Middleberg**

**Ph.D, F-ABFT, DABCC(TC), Laboratory Director, & Sr. V/P of Quality Assurance and Operations, NMS Labs**

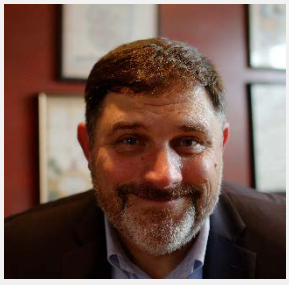
Robert A. Middleberg, PhD, DABCC, F-ABFT, Laboratory Director & Sr. V/P of Laboratory Operations & Quality Assurance at NMS Labs. He currently sits on the Board of Directors of the ABFT. He served as Tox Section Chair w/in the AAFS, & was Chair of the SWGTOX from its beginning to its end in 2014. He currently is a member of CAP's Tox Resource Committee and sits on the Tox Subcommittee within the NIST OSAC. In 2013, he was awarded the Rolla N. Harger Award by the Tox section of the AAFS for contributions to the field & profession of forensic toxicology.

**Dr. Theresa Sosienski**

**Ph.D, LC/MS Marketing Applications Scientist, Agilent Technologies**

Terri is an LC/MS applications scientist at Agilent Technologies in Santa Clara, CA. She joined Agilent in October 2016 after completing her Ph.D. in Crop and Soil Environmental Science at Virginia Tech, where she researched emerging organic contaminants sourced from livestock manures. At Agilent, she is currently focusing on LC triple quadrupole applications and is the lead applications scientist working on the Ultivo LC/TQ platform.

**Dr. Marc A. LeBeau**



**Ph.D, F-ABFT, Senior Scientist, FBI Laboratory, Quantico, Virginia, USA**

Marc A. LeBeau, PhD, is a Senior Forensic Scientist of the Scientific Analysis Section of the FBI Laboratory. He has worked as a Forensic Chemist and Toxicologist for the FBI since 1994 and has testified in federal, state, and county courts throughout the United States.

Dr. LeBeau holds a Bachelor's degree in Chemistry and Criminal Justice from Central Missouri State University (1988) and a Master of Science degree in Forensic Science from the University of New Haven (1990). He was employed in the St. Louis County Medical Examiner's Office (1990-1994), before beginning his career with the FBI. In 2005, he received his Doctorate in toxicology from the University of Maryland – Baltimore.

As a Fellow of the American Board of Forensic Toxicology, Dr. LeBeau is active in numerous scientific organizations. He serves as the current President of The International Association of Forensic Toxicologists (TIAFT) and is a Fellow of the American Academy of Forensic Sciences

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(AAFS). Additionally, Dr. LeBeau is a member and Past-President of the Society of Forensic Toxicologists (SOFT).

Dr. LeBeau has spent much of his career helping to advance the forensic sciences. He has served as a Commissioner on the National Commission on Forensic Science, the chairman of the Scientific Working Group on the Forensic Analysis of Chemical Terrorism (SWGFACT), and co-chair to the Scientific Working Group on the Forensic Analysis on Chemical, Biological, Radiological, and Nuclear Terrorism (SWGCBRN). He was also a co-chair of the Scientific Working Group for Forensic Toxicology (SWGTOX). He is currently the Toxicology Subcommittee Chair of the Organization of Scientific Area Committees (OSAC) and Chair of the AAFS Standards Board's Toxicology Consensus Body.

In 2004, Dr. LeBeau won the *FBI Director's Award for Outstanding Scientific Advancement,* the *2008 End Violence Against Women (EVAW) International Visionary Award*, and the *Alexander O. Gettler Award* from the Toxicology Section of the American Academy of Forensic Sciences in 2015.

**Dr. Rebecca Veeneman**

**Ph.D, Applications Chemist Manager, Agilent Technologies**

Becki Veeneman is an Applications Chemist Manager in GC Marketing at Agilent Technologies. She currently leads a team of applications chemists charged with developing technical marketing material for new gas phase product introductions. She has over 15 years of research experience in gas chromatography. Becki holds a B.S. in Chemistry from Xavier University (Cincinnati, OH) and a M.S. and Ph.D. in Chemistry from the University of Michigan.

**Priv. Doz. Dr. Frank T. Peters**

**Head of Forensic & Clinical Toxicology, Institute of Forensic Medicine, Jena University Hospital Jena, Germany**

Frank T. Peters is a pharmacist and obtained a PhD from Saarland University. Since 2009 he is the Head of Toxicology at the Institute of Forensic Medicine in Jena, Germany. His research interests include analytical method validation. Frank Peters is (co-)author of over 90 peer-reviewed papers. He is a member of TIAFT, GTFCh and IATDMCT and currently a member of the GTFCh board. He has received several awards from professional organizations including one for a review article on method validation.

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**Dr. Anthony P. DeCaprio**

**Ph.D, F-ABFT, Associate Professor, Department of Chemistry & Biochemistry, Florida International University**

Dr. Tony DeCaprio is a toxicologist with experience in neurotoxicology and the analysis of drugs and other xenobiotics in human specimens. Prior to joining FIU in 2009, he served in research positions at the NY State Department of Health, UAlbany, and UMass Amherst. He directs the FIU Forensic & Analytical Toxicology Facility, which provides research support to investigators in analytical/clinical/forensic toxicology. His work has been supported by funding from NIEHS, NCI, NIOSH, ATSDR, and NIJ.

**Agnes D. Winokur**

**Associate Laboratory Director, DEA Southeast Laboratory, USA**

Ms. Winokur is the Associate Laboratory Director for the DEA Southeast Laboratory, which serves the southeast part of the United States and the Caribbean. In addition to her 22 years of service with DEA, Ms. Winokur currently serves in the NIST OSAC Seized Drugs Sub-committee, she is a member of SWGDRUG, the Co-Chair of the AAFS Synthetic Opioids Ad-Hoc Committee, and the Vice-Chair of the ASTM International E30 Forensic Science Committee.

**Dr. Luis A. Cuadra-Rodriguez**

**Ph.D, R&D Chemist, Agilent Technologies**

Dr. Luis Cuadra-Rodriguez obtained his PhD in physical chemistry from the University of Colorado at Boulder in 2011 followed by a two-year post-doctoral appointment at the University of California San Diego. He joined Agilent in 2013 as an R&D chemist focused on mass spectrometry technology within the GC/MS group. Since then, he has been involved in the development and testing of single and tandem quadrupole technologies such as the 5977B MSD and the 7010 TQ.

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**Dr. Michelle Peace**

**Associate Professor, Department of Forensic Science, Virginia Commonwealth University**

Dr. Peace earned her Ph.D. from the Medical College of Virginia at Virginia Commonwealth University (VCU). Dr. Peace is currently an Associate Professor for the FEPAC-accredited Department of Forensic Science at VCU.

Dr. Peace is currently the PI for an NIJ grant studying the efficacy of electronic cigarettes, particularly as they pertain to substance use and abuse. Her current project is a clinical study to evaluate the impact of vaping on roadside impairment evaluations for suspected DUI.

**Dr. Robert Stokes**

**Head of Detection and Security Business, Agilent Technologies**

Dr. Robert Stokes completed his PhD from Cranfield University, UK in 2003. Since then he has worked for the UK Government, the Academic sector and private industry in Narcotics, Explosives and Hazardous Chemicals Detection. Rob has developed a number of instrumentation platforms for use in the sector and is now Head of Detection and Security Business at Agilent Technologies.

**Dr. Jose Almirall**

**Professor of Chemistry and Biochemistry and Director, Center for Advanced Research in Forensic Science (CARFS), Florida International University**

Dr. José R. Almirall is a Professor in the Department of Chemistry and Biochemistry and Director of the Center for Advanced Research in Forensic Science (CARFS) at Florida International University. He was a practicing forensic scientist at the Miami-Dade Police Department Crime Laboratory for 12 years, where he testified in over 100 criminal cases in state and federal courts prior to his academic appointment at FIU in 1998. Professor Almirall has authored ~ 140 peer-reviewed scientific publications in the field of analytical and forensic chemistry. He was appointed to serve on the Forensic Science Standards Board (FSSB) of the Organization of Scientific Area Committees (OSAC) in 2015 and is Chair of the Chemistry scientific area committee (SAC) of the OSAC.

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**Dr. Bert Woods**

**Ph.D, ICP-MS Applications Scientist, Agilent Technologies**

Dr. Bert Woods has been an ICP-MS Applications Scientist at Agilent technologies since 2004, focusing on a myriad of applications on Agilent's single quad and triple quad technologies doing pre and post sales support. Before joining Agilent, Bert was an Analytical Chemist with Micron Technologies and Dominion Semiconductor in Manassas, VA. Bert is a graduate of Radford University in Radford, VA and is a proud father of 3, hockey player and Washington DC Sports fan.

**Dr. Edward M. Suzuki**


**Ph.D, Supervising Forensic Scientist. Washington State Crime Laboratory, Washington State Patrol**

De. Suzuki received his B.S. degree in chemistry from the University of Washington (Seattle, WA) in 1970 and his Ph.D. in chemistry (physical) from Oregon State University (Corvallis, OR) in 1975. Dr. Suzuki's doctoral dissertation involved the characterization of highly reactive chemical species trapped in low-temperature argon matrices using various spectroscopic methods, including infrared, Raman, and electron paramagnetic resonance.

Dr. Suzuki is currently a supervising forensic scientist at the Washington State Crime Laboratory (Seattle, WA). He has worked for over 38 years in the field of forensic science and has testified in over 750 criminal cases. His main research interests include applications of infrared, Raman, and X-ray fluorescence spectroscopies for the analysis of various types of evidence, and particularly, for the identification of pigments in automotive finishes. He has published over 30 research papers, primarily in the area of vibrational spectroscopy.

Dr. Suzuki has helped teach classes on forensic applications of infrared spectroscopy for the FBI Academy (Quantico, VA), IR Courses Inc. (Bowdoin College: Brunswick, ME), Eastern Washington University (Cheney, WA), the California Criminalistics Institute (Sacramento, CA), Microtrace LLC (Elgin, IL), and public forensic science laboratories in New Hampshire, Illinois, California, and Singapore. He is a fellow of the American Academy of Forensic Sciences; a member of the American Chemical Society, the Society for Applied Spectroscopy, the Coblentz Society, the American Society of Trace Evidence Examiners, and the Northwest Association of Forensic Scientists; and is certified as a fellow by the American Board of Criminalistics.

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**Dr. Louis G. Tisinger**

**Ph.D, Molecular Spectroscopy Application Scientist, Agilent Technologies**

Dr. Louis (Lou) Tisinger has a Ph.D. in Analytical Chemistry from Miami University in Oxford Ohio, where his graduate research involved the study of ATR imaging and microscope performance in vibrational spectroscopy. Most of his career has been related to pre- and post-sales support of FTIR spectrometers, microscopes, imaging systems, and thermal analytical instruments, focusing on analyzing customer samples, demonstrations, post-sales training, troubleshooting, and R&D.



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|---|---|
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| Benzodiazepines | instant |
| TCAs (N+ glucuronides) | instant |
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| Synthetic Cannabinoids | 10 min |
| TDM | 10 min |

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